Achieve Alignment and Commentary:
Yellow highlighted rows indicates a gap in the alignment between the CCSS and NY.
Differences in grade level requirements are indicated in pink when the concept is addressed later in NY than in the CCSS.

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
|---|---|---|
| MP.1 Make sense of problems and persevere in solving them. | | . |
| MP.2 Reason abstractly and quantitatively. | | . |
| MP.3 Construct viable arguments and critique the reasoning of others. | | . |
| MP.4 Model with mathematics. | | . |
| MP.5 Use appropriate tools strategically. | | . |
| MP.6 Attend to precision. | | . |
| MP.7 Look for and make use of structure. | | . |
| MP.8 Look for and express regularity in repeated reasoning. | | . |
| **GRADE K** | | . |
| **Counting and Cardinality** | | . |
| **Know number names and the count sequence.** | **A. Know number names and the count sequence.** | . |
| K.CC.1. Count to 100 by ones and by tens. | K.CC.A.1. Count to 100 by ones and by tens. | . |
| K.CC.2. Count forward beginning from a given number within the known sequence (instead of having to begin at 1). | K.CC.A.2. Count forward by 1's beginning from any given number within 100. | NYS clarified the limitations and the requirement to count by 1's. |
| K.CC.3. Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects). | K.CC.A.3 Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 representing account of no objects). | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
|---|---|---|
| **Count to tell the number of objects.** | **B. Count to tell the number of objects.** | . |
| K.CC.4. Understand the relationship between numbers and quantities; connect counting to cardinality. | K.CC.B.4. Understand the relationship between numbers and quantities up to 20; connect counting to cardinality. | NYS added a limitation that is consistent with grade level expectations. |
| K.CC.4a When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object. | K.CC.B.4a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object. (1:1 correspondence) | NYS added a vocabulary term. |
| K.CC.4b Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted. | K.CC.B.4b. Understand that the last number name said tells the number of objects counted, (cardinality). The number of objects is the same regardless of their arrangement or the order in which they were counted. | NYS added a vocabulary term. |
| K.CC.4c Understand that each successive number name refers to a quantity that is one larger. | K.CC.B.4c. Explore the concept that each successive number name refers to a quantity that is one larger. | NYS changed "understand" to "explore the concept." It is not clear in the glossary of verbs whether this is an even exchange in terms of rigor. |
| | K.CC.B.4d. Explore the concept of ordinal numbers (first through tenth) to describe the relative position and magnitude of whole numbers. | NYS added a similar standard in the original adaptation of the CCSS. In this draft that standard has been modified to replace “develop” with “explore.” This standard is appropriate for inclusion and it was wise to add this at the end of this cluster to avoid coding issues. It is possible that the cluster title should be changed to reflect this new requirement. |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| K.CC.5. Count to answer "how many?" questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects. | K.CC.B.5a. Answer counting questions using as many as 20 objects arranged in a line, a rectangular array, and a circle and as many as 10 objects in a scattered configuration, (e.g., "How many _____ are there?"). | The NYS change from "or" to "and" may be taken to mean that the objects must be arranged in all of the ways for each set. This makes the new version of the standard less clear. |
| | K.CC.B.5b. Given a number from 1–20, count out that many objects. | NYS separated the two concepts in the compound CCSS version. |
| **Compare numbers.** | **C. Compare numbers.** | . |
| K.CC.6. Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies. [Include groups with up to 10 objects.] | K.CC.C.6. Identify whether the number of objects in one group is more/greater than, fewer/less than, or equal/same to the number of objects in another group, (e.g., by using matching and counting strategies). Include groups with up to ten objects. | NYS put the CCSS example in parentheses and made the footnote part of the standard. |
| K.CC.7. Compare two numbers between 1 and 10 presented as written numerals. | K.CC.C.7. Compare two numbers between 1 and 10 presented as written numerals. | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **Operations and Algebraic Thinking** | | . |
| **Understand addition as putting together and adding to, and under- stand subtraction as taking apart and taking from.** | **A. Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.** | . |
| K.OA.1. Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations. [Drawings need not show details, but should show the mathematics in the problem.] | K.OA.A.1. Represent addition and subtraction using objects, fingers, pennies, mental images, drawings, sounds, acting out situations, verbal explanations, expressions, equations or other strategies. Drawings need not show details, but should show the mathematics in the problem. | NYS added "pennies" in the list of required representations. It is not clear how "pennies" are different than objects. It might be clearer to put "including pennies" in parentheses after "objects." This NYS version opened the door to include "other strategies" in the requirement. They also made the CCSS footnote part of the standard, which was intended as a clarification for the teacher rather than a performance objective. |
| K.OA.2. Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem. | K.OA.A.2. Solve addition and subtraction word problems, and add and subtract within 10, (e.g., by using objects or drawings to represent the problem). | . |
| K.OA.3. Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., 5 = 2 + 3 and 5 = 4 + 1). | K.OA.A.3. Decompose numbers less than or equal to 5 into pairs in more than one way, and record each decomposition by a drawing or equation (e.g., 5 = 2 + 3 and 5 = 4 + 1). Explore decomposition within 10. | NYS changed the focus by requiring students to decompose numbers to 5 and "explore decomposition" to 10. The difference between what students should do with numbers less than five and numbers less than 10 is unclear, though a distinction is clearly implied. "Explore," according to the glossary, means that "students will learn the concept" but it is not clear how the differences in expectation would be measured. |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| K.OA.4. For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation. | K.OA.A.4. Find the number that makes 10 when given a number from 1 to 9, (e.g., by using objects or drawings, and record the answer with a drawing or equation). | Typo: It appears that including the last part of the requirement is inside the parentheses, may be an error. Enclosing it, technically, made it part of the example rather than the standard. Perhaps the closing parenthesis should be in the place of the comma after "objects or drawings." |
| K.OA.5. Fluently add and subtract within 5. | K.OA.A.5. Fluently add and subtract within 5. Fluency involves a mixture of just knowing some answers, knowing some answers from patterns, and knowing some answers from the use of strategies. | NYS added an explanation of fluency to the standard, presumably for the teacher. The usage here seems to imply that students should think of some elements of adding and subtracting within 5 in different ways. Is it allowable, for example, that students "just know" all of these? This distinction matters for measurability purposes. Also, the explanation, itself, should be in parentheses or added as a "note," as is the case in other NYS (See 1.OA.C.6b, 2.OA.B.2a, 2.NBT.B.5a, etc.). As it is, it appears to be part of the performance objective. |
| | **B. Understand simple patterns.** | |
| | K.OA.B.6. Duplicate, extend, and create simple patterns using concrete objects. | The CCSS does not emphasize patterns. NYS added this standard to follow a progression started in their Pre-K standards. Clarification is needed for consistent application of this standard and for teachers to understand what is meant by "simple patterns." |
| **Numbers and Operations in Base Ten** | | . |
| **Work with numbers 11–19 to gain foundations for place value.** | **A. Work with numbers 11-19 to gain foundations for place value.** | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| K.NBT.1. Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation (e.g., 18 = 10 + 8); understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones. | K.NBT.A.1. Explore composing and decomposing of the numbers from 11 to 19 into ten ones and some further ones, (e.g., by using objects or drawings). | NYS removed the requirement to record and understand the de/composed numbers and changed the performance for this standard to "explore." It is not clear in the glossary of verbs whether this is an even exchange in terms of rigor. |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **Measurement and Data** | | . |
| **Describe and compare measurable attribute** | **A. Describe and compare measurable attributes.** | . |
| K.MD.1. Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. | K.MD.A.1. Describe measurable attributes of an object(s), such as length or weight, using appropriate vocabulary (e.g., small, big, short, tall, empty, full, heavy, and light). | The CCSS and current NYS emphasize describing the attribute. (This object has length, for example.) The new NYS examples shift that to make claims of quantifying that attribute. Is this an intentional shift? If so, this seems to overlap with K.MD.A.2 in that a claim about "small" requires some sort of comparison to something else. Clarification is needed. |
| K.MD.2. Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. *For example, directly compare the heights of two children and describe one child as taller/shorter.* | K.MD.A.2. Directly compare two objects with a measurable attribute in common to see which object has "more of"/"less of" the attribute and describe the difference. | NYS removed the CCSS example. |
| **Classify objects and count the number of objects in each category.** | **B. Classify objects and count the number of objects in each category.** | . |
| K.MD.3. Classify objects into given categories; count the numbers of objects in each category and sort the categories by count. [Limit category counts to be less than or equal to 10.] | K.MD.B.3. Classify objects into given categories; count the objects in each category and order the categories by count. Limit category counts to be less than or equal to 10. | . |
| | **C. Work with money** | |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
|---|---|---|
| | K.MD.C.4. Explore coins and begin identifying pennies and dimes. | NYS increased emphasis on money. This standard may present a measurement problem. What does it mean to *begin* identifying pennies and dimes? How would a teacher measure "begin" in this standard? |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **Geometry** | | . |
| **Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).** | **A. Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).** | . |
| K.G.1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as *above* , *below* , *beside* , *in front of* , *behind* , and *next to* . | K.G.A.1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to. | . |
| K.G.2. Correctly name shapes regardless of their orientations or overall size. | K.G.A.2. Name shapes regardless of their orientations or overall size. | NYS assumed that correctness was implied in the standard. However, the wording of the new NYS allows for any name for a shape. Is the expectation for students to provide their own names for shapes or to provide established names for shapes? |
| K.G.3. Identify shapes as two-dimensional (lying in a plane, "flat") or three- dimensional ("solid"). | K.G.A.3. Differentiate between two-dimensional (lying in a plane, "flat") and three-dimensional ("solid") shapes. | NYS slightly changed the wording in this standard. This change is insignificant in terms of meaning and rigor. |
| **Analyze, compare, create, and compose shapes.** | **B. Analyze, compare, and sort objects.** | The header for this cluster is changed, creating a coherence issue. However, the rationale for this change needs clarification as none of the standards below address sorting objects. |
| K.G.4. Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/"corners") and other attributes (e.g., having sides of equal length). | K.G.B.4. Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/"corners") and other attributes (e.g., having sides of equal length). | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
|---|---|---|
| K.G.5. Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes. | K.G.B.5. Model objects in their environment by using and/or drawing shapes (e.g., using unit blocks to build a simple representation of the classroom). | The wording in this NYS is awkward. Should "their" be "the?" It is not clear why "building shapes" was removed, as it clarified what the "model" was to be.<br><br>By putting "using" and "drawing" together, NYS put the emphasis on 3-D models. It is not clear how students in Gr K would know how to "draw" environmental shapes that are 3-D. They changed from "sticks and clay balls," which might be used to build either 2- or 3-D shapes, to "unit blocks," which essentially removed the possibility of 2-D shapes. |
| K.G.6. Compose simple shapes to form larger shapes. *For example, "Can you join these two triangles with full sides touching to make a rectangle?"* | K.G.B.6. Compose larger shapes from simple shapes ( e.g., join two triangles to make a rectangle). | NYS slightly changed the wording of this standard. |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **GRADE 1** | | . |
| **Operations and Algebraic Thinking** | | . |
| **Represent and solve problems involving addition and subtraction.** | **A. Represent and solve problems involving addition and subtraction.** | . |
| 1.OA.1. Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem*. [*See Glossary, Table 1.] | 1.OA.A.1. Use addition and subtraction within 20 to solve one step word problems involving situations of adding to, taking from, putting together, taking apart, and/or comparing, with unknowns in all positions (e.g., by using objects or drawings, and equations with a symbol for the unknown number to represent the problem). (See Table 2 Addition and Subtraction Situations, pg. 9 of https://commoncoretools.files.wordpress.com/2011/05/ccss_progression_cc_oa_k5_2011_05_30 2.pdf )<br><br>Note: Instructionally, students should be taught to use objects, drawings, and equations with a symbol for the unknown number to represent the problem; however, when solving any problem, students can use objects or drawings, and equations. | NYS added a link to the Draft K-5 progressions and an instructional note to the teacher. It is not clear why the example was changed from a list of three strategies to, what appears to be, two: "objects or drawings" and "equations." |
| 1.OA.2. Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem. | 1.OA.A.2. Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20. e.g. by using objects, drawings, and equations with a symbol for the unknown number to represent the problem. | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **Understand and apply properties of operations and the relationship between addition and subtraction.** | **B. Understand and apply properties of operations and the relationship between addition and subtraction.** | . |
| 1.OA.3. Apply properties of operations as strategies to add and subtract. *Examples: If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known. (Commutative property of addition.) To add 2 + 6 + 4, the second two numbers can be added to make a ten, so 2 + 6 + 4 = 2 + 10 = 12. (Associative property of addition.)* [Students need not use formal terms for these properties.] | 1.OA.B.3. Apply properties of operations as strategies to add and subtract. Examples: If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known. (Commutative property of addition.) To add 2 + 6 + 4, the second two numbers can be added to make a ten, so 2 + 6 + 4 = 2 + 10 = 12. (Associative property of addition.) (Students need not use formal terms for these properties.) | NYS put the CCSS footnote in parentheses in the standard. |
| 1.OA.4. Understand subtraction as an unknown-addend problem. *For example, subtract 10 – 8 by finding the number that makes 10 when added to 8.* | 1.OA.B.4. Understand subtraction as an unknown-addend problem (e.g., subtract 10 – 8 by finding the number that makes 10 when added to 8). Add and subtract within 20. | NYS added the requirement to add/subtract within 20 to this understanding of subtraction standard. This requirement is not well connected to 1.OA.B.4. This may be a typo, as it is also the cluster header that immediately follows. |
| **Add and subtract within 20.** | **C. Add and subtract within 20.** | . |
| 1.OA.5. Relate counting to addition and subtraction (e.g., by counting on 2 to add 2). | 1.OA.C.5. Relate counting to addition and subtraction (e.g., by counting on 2 to add 2). | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 1.OA.6. Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. Use strategies such as counting on; making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a ten (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9); using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4); and creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13). | 1.OA.C.6a. Add and subtract within 20. Use strategies such as counting on; making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a ten (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9); using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4); and creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13). | NYS separated the requirements in this CCSS into two parts. |
| | 1.OA.C.6b. Fluently add and subtract within 10. Note: Fluency involves a mixture of just knowing some answers, knowing some answers from patterns, and knowing some answers from the use of strategies. | NYS added the definition of fluency (presumably for the teacher) to this standard. In this case, it is not clear how this particular fluency requirement would be relevant, since in this case, "just knowing" is the goal. Using patterns and strategies would not be useful or expected. |
| **Work with addition and subtraction equations.** | **D. Work with addition and subtraction equations.** | . |
| 1.OA.7. Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false. *For example , which of the following equations are true and which are false? 6 = 6, 7 = 8 – 1, 5 + 2 = 2 + 5, 4 + 1 = 5 + 2.* | 1.OA.D.7. Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false (e.g., which of the following equations are true and which are false? 6 = 6, 7 = 8 – 1, 5 + 2 = 2 + 5, 4 + 1 = 5 + 2). | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 1.OA.8. Determine the unknown whole number in an addition or subtraction equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 + ? = 11, 5 = □– 3, 6 + 6 = □.* | 1.OA.D.8. Determine the unknown whole number in an addition or subtraction equation with the unknown in all positions, (e.g., determine the unknown number that makes the equation true in each of the equations 8 + ? = 11, __ – 3 = 5 , 6 + 6 = ■). | NYS removed the reference to three whole numbers in the equation but added "the unknown in all positions." Clarification may be needed to ensure consistent understanding of this requirement. Does NYS expect that equations relating more than three whole numbers are allowed?<br><br>It is not clear why NYS changed all three equations to be in the same order: a + b = c, rather than having one in the c = a + b order, as is the case in the CCSS. This is especially interesting given the move to placing "the unknown in all positions" in the NYS. |
| **Numbers and Operations in Base 10** | | . |
| **Extend the counting sequence.** | **A. Extend the counting sequence.** | . |
| 1.NBT 1. Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral. | 1.NBT.A.1. Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral. | . |
| **Understand place value.** | **B. Understand place value.** | . |
| 1.NBT 2. Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases:<br>a. 10 can be thought of as a bundle of ten ones — called a “ten.” | 1.NBT.B.2. Understand that the two digits of a two-digit number represent amounts of tens and ones. | In removing the colon and separating the sub parts of this CCSS, the purpose of the parts, special cases of the standard, was lost. More revision is needed to clearly identify a performance expectation in those parts. |
| b. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones. | 1.NBT.B.2a. 10 can be thought of as a bundle of ten ones, called a "ten". | Measurability: This standard has no performance requirement but is rather a definition or statement of fact. |

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| c. The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones). | 1.NBT.B.2b. The numbers from 11 to 19 are composed of a ten and some ones. | Measurability: This standard has no performance requirement but is rather a definition or statement of fact. |
| | 1.NBT.B.2c. The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight or nine tens (and 0 ones). | Measurability: This standard has no performance requirement but is rather a definition or statement of fact. |
| 1.NBT.3. Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <. | 1.NBT.B.3. Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <. | . |
| **Use place value understanding and properties of operations to add and subtract.** | **C. Use place value understanding and properties of operations to add and subtract** | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 1.NBT.4. Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten. | 1.NBT.C.4. Add within 100 using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. Relate the strategy to a written method and explain the reasoning used. A written method is any way of representing a strategy using pictures or numbers.<br><br>Note: Instructionally, students should be taught to use strategies based on place value, properties of operations, and the relationship between addition and subtraction; however, when solving any problem, students can choose any strategy. | All parts of the CCSS were separated into sub parts. This rearrangement did not change the meaning or rigor of the CCSS counterpart.<br><br>NYS added a note to the teacher attempting to clarify the stem for this standard. The last part of this note, if taken at face value, may instruct a teacher to never hold students accountable for a specific strategy. This may need clarification. |
| | 1.NBT.C.4a. Add a two-digit number and a one-digit number. | |
| | 1.NBT.C.4b. Add a two-digit number and a multiple of 10. | |
| | 1.NBT.C.4c. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones, and sometimes it is necessary to compose a ten. | |
| 1.NBT.5. Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used. | 1.NBT.C.5. Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used. | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 1.NBT.6. Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. | 1.NBT.C.6. Subtract multiples of 10 from multiples of 10 in the range 10-90. Relate the strategy used to a written representation and explain the reasoning. A written method is any way of representing a strategy using pictures or numbers.<br>Note: Students may use concrete models, drawings, strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. | NYS removed the limitation of "positive or zero differences" and moved the suggested strategies to a note for teachers. Returning the missing limitation might need to be considered, since it is not necessarily "implied" as stated in the clarification notes. The added definition for "written method" should be in a glossary rather than in the standard. |
| **Measurement and Data** | | . |
| **Measure lengths indirectly and by iterating length units.** | **A. Measure lengths indirectly and by iterating length units.** | . |
| 1.MD.1. Order three objects by length; compare the lengths of two objects indirectly by using a third object. | 1.MD.A.1. Order three objects by length; compare the lengths of two objects indirectly by using a third object. | . |
| 1.MD.2. Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps. | 1.MD.A2. Express the length of an object as a whole number using “length units”, (e.g., cubes, paper clips). Measure end to end with no gaps or overlaps. | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **Tell and write time.** | **B. Tell and write time and money.** | The wording of this new header needs clarification: "Tell and write…money?" |
| 1.MD.3. Tell and write time in hours and half-hours using analog and digital clocks. | 1.MD.B.3a. Tell and write time in hours and half-hours using analog and digital clocks. Use the terms o'clock and half past. | NYS added vocabulary requirements related to telling time. It is not clear why these particular time vocabulary words are called out, especially "half past," which is not commonly used in today's language. Also in 2.MD.C.7 the additional phrase "but not included to" is added to a similar addition. This wording makes it appear that only those terms are required. Will students also be required to use "thirty?" For example saying 9:30? |
| | 1.MD.B.3b. Recognize and identify coins (penny, nickel, dime, and quarter) and their value and use the ¢ (cent) symbol appropriately. | NYS added a similar expectation in the original adaptation of the CCSS, though it was part of an existing standard. In this draft money is split into two additional substandards. |
| | 1.MD.B.3c. Explore dimes and pennies as they relate to place value concepts. | NYS added requirements related to money. This standard uses the verb, "explore," as an indication that this is a concept that will be built upon in later grades. |
| **Represent and interpret data.** | **C. Represent and interpret data.** | . |
| 1.MD.4. Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another. | 1.MD.C.4.Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another. | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
|---|---|---|
| **Geometry** | | . |
| **Reason with shapes and their attributes.** | | . |
| 1.G.1. Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes. | 1.G.A.1. Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size) for a wide variety of shapes; build and/or draw shapes to possess defining attributes. | NYS added "or" to this requirement. |
| 1.G.2. Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape. [Students do not need to learn formal names such as "right rectangular prism."] | 1.G.A.2. Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape. (Students do not need to learn formal names such as “right rectangular prism.”) | . |
| 1.G.3. Partition circles and rectangles into two and four equal shares, describe the shares using the words *halves* , *fourths* , and *quarters* , and use the phrases *half of* , *fourth of* , and *quarter of* . Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares. | 1.G.A.3. Partition circles and rectangles into two and four equal shares, describe the shares using the words halves, fourths, and quarters, and use the phrases half of, fourth of, and quarter of. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares. | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
|---|---|---|
| **GRADE 2** | | . |
| **Operations and Algebraic Thinking** | | . |
| **Represent and solve problems involving addition and subtraction.** | **A. Represent and solve problems involving addition and subtraction.** | . |
| 2.OA.1. Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem*. [*See Glossary, Table 1.] | 2.OA.A.1a. Use addition and subtraction within 100 to solve one-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions ( e.g., by using drawings and equations with a symbol for the unknown number to represent the problem). Explanations may be supported by drawings or objects. (See Table 2 Addition and Subtraction Situations, pg. 9 of https://commoncoretools.files.wordpress.com/2011/05/ccss_progression_cc_oa_k5_2011_05_302.pdf ) | NYS split this CCSS into to sub parts, making 1-step problem solving the primary requirement at this grade level. |
| | 2.OA.A.1b. Use addition and subtraction within 100 to develop an understanding of solving two-step problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem. | This NYS reduced the rigor for 2-step problem solving by making the requirement to "develop an understanding" of them, rather than to actually solve them. This may present a measurement issue: Is there a measurement difference between "develop an understanding" and "understand?" This is not addressed in the Glossary of Verbs. |
| **Add and subtract within 20.** | **B. Add and Subtract within 20.** | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
|---|---|---|
| 2.OA.2. Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers. [See standard 1.OA.6 for a list of mental strategies.] | 2.OA.B.2a. Fluently add and subtract within 20 using mental strategies. Strategies could include counting on; making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a ten (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9); using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4); and creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13).<br>Note: Fluency involves a mixture of just knowing some answers, knowing some answers from patterns, and knowing some answers from the use of strategies. | NYS separated the two concepts in the compound CCSS version into two sub parts. They also added an explanation of the mental strategies expected and a definitive note to the teacher regarding fluency. In this case the fluency note appears to contradict the standard, itself, since "the use of strategies" is the only fluency method called for. |
| | 2.OA.B.2b. By end of the year, know from memory all sums within 20 of two one-digit numbers. | |
| **Work with equal groups of objects to gain foundations for multiplication.** | **C. Work with equal groups of objects to gainin foundations for multiplication** | . |
| 2.OA.3. Determine whether a group of objects (up to 20) has an odd or even number of members, e.g., by pairing objects or counting them by 2s; write an equation to express an even number as a sum of two equal addends. | 2.OA.C.3a. Determine whether a group of objects (up to 20) has an odd or even number of members (e.g., by pairing objects or counting them by 2's). | NYS separated the two concepts in the compound CCSS version into two sub parts. |
| | 2.OA.C.3b.Write an equation to express an even number as a sum of two equal addends. | |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 2.OA.4. Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends. | 2.OA.C.4. Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends. | . |
| **Numbers and Operations in Base Ten** | | . |
| **Understand place value.** | **A. Understand place value** | . |
| 2.NBT.1. Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. Understand the following as special cases:<br>a. 100 can be thought of as a bundle of ten tens — called a “hundred.”<br>b. The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones). | 2.NBT.A.1. Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones: e.g. 706 equals 7 hundreds, 0 tens, and 6 ones. | In removing the colon and separating the sub parts of this CCSS, the purpose of the parts, special cases of the standard, was lost. More revision is needed to clearly identify a performance expectation. |
| | 2.NBT.A.1a. 100 can be thought of as a bundle of ten tens, called a "hundred". | Measurability: This standard has no performance requirement but is rather a definition or statement of fact. |
| | 2.NBT.A.1b. Then numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones). | Measurability: This standard has no performance requirement but is rather a definition or statement of fact. Typo: "the" is changed to "then" in the NYS version. |
| 2.NBT.2. Count within 1000; skip-count by 5s, 10s, and 100s. | 2.NBT.A.2. Count within 1000; skip-count by 5s, 10s, and 100s.<br>Note: Begin sequence with a multiple of 5, 10, or 100. | NYS added a limitation that is not expressly present in the CCSS. |
| 2.NBT.3. Read and write numbers to 1000 using base-ten numerals, number names, and expanded form. | 2.NBT.A.3. Read and write numbers to 1000 using base-ten numerals, number names, and expanded form. Expanded form in Grade 2 should take the form of : 237=200+30+7. | NYS added an explanatory note for the teacher. This might be more appropriate in parentheses or brackets. |

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| 2.NBT.4. Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using >, =, and < symbols to record the results of comparisons. | 2.NBT.A.4. Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using >, =, and < symbols to record the results of comparisons. | . |
| **Use place value understanding and properties of operations to add and subtract.** | **B. Use place value understanding and properties of operations to add and subtract.** | . |
| 2.NBT.5. Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. | 2.NBT.B.5a. Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; illustrate or explain the strategy and reasoning used.<br>Note: Fluency involves a mixture of just knowing some answers, knowing some answers from patterns, and knowing some answers from the use of strategies. | NYS added a requirement for students to illustrate or explain the strategy. Presumably this addition was intended to cover 2.NBT.9. However, this requirement does not meet that of the CCSS: "Explain WHY ... strategies work." The added note to the teacher related to fluency does not make sense here, since this standard addresses only strategies and not a mixture of other ways of "knowing." |
| | 2.NBT.B.5b. Understand that in adding or subtracting two-digit numbers, one adds or subtracts tens and tens, ones and ones, and sometimes it is necessary to compose or decompose tens. | NYS added this requirement, expounding on NBT.B.5a. |
| 2.NBT.6. Add up to four two-digit numbers using strategies based on place value and properties of operations. | 2.NBT.B.6. Add up to four two-digit numbers using strategies based on place value and properties of operations. | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
|---|---|---|
| 2.NBT.7. Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method. Understand that in adding or subtracting three- digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds. | 2.NBT.B.7a. Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method. A written method is any way of representing a strategy using pictures or numbers.<br>Note: Fluency not expected until grade three. | NYS separated the concepts in the compound CCSS version into two sub parts. In this one they added a note for the teacher regarding fluency requirements at this grade level and an explanation of the term, "written method." Since it is not part of the performance objective, this definition would be more appropriate in a parenthetical, a note, or the glossary. |
| | 2.NBT.B.7b. Understand that in adding or subtracting up to three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones, and sometimes it is necessary to compose or decompose tens or hundreds. | . |
| 2.NBT.8. Mentally add 10 or 100 to a given number 100–900, and mentally subtract 10 or 100 from a given number 100–900. | 2.NBT.B.8. Mentally add 10 or 100 to a given number 100-900, and mentally subtract 10 or 100 from a given number 100-900. | . |
| 2.NBT.9. Explain why addition and subtraction strategies work, using place value and the properties of operations. [Explanations may be supported by drawings or objects.] | . | NYS removed this CCSS, thinking the requirement can be met through their addition to 2.NBT.B.5a. However, this addition does not meet the requirement of explaining WHY the strategies work. This removal created a gap in the alignment. |
| **Measurement and Data** | | . |
| **Measure and estimate lengths in standard units.** | **A. Measure and estimate lengths in standard units.** | . |

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|---|---|---|
| 2.MD.1. Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes. | 2.MD.A.1. Measure the length of an object to the nearest whole by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes. | The wording of this NYS is awkward in that there appears to be a word missing. Should this be "to the nearest whole UNIT?" |
| 2.MD.2. Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen. | 2.MD.A.2. Measure the length of an object twice, using different "length units" for the two measurements; describe how the two measurements relate to the size of the unit chosen. | The only apparent change here (other than a slight change in word order) is the quotation marks. This change makes it appear that "length units" is a concept? In the CCSS version it reads more as units of different lengths (e.g. inches, feet, centimeters, ...). It is not clear how this change is a clarification and it may actually cause confusion. |
| 2.MD.3. Estimate lengths using units of inches, feet, centimeters, and meters. | 2.MD.A.3. Estimate lengths using units of inches, feet, centimeters, and meters. | . |
| 2.MD.4. Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit. | 2.MD.A.4. Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard "length unit". | Again, "length unit" is presented in NYS as a concept. In the CCSS it is about units of standard length. This is more likely to cause confusion than clarification. |
| **Relate addition and subtraction to length.** | **B. Relate addition and subtraction to length.** | . |
| 2.MD.5. Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem. | 2.MD.B5. Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units (e.g., by using drawings and equations with a symbol for the unknown number to represent the problem). | NYS removed the example of a drawing that might be used. |

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| 2.MD.6. Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole-number sums and differences within 100 on a number line diagram. | 2.MD.B.6. Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, … , and represent whole-number sums and differences within 100 on a number line diagram. | . |
| **Work with time and money.** | **C. Work with time and money.** | . |
| 2.MD.7. Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m. | 2.MD.C.7. Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m. Develop an understanding of common terms, such as, but not limited to, quarter past, and quarter to. | NYS added vocabulary requirements related to telling time. Note: In this NYS "quarter past" and "quarter to" are called "common terms." These are more archaic, and possibly regional, than common. |
| 2.MD.8. Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately. *Example: If you have 2 dimes and 3 pennies, how many cents do you have?* | 2.MD.C.8a. Count a mixed collection of coins that equals up to a dollar. | NYS split this requirement into two steps: First, to simply count coins and then, to solve problems involving coins. |
| | 2.MD.C.8b. Solve real world and mathematical problems within 1 dollar involving, quarters, dimes, nickels, and pennies, using ¢ (cents) symbols appropriately, (e.g., If you have 2 dimes and 3 pennies, how many cents do you have?). | NYS added a limitation in this case, which requires that problems use values less than or equal to $1 and does not require us of the dollar sign. This is a shift in focus from that of the CCSS. |
| **Represent and interpret data.** | **D. Represent and interpret data.** | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 2.MD.9. Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units. | 2.MD.D.9. Generate and present measurement data in a line plot where the horizontal scale is marked off in whole-number units, by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. | The order and word changes in this NYS make it awkward. First, the second part of the compounded verb does not make sense. How would one "generate ... data in a line plot...?" Then, there may be a comma missing after "measurement data in a line plot." This makes the description of the horizontal scale an aside. Without the comma the "by measuring lengths ..." seems to have no connection to a verb. |
| 2.MD.10. Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems* using information presented in a bar graph. [*See Glossary, Table 1.] | 2.MD.D.10. Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in graphs. | NYS includes a glossary of verbs but not of other important mathematical concepts, such as "put-together, take-apart, and compare problems." This standard might call for examples, or an outside reference, since that glossary is missing in NYS. |
| **Geometry** | | . |
| **Reason with shapes and their attributes.** | **A. Reason with shapes and their attributes.** | . |
| | 2.G.A.1. Classify two-dimensional figures as polygons or non-polygons. | This NYS used vocabulary that goes beyond the grade level of the CCSS (the term, polygon, is not used until Gr 3). At this grade, students are required to recognize, draw, and identify shapes based on specified attributes. This includes several types of polygons but is limited to those with 3, 4, 5, or 6 sides, and also includes cubes. The NYS does not limit the number of sides in a polygon in this level. |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 2.G.1. Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces. Identify triangles, quadrilaterals, pentagons, hexagons, and cubes. [Sizes are compared directly or visually, not compared by measuring.] | 3.G.A.1. Classify polygons based on the number of sides and vertices. Recognize triangles, quadrilaterals, pentagons, and hexagons as examples of polygons, and draw examples of polygons that do not belong to any of these subcategories. | This CCSS is addressed one year later in NYS, creating a change in focus for this grade level. 3.G.A.1 includes a more general requirement to classify polygons based only on the number of sides and vertices ("angles" in the CCSS example was replaced with "vertices" in the NYS). Drawing of figures is only required for figures that do not belong to any of the subcategories in NYS, in this case, that would mean drawing, for example polygons with more than 6 sides. This CCSS also requires recognition of cubes, which is missing from the NYS at this level.<br><br>While the explanation for this change states that the CCSS version is not possible in Gr 3 since it required students to understand both angles and parallelism, it should be pointed out that students have recognized squares and rectangles since Gr K. |
| 2.G.2. Partition a rectangle into rows and columns of same-size squares and count to find the total number of them. | 2.G.A.2. Partition a rectangle into rows and columns of same-size squares and count to find the total number of them. | . |

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|---|---|---|
| 2.G.3. Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words *halves* , *thirds* , *half of* , *a third of* , etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape. | 2.G.A.3. Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words halves, thirds, half of, a third of, etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape. | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **GRADE 3** | | |
| **Operations and Algebraic Thinking** | | . |
| **Represent and solve problems involving multiplication and division.** | **A. Represent and solve problems involving multiplication and division.** | . |
| 3.OA.1. Interpret products of whole numbers, e.g., interpret 5 x 7 as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as 5 × 7.* | 3.OA.A.1. Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. For example, describe a context in which a total number of objects can be expressed as 5 × 7. | . |
| 3.OA.2. Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. *For example, describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.* | 3.OA.A.2. Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. For example, describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8. | . |
| 3.OA.3. Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem*. [See Glossary, Table 2.] | 3.OA.A.3. Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem. (See glossary table 2) | The NYS reference to "glossary table 2" needs clarification. There is no table 2 in the "glossary of verbs," the only glossary in these standards. |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 3.OA.4. Determine the unknown whole number in a multiplication or division equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 × ? = 48, 5 = □ ÷ 3, 6 × 6 = ?.* | 3.OA.A.4. Determine the unknown whole number in a multiplication or division equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations 8 × ? = 48, 5 = __ ÷ 3, 6 × 6 = ?. | . |
| **Understand properties of multiplication and the relationship between multiplication and division.** | **B. Understand properties of multiplication and the relationship between multiplication and division** | . |
| 3.OA.5. Apply properties of operations as strategies to multiply and divide. *Examples: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.) 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.) Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)*<br>[Students need not use formal terms for these properties.] | 3.OA.B.5. Apply properties of operations as strategies to multiply and divide. *Examples:*<br>• *If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.)*<br>• *3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.)*<br>• *Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)*<br>Note: Students need not use formal terms for these properties. A variety of representations can be used when applying the properties of operations, which may or may not include parentheses. | NYS included the footnote in their note to the teachers and added more to the explanation about the "variety of representations" that may be used. It is not clear what that means, indicating that examples or a further expansion of the note may be required. In this case, it appears that the properties of operations are not to be limited to those in the parentheses (commutative, associative, distributive). Since the list of properties is finite, It should be made clear which are required at this level. [Clarity] |
| 3.OA.6. Understand division as an unknown-factor problem. *For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.* | 3.OA.B.6. Understand division as an unknown-factor problem. For example, divide 32 ÷ 8 by finding the number that makes 32 when multiplied by 8. | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **Multiply and divide within 100.** | **C. Multiply and divide within 100.** | . |
| 3.OA.7. Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 x 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers. | 3.OA.C.7. Fluently solve single-digit multiplication and related divisions, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers. Fluency expectation: Reaching fluency will take much of the year for many students, so work on developing understanding and fluency of multiplication and division should begin at or near the beginning of the year. | NYS changed "fluently multiply and divide" to "fluently solve... multiplication and related divisions." Adding the word "solve" makes this read awkwardly, since "solve multiplication" and "solve divisions" is nonstandard language. This may be an error. Perhaps the word "problem" was lost? NYS also uses "single-digit" to replace "within 100." The definition of "solve single-digit multiplication" needs clarification. Does this mean that 4 x 25 is addressed in this standard? The CCSS version may be interpreted to mean that any division of numbers less than 100 are fair game (e.g. 75 divided by 25, or 40 divided by 12). NYS appears only to address products to 81 (9 x 9) and only the discrete set of division problems that relate to those products. NYS also added a clarification of fluency for the teacher. |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **Solve problems involving the four operations, and identify and explain patterns in arithmetic.** | **D. Solve problems involving the four operations, and identify and explain patterns in arithmetic.** | . |
| 3.OA.8 Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. [This standard is limited to problems posed with whole numbers and having whole-number answers; students should know how to perform operations in the conventional order when there are no parentheses to specify a particular order (Order of Operations).] | 3.OA.D.8. Solve two-step word problems posed with whole numbers and having whole-number answers using the four operations.<br>a. Represent these problems using equations or expressions with a letter standing for the unknown quantity.<br>b. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.<br>Note: Two-step problems need not be represented by a single expression or equation. | NYS separated the parts of this CCSS into sub parts but did not give them separate-standard status.<br><br>A note to the teacher regarding 2-step problems was added. The meaning and intention is not clear. More support may be needed to ensure that teachers have a consistent understanding of the note. |
| 3.OA.9. Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. *For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.* | 3.OA.D.9. Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends. | . |
| **Numbers and Operations in Base Ten** | | . |
| **Use place value understanding and properties of operations to perform multi-digit arithmetic.** [A range of algorithms may be used.] | **A. Use place value understanding and properties of operations to perform multi-digit arithmetic. A range of algorithms may be used.** | The CCSS footnote became part of the NYS cluster title. |

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| 3.NBT.1. Use place value understanding to round whole numbers to the nearest 10 or 100. | 3.NBT.A.1. Use place value understanding to round whole numbers to the nearest 10 or 100. | . |
| 3.NBT.2. Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction. | 3.NBT.A.2. Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction. (A range of algorithms may be used.) | NYS added the footnote for the cluster title to this standard. |
| 3.NBT.3. Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 x 80, 5 x 60) using strategies based on place value and properties of operations. | 3.NBT.A.3. Multiply one-digit whole numbers by multiples of 10 in the range 10-90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations. | . |
| **Number and Operations – Fractions** [Grade 3 expectations in this domain are limited to fractions with denominators 2, 3, 4, 6, and 8.] | | . |
| **Develop understanding of fractions as numbers.** | **A. Develop understanding of fractions as numbers.** | . |
| 3.NF.1. Understand a fraction 1/*b* as the quantity formed by 1 part when a whole is partitioned into *b* equal parts; understand a fraction *a* /*b* as the quantity formed by *a* parts of size 1/*b* . | 3.NF.A.1. Understand a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b. (Grade 3 expectations in this domain are limited to fractions with denominators 2, 3, 4, 6, and 8.) | NYS added the footnote for the cluster title to this standard. |
| 3.NF.2. Understand a fraction as a number on the number line; represent fractions on a number line diagram. | 3.NF.A.2. Understand a fraction as a number on the number line; represent fractions on a number line diagram. | . |

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| 3.NF.2a Represent a fraction 1/*b* on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into *b* equal parts. Recognize that each part has size 1/*b* and that the endpoint of the part based at 0 locates the number 1/*b* on the number line. | 3.NF.A.2a. Represent a fraction 1/b on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. Recognize that each part has size 1/b and that the endpoint of the part starting at 0 locates the number 1/b on the number line. For example,<br>[geometric figure added] | NYS changed "based" to "starting" and added a visual example. |
| 3.NF.2b Represent a fraction *a* /*b* on a number line diagram by marking off *a* lengths 1/*b* from 0. Recognize that the resulting interval has size *a* /*b* and that its endpoint locates the number *a* /*b* on the number line. | 3.NF.A.2b. Represent a fraction a/b on a number line diagram by marking off a lengths 1/b from 0. Recognize that the resulting interval has size a/b and that its endpoint locates the number a/b on the number line. For example,<br>[geometric figure added] | NYS added a visual example. |
| 3.NF.3. Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. | 3.NF.A.3. Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. | . |
| 3.NF.3a Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line. | 3.NF.A.3a. Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line. (Grade 3 expectations in this domain are limited to fractions with denominators 2, 3, 4, 6, and 8.) | NYS included the CCSS footnote as part of the standard. |

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| 3.NF.3b Recognize and generate simple equivalent fractions, e.g., 1/2 = 2/4, 4/6 = 2/3). Explain why the fractions are equivalent, e.g., by using a visual fraction model. | 3.NF.A.3b. Recognize and generate equivalent fractions (e.g., 1/2 = 2/4, 4/6 = 2/3). Explain why the fractions are equivalent, e.g., by using a visual fraction model. | NYS removed "simple" from the description. |
| 3.NF.3c Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. *Examples: Express 3 in the form 3 = 3/1; recognize that 6/1 = 6; locate 4/4 and 1 at the same point of a number line diagram.* | 3.NF.A.3c. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. *Examples: Express 3 in the form 3 = 3/1; recognize that 6/3 = 2 ; locate 4/4 and 1 at the same point of a number line diagram.* | NYS changed the example. |
| 3.NF.3d Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model. | 3.NF.A.3d. Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons rely on the two fractions referring to the same whole. Record the results of comparisons with the symbols > or <, and justify the conclusions, e.g., by using a visual fraction model. | The validity of comparisons was removed from the NYS. Perhaps it should read, "Recognize that VALID comparisons rely on …" |

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| **Measurement and Data** | | . |
| **Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.** | **A. Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.** | . |
| 3.MD.1. Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram. | 3.MD.A.1. Tell and write time to the nearest minute and measure time intervals in minutes. Solve one-step word problems involving addition and subtraction of time intervals in minutes (e.g., by representing the problem on a number line diagram).<br>Note: This includes one-step problems that cross into a new hour as well as those that cross the a.m./p.m. | NYS restricts this requirement to 1-step problems, reducing rigor when compared to the CCSS. |
| 3.MD.2. Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).* Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem**.<br>[* Excludes compound units such as cm^3 and finding the geometric volume of a container.<br>**Excludes multiplicative comparison problems (problems involving notions of "times as much"; see Glossary, Table 2.] | 3.MD.A.2. Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). (Excludes compound units such as cm^3 and finding the geometric volume of a container.) Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. (Excludes multiplicative comparison problems (problems involving notions of “times as much.”) | NYS added the footnotes for this CCSS to the standard in parentheses. |

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| **Represent and interpret data.** | **B. Represent and interpret data.** | . |
| 3.MD.3. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.* | 3.MD.B.3. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. For example, draw a bar graph in which each square in the bar graph might represent 5 pets. | . |
| 3.MD.4. Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters. | 3.MD.B.4. Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters. | . |
| **Geometric measurement: understand concepts of area and relate area to multiplication and to addition.** | **C. Geometric measurement: understand concepts of area and relate area to multiplication and to addition.** | . |

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| 3.MD.5 Recognize area as an attribute of plane figures and understand concepts of area measurement.<br>a. A square with side length 1 unit, called "a unit square," is said to have "one square unit" of area, and can be used to measure area.<br>b. A plane figure which can be covered without gaps or overlaps by n unit squares is said to have an area of n square units. | 3.MD.C.5. Recognize area as an attribute of plane figures and understand concepts of area measurement. | In separating the sub parts of this CCSS, the purpose of the parts, special cases of the standard, was lost. More revision is needed to either clearly identify a performance expectation in those parts or to remove the grid lines, which make them appear to be separate standards. |
| | 3.MD.C.5a. A square with side length 1 unit, called "a unit square," is said to have "one square unit" of area, and can be used to measure area. | This explanation of a special case for the stem statement is listed as a separate standard in the NYS but does not describe student performance. A teacher who attempts to use this explanation of a special case for the stem statement as a standard will not know what students are to do or how to measure their performance. |
| | 3.MD.C.5b. A plane figure which can be covered without gaps or overlaps by n unit squares is said to have an area of n square units. | This explanation of a special case for the stem statement is listed as a separate standard in the NYS but does not describe student performance. A teacher who attempts to use this explanation of a special case for the stem statement as a standard will not know what students are to do or how to measure their performance. |
| 3.MD.6. Measure areas by counting unit squares (square cm, square m, square in, square ft., and improvised units). | 3.MD.C.6. Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units). | . |
| 3.MD.7. Relate area to the operations of multiplication and addition. | 3.MD.C.7. Relate area to the operations of multiplication and addition. | . |

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| 3.MD.7a Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths. | 3.MD.C.7a. Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths. | . |
| 3.MD.7b Multiply side lengths to find areas of rectangles with whole- number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning. | 3.MD.C.7b. Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning. | . |
| 3.MD.7c Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths *a* and *b* + *c* is the sum of a x b and a x c. Use area models to represent the distributive property in mathematical reasoning. | 3.MD.C.7c. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and b + c is the sum of a × b and a × c. Use area models to represent the distributive property in mathematical reasoning. [geometric figure added] | NYS added a visual example. |
| 3.MD.7d Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems. | 3.MD.C.7d. Recognize area as additive. Find areas of figures composed of non-overlapping rectangles, including within the context of real world problems. For example, [geometric figure added] | NYS replaced the explanation of what "additive" means for area with a visual example. |
| **Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.** | **D. Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.** | . |

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| 3.MD.8. Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters. | 3.MD.C.8. Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length. Represent rectangles with the same perimeter and different areas or with the same area and different perimeters. | NYS changed "exhibiting rectangles ..." to "represent rectangles..." This wording is awkward as there is not a clear meaning for "represent rectangles." |
| **Geometry** | | . |
| **Reason with shapes and their attributes.** | **A. Reason with shapes and their attributes.** | . |
| 3.G.1. Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories. | . | This CCSS has no match in the NYS. Classification of different shapes within a category (e.g. quadrilateral) is not addressed in the NYS at this grade.<br>NYS adjusted the progression leading to this standard (with justification). This standard, however, was lost in the process. NOTE: NYS 3.G.A.1 aligns with Gr 2 in the CCSS (See 2.G.1). |
| 3.G.2. Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.* | 3.G.A.2. Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape. | . |

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| **GRADE 4** | | . |
| **Operations and Algebraic Thinking** | | . |
| **Use the four operations with whole numbers to solve problems.** | **A. Use the four operations with whole numbers to solve problems.** | . |
| 4.OA.1. Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 X 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations. | 4.OA.A.1. Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 x 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations. | . |
| 4.OA.2. Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison. [See Glossary, Table 2.] | 4.OA.A.2. Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison. See glossary table 2. | The NYS reference to "glossary table 2" needs clarification. There is no table 2 in the "glossary of verbs," the only glossary in these standards. |

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| 4.OA.3. Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. | 4.OA.A.3. Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted.<br>a. Represent these problems using equations or expressions with a letter standing for the unknown quantity.<br>b. When problems include multiplication and addition, understand that multiplication is always done before addition - unless parentheses are included.<br>c. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.<br>Note: Multistep problems need not be represented by a single expression or equation. | NYS added the requirement to "understand that multiplication is always done before addition" when no parentheses are present. This may not be precisely accurate. For example, what if there was a fraction with the numerator as a sum? In that case a student would add first and then divide. NYS may consider using the phrase "order of operations" to help teachers when they are looking for it in the progression. More support may be needed to ensure that teachers have a consistent understanding of the note. The meaning and intention is not clear. |
| **Gain familiarity with factors and multiples.** | **B. Gain familiarity with factors and multiples** | . |
| 4.OA.4. Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite. | 4.OA.B.4. Find all factor pairs for a whole number in the range 1-100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1-100 is prime or composite. | . |
| **Generate and analyze patterns.** | **C. Generate and analyze patterns.** | . |

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|---|---|---|
| 4.OA.5. Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. *For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.* | 4.OA.C.5. Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way. | . |
| **Numbers and Operations in Base Ten** [Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.] | **Number & Operations in Base Ten** | NYS added the CCSS footnote only to 4.NBT.B.4, 5, and 6. |
| **Generalize place value understanding for multi-digit whole numbers.** | **A. Generalize place value understanding for multi-digit whole numbers.** | . |
| 4.NBT.1. Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. *For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.* | 4.NBT.A.1. Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. For example, recognize that 70 × 10 = 700 (and, therefore, 700 ÷ 70 = 10) by applying concepts of place value, multiplication, and division. | The limitation for this standard is less clear without the domain footnote. |

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| 4.NBT.2. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. | 4.NBT.A.2. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.<br>Note: Expanded Form in grade 4 should take the form of: (3×100) + (2×10) + (7×1) *with or without parentheses. This representation helps scaffold depth of understanding of the base-ten number system from 2.NBT.A.3 towards that which is required by 5.NBT.A.3a. | NYS added a note for teachers. Clarity is needed to explain what is meant by "scaffold depth of understanding." Is the intention to imply that this standard fits into a progression? If so, this should be made more clear. The limitation for this standard is less clear without the domain footnote. |
| 4.NBT.3. Use place value understanding to round multi-digit whole numbers to any place. | 4.NBT.A.3. Use place value understanding to round multi-digit whole numbers to any place. (Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.) | The CCSS domain title footnote was included as part of this NYS. |
| **Use place value understanding and properties of operations to perform multi-digit arithmetic.** | **B. Use place value understanding and properties of operations to perform multi-digit arithmetic.** | . |
| 4.NBT.4. Fluently add and subtract multi-digit whole numbers using the standard algorithm. | 4.NBT.B.4. Fluently add and subtract multi-digit whole numbers using the standard algorithm. (Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000. A range of algorithms may be used.) | The previous CCSS domain title footnote was included as part of this NYS. While the body of the NYS is a perfect match with the CCSS, "using the standard algorithm" is changed to "a range of algorithms" in the parenthetical statement in NYS. It is not clear in the NYS whether the student will be required to apply the standard algorithm. |

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| 4.NBT.5. Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. | 4.NBT.B.5. Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. (Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000. A range of algorithms may be used.) | The CCSS domain title footnote was included as part of this NYS. |
| 4.NBT.6. Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. | 4.NBT.B.6. Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. (Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000. A range of algorithms may be used.) | The CCSS domain title footnote was included as part of this NYS. |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **Number and Operations – Fractions**<br>[Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.] | **Number & Operations - Fractions (limited to denominators 2, 3, 4, 5, 6, 8, 10, 12, 100)** | . |
| **Extend understanding of fraction equivalence and ordering.** | **A. Extend understanding of fraction equivalence and ordering.** | . |
| 4.NF.1. Explain why a fraction a/b is equivalent to a fraction (n x a)/(n x b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions. | 4.NF.A.1. Explain why a fraction a/b is equivalent to a fraction (a × n)/(b × n) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions. For example,<br>[geometric figure added] | NYS commuted the numerator expressions and added the visual example. |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 4.NF.2. Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model. | 4.NF.A.2. Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model. (Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.) | The CCSS domain title footnote was included as part of this NYS. It is not clear why this is the case only for this particular NYS in the cluster. Since the footnote is included as part of the domain title, it would be assumed to apply here, making the extra note unnecessary. |
| **Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.** | **B. Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.** | . |
| 4.NF.3. Understand a fraction $a/b$ with $a > 1$ as a sum of fractions $1/b$. | 4.NF.B.3. Understand a fraction a/b with a > 1 as a sum of fractions 1/b (the unit fraction for a/b). | NYS included an explanation of 1/b as a unit fraction. |
| 4.NF.3a Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. | 4.NF.B.3a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. | . |

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| 4.NF.3b Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. *Examples: 3/8 = 1/8 + 1/8 + 1/8 ; 3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8.* | 4.NF.B.3b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. Examples:<br>• 3/8 = 1/8 + 1/8 + 1/8<br>• 3/8 = 1/8 + 2/8<br>• 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8 | NYS bulleted the examples. |
| 4.NF.3c Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction. | 4.NF.B.3c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction. | . |
| 4.NF.3d Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem. | 4.NF.B.3d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem. | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 4.NF.4. Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. | 4.NF.B.4. Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.<br>Note: This standard is limited to n groups of a fraction (where n is a whole number). For example, 4 groups of 1/3; which lends itself to being thought about as repeated addition. | NYS added a note to clarify the limitations for this standard. The note is mathematically troublesome in that it departs from multiplication as it is understood in 4.OA, and contradicts the subparts of the standard. Note also that 3.OA.2 does not mention "repeated addition" (nor does any standard) but speaks of 5 times 7 as 5 groups of 7 objects each. Should students think of 4 times 1/3 as 4 groups of 1/3 object each? It also should be pointed out that repeated addition only works marginally with multiplication of fractions and not at all for multiplication involving irrational numbers (an example that expires). |
| 4.NF.4a Understand a fraction *a* /*b* as a multiple of 1/*b* . *For example, use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4).* | 4.NF.B.4a. Understand a fraction a/b as a multiple of 1/b. For example, use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4). | . |
| 4.NF.4b Understand a multiple of *a* /*b* as a multiple of 1/*b* , and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express 3 × (2/5) as 6 × (1/5), recognizing this product as 6/5. (In general, n × (a/b) = (n × a)/b.)* | 4.NF.B.4b. Understand a multiple of a/b as a multiple of 1/b, and use this understanding to multiply a fraction by a whole number. For example, use a visual fraction model to express 3 × (2/5) as 6 × (1/5), recognizing this product as 6/5. (In general, n × (a/b) = (n × a)/b.)<br>[geometric figure added] | NYS added a visual example. |

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| 4.NF.4c Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. *For example, if each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?* | 4.NF.B.4c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. For example, if each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie? | . |
| **Understand decimal notation for fractions, and compare decimal fractions.** | **C. Understand decimal notation for fractions, and compare decimal fractions.** | . |
| 4.NF.5. Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100.4 *For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.* [Students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators in general. But addition and subtraction with unlike denominators in general is not a requirement at this grade.] | 4.NF.C.5. Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. For example, express 3/10 as 30/100 and add 3/10 + 4/100 = 34/100. (Students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators in general. But addition and subtraction with unlike denominators in general is not a requirement at this grade.) (Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.) | NYS added the footnote for this domain to the standard. |

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| 4.NF.6. Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.* | 4.NF.C.6. Use decimal notation for fractions with denominators 10 or 100. For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram. (Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.) | NYS added the footnote for this domain to the standard. |
| 4.NF.7. Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model. | 4.NF.C.7. Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model. (Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.) | NYS added the footnote for this domain to the standard. |
| **Measurement and Data** | | . |
| **Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.** | **A. Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.** | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 4.MD.1. Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two- column table. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...* | 4.MD.A.1. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit.<br>a. Know relative sizes of units: ft., in.; hr., min., sec. *For example, know that 1 ft. is 12 times as long as 1 in. Express the length of a 4 ft. snake as 48 in.*<br>b. Convert units within one system of units when the conversion factor is given (e.g., km, m, cm; kg, g; lb., oz.; l, ml).<br>c. Record measurement equivalents in a two column table. For example, generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ... | NYS split the compound CCSS into separate sub parts, making the second sentence in the CCSS the stem statement for the standard. In this case, the sub parts and their examples do not always match the stem standard. It appears that the NYS version requires different units for the different parts, however, making the limitations different. It is not clear whether the lists of units are comprehensive, but that appears to be the case. The rationale provided in the "additional notes" (accompanying the NYS) for requiring different units is that students will be required to know only the conversions that are not given on "reference sheets" in future grades. In this NYS version, knowing relative sizes of units appears to be limited to feet/inches and hour/min/sec, none of which are required for conversions within a system in part b. And km/m/cm, kg/g, ounce/lb, and liter/mL are used as examples for conversion within the system but not for knowing relative size.<br>Clarity: "convert units within one system of units" is unclear. It would be clearer to say "within one system of measurement." |

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| 4.MD.2. Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. | 4.MD.A.2. Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money.<br>a. Solve problems involving fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit.<br>b. Represent measurement quantities using diagrams that feature a measurement scale, such as number lines. | NYS split the parts of this compound CCSS but did not separate the parts into different standards. They removed the descriptor "simple" for fractions and decimals. |
| 4.MD.3. Apply the area and perimeter formulas for rectangles in real world and mathematical problems. *For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.* | 4.MD.A.3. Apply the area and perimeter formulas for rectangles in real world and mathematical problems. For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor. | . |
| **Represent and interpret data.** | **B. Represent and interpret data.** | . |
| 4.MD.4. Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots. *For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.* | 4.MD.B.4. Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots. *For example, given measurement data on a line plot, find and interpret the difference in length between the longest and shortest specimens in an insect collection.* | NYS added more detail to the example. |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **Geometric measurement: understand concepts of angle and measure angles.** | **C. Geometric measurement: understand concepts of angle and measure angles.** | . |
| 4.MD.5. Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:<br>a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles.<br>b. An angle that turns through n one-degree angles is said to have an angle measure of n degrees. | 4.MD.C.5. Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: | NYS left the colon at the end of this stem statement but separated the sub parts into separate standards. This leaves the separate stem statement with a punctuation problem and the sub parts without a performance objective. (Typo) |
| | 4.MD.C.5a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles. | This explanation of a special case for the stem statement is listed as a separate standard in the NYS but does not describe student performance. A teacher who attempts to use this explanation of a special case for the stem statement as a standard will not know what students are to do or how to measure their performance. |
| | 4.MD.C.5b. An angle that turns through n one-degree angles is said to have an angle measure of n degrees. | This explanation of a special case for the stem statement is listed as a separate standard in the NYS but does not describe student performance. A teacher who attempts to use this explanation of a special case for the stem statement as a standard will not know what students are to do or how to measure their performance. |
| 4.MD.6. Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure. | 4.MD.C.6. Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure. | . |

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| 4.MD.7. Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure. | 4.MD.C.7. Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems.<br>Connection: By using an equation with a symbol for the unknown angle measure, students connect this work with 4.OA.A.3. | NYS removed the CCSS example and added a "connection." |
| **Geometry** | | . |
| **Draw and identify lines and angles, and classify shapes by properties of their lines and angles.** | **A. Draw and identify lines and angles, and classify shapes by properties of their lines and angles.** | . |
| 4.G.1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. | 4.G.A.1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. | . |

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| 4.G.2. Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles. | 4.G.A.2. Classify triangles based on angle size. Classify quadrilaterals based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. | NYS limited "two-dimensional figures" to triangles and quadrilaterals, which appears to be less rigorous than the CCSS. But then they require classification of triangles "based on angle size." It is not clear whether this means students at this grade level are expected to recognize and define triangles as acute, obtuse, Isosceles, equilateral, and right. This appears to go beyond the CCSS, which specifically requires recognition of right triangles but not other defined triangles. |
| 4.G.3. Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. | 4.G.A.3. Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. | . |
| **Gr 4 Total** | | |
| **GRADE 5** | | . |
| **Operations and Algebraic Thinking** | | . |
| **Write and interpret numerical expressions.** | **A. Write and interpret numerical expressions** | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 5.OA.1. Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols. | 5.OA.A.1. Apply order of operations to evaluate numerical expressions involving only parentheses and/or the four operations. | Clarity is needed for this NYS as it leaves an unclear picture of what an expression would look like. All references to symbols of inclusion except for parentheses were removed from the NYS. An explanation is needed for the phrase, "numerical expressions involving only parentheses and/or the four operations." First, there appears to be an article missing in opening for the standard: "apply THE order of operations." Second, since the expressions are numerical, it would be assumed that these expressions involve numbers but not variables. Given that assumption, what is the rationale for requiring ONLY parentheses? Would an expression requiring parentheses within parentheses be clearly understood? And then, the "or" part of "and/or" makes it seem that either all four or none of the operations would be involved. How would expressions involve numbers and parentheses but none of the operations? Also by using the term, "numerical expressions" the use of one or more operations would be assumed. This NYS would read less awkwardly if it were, "Apply the order of operations to evaluate numerical expressions involving parentheses."<br>The CCSS first mentions order of operations in Grade 3 (footnote on 3.OA.8). |

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| 5.OA.2. Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.* | 5.OA.A.2. Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product. | . |
| **Analyze patterns and relationships.** | **B. Analyze patterns and relationships.** | . |
| 5.OA.3. Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. *For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.* | 5.OA.B.3. Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so. | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **Numbers and Operations in Base Ten** | | . |
| **Understand the place value system.** | **A. Understand the place value system.** | . |
| 5.NBT.1. Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left. | 5.NBT.A.1. Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left. | . |
| 5.NBT.2. Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. | 5.NBT.A.2. Use whole-number exponents to denote powers of 10. Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. | NYS changed the order of the sentences but not the content of this CCSS. |
| 5.NBT.3. Read, write, and compare decimals to thousandths. | 5.NBT.A.3. Read, write, and compare decimals to thousandths. | . |
| 5.NBT.3a Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., 347.392 = 3 x 100 + 4 x 10 + 7 x 1 + 3 x (1/10) + 9 x (1/100) + 2 x (1/1000). | 5.NBT.A3a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, (e.g., 347.392 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × (1/10) + 9 × (1/100) + 2 × (1/1000), or equivalent form using decimals for the unit fraction). | NYS added the possibility of using decimal versions in the expanded form of decimal numbers. |
| 5.NBT.3b Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. | 5.NBT.A.3b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. | . |
| 5.NBT.4. Use place value understanding to round decimals to any place. | 5.NBT.A.4. Use place value understanding to round decimals to any place. | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **Perform operations with multi-digit whole numbers and with decimals to hundredths.** | **B. Perform operations with multi-digit whole numbers and with decimals to hundredths.** | . |
| 5.NBT.5. Fluently multiply multi-digit whole numbers using the standard algorithm. | 5.NBT.B.5. Fluently multiply multi-digit whole numbers using the standard algorithm. | . |
| 5.NBT.6. Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. | .NBT.B.6. Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. | . |
| 5.NBT.7. Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. | 5.NBT.B.7. Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between operations. Relate the strategy to a written method and explain the reasoning used. Note: Division problems are limited to those that allow the use of concrete models, strategies based on properties of operations, and/or the relationship between operations. Problems should not be so complex as to require the use of an algorithm. | NYS changed from the requirement to use the relationship between just addition and subtraction to those between all operations. They also added a limitation for division. |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **Number and Operations – Fractions** | | |
| **Use equivalent fractions as a strategy to add and subtract fractions.** | **A. Use equivalent fractions as a strategy to add and subtract fractions.** | . |
| 5.NF.1. Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)* | 5.NF.A.1. Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example,*<br>• *1/3 + 2/9 = 3/9 + 2/9 = 5/9*<br>• *2/3 + 5/4 = 8/12 + 15/12 = 23/12* | NYS replaced the general example in the CCSS with a different specific one. |
| 5.NF.2. Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2.* | 5.NF.A.2. Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. For example, recognize an incorrect result 2/5 + 1/2 = 3/7 by observing that 3/7 < 1/2. | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **Apply and extend previous understandings of multiplication and division to multiply and divide fractions.** | **B. Apply and extend previous understandings of multiplication and division to multiply and divide fractions** | . |
| 5.NF.3. Interpret a fraction as division of the numerator by the denominator (a/b = a ÷ b). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. *For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?* | 5.NF.B.3. Interpret a fraction as division of the numerator by the denominator (a/b = a ÷ b). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, (e.g., by using visual fraction models or equations to represent the problem). *For example,*<br>• *Interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4.*<br>• *If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?* | NYS used bullets to separate the two CCSS examples. |
| 5.NF.4. Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. | 5.NF.B.4. Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 5.NF.4a Interpret the product (*a* /*b* ) x *q* as *a* parts of a partition of *q* into *b* equal parts; equivalently, as the result of a sequence of operations *a x q ÷ b. For example, use a visual fraction model to show (2/3) × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. (In general, (a/b) × (c/d) = ac/bd.)* | 5.NF.B.4a. Interpret the product (a/b) × q as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations a × q ÷ b. For example, use a visual fraction model to show (2/3) × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. | . |
| 5.NF.4b Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas. | 5.NF.B.4b. Find the area of a rectangle with fractional side lengths by tiling it with rectangles of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas. *For example, the figure below shows (2/3) × (3/4) by tiling it with rectangles of the appropriate unit fraction side lengths. [geometric figure added]* | NYS changed "unit squares" to "rectangles," and by doing so matched the Gr 3 - 5 progression document. They also added a visual example. This change and example is an improvement on the CCSS. |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 5.NF.5. Interpret multiplication as scaling (resizing), by:<br>a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.<br>b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence a/b = (n x a)/(n x b) to the effect of multiplying a/b by 1. | 5.NF.B.5. Interpret multiplication as scaling (resizing) by | In removing the colon, NYS left this standard as an incomplete sentence without punctuation. In separating the sub parts of this CCSS, the purpose of the parts, special cases of the standard, was lost. More revision is needed to clearly identify a performance expectation in those parts. |
| | 5.NF.B.5a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication. *For example, The product of 220 x 1/8 is half the product of 220 x 1/4 because 1/8 is half of 1/4.* | Measurability: While this NYS matches the language of the sub part of the CCSS, it is now a separate standard that does not describe a performance (missing a verb). This sub part needs the stem statement attached for it to make sense. If a teacher takes this separated standard out of the context of its stem statement, there is no way to know what student performance is required or how to measure it. |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
|---|---|---|
| | 5.NF.B.5b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence a/b = (a×n) / (b×n) to the effect of multiplying a/b by 1. *For example:*<br>• *3/2 x 4 > 4*<br>• *1/2 x 4 < 4*<br>• *2/2 x 4 = 4* | Measurability: While this NYS matches the language of the sub part of the CCSS, making it a separate standard created one that does not describe a performance (missing a verb). This sub part needs the stem statement attached for it to make sense. If a teacher takes this separated standard out of the context of its stem statement, there is no way to know what student performance is required or how to measure it.<br><br>NYS added examples and commuted the terms in the general equivalence. |
| 5.NF.6. Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem. | 5.NF.B.6. Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem. | . |
| 5.NF.7. Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. [Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division. But division of a fraction by a fraction is not a requirement at this grade.] | 5.NF.B.7. Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division. But division of a fraction by a fraction is not a requirement until grade 6, 6.NS.A.1.) | NYS added more specific information about when fraction division is required. |

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| 5.NF.7a Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. *For example, create a story context for (1/3) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3.* | 5.NF.B.7a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. For example, create a story context for (1/3) ÷ 4 and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3. | . |
| 5.NF.7b Interpret division of a whole number by a unit fraction, and compute such quotients. *For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4.* | 5.NF.B.7b. Interpret division of a whole number by a unit fraction, and compute such quotients. For example, create a story context for 4 ÷ (1/5) and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4. | . |
| 5.NF.7c Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, how much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?* | 5.NF.B.7c. Solve real-world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. For example, how much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins? | . |
| **Measurement and Data** | | . |
| **Convert like measurement units within a given measurement system.** | **A. Convert like measurement units within a given measurement system.** | . |

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| 5.MD.1. Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems. | 5.MD.A.1. Convert among different-sized standard measurement units within a given measurement system when the conversion factor is given (e.g., convert 5 cm to 0.05 m). Use these conversions in solving multi-step, real world problems. | The NYS addition, "when the conversion factor is given" implies that the conversion is only required when the factor is supplied to the student. This removes the need for students to know, for example, the number of inches in a foot or centimeters in a meter. In 4.MD.A.1, there is an explanation that for later grades, some conversion factors are provided on "reference sheets." It is not clear in this NYS that the factors are given only for certain units. |
| **Represent and interpret data.** | **B. Represent and interpret data.** | . |
| 5.MD.2. Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.* | 5.MD.B.2. Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally. | . |
| **Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.** | **C. Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.** | . |
| 5.MD.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement. | 5.MD.C.3. Recognize volume as an attribute of solid figures and understand concepts of volume measurement. | Separating the sub parts of this standard requires more revision to make parts a and b describe performances. |

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| a. A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume.<br>b. A solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units. | 5.MD.C.3a. A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume. | Measurability: In separating this standard from its stem statement, NYS has created a standard that has no performance requirement but is rather a definition or statement of fact. |
| | 5.MD.C.3b. A solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units. | Measurability: In separating this standard from its stem statement, NYS has created a standard that has no performance requirement but is rather a definition or statement of fact. |
| 5.MD.4. Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. | 5.MD.C.4. Measure volumes by counting unit cubes, using cubic cm, cubic in., cubic ft., and improvised units. | . |
| 5.MD.5. Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. | 5.MD.C.5. Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. | . |
| 5.MD.5a Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication. | 5.MD.C.5a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. | NYS removed the requirement to represent threefold products as volumes. |

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| 5.MD.5b Apply the formulas *V* =(*l*)(*w*)(*h*) and *V* = *b* x *h* for rectangular prisms to find volumes of right rectangular prisms with whole- number edge lengths in the context of solving real world and mathematical problems. | 5.MD.C.5b. Apply the formulas V =(l)(w)(h) and V = (B)(h) for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems. | . |
| 5.MD.5c Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems. | 5.MD.C.5c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems. *For example,*<br>*[geometric figure added]* | NYS added a visual example. |
| **Geometry** | | . |
| **Graph points on the coordinate plane to solve real-world and mathematical problems.** | **A. Graph points on the coordinate plane to solve real-world and mathematical problems.** | . |

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| 5.G.1. Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., *x* -axis and *x* -coordinate, *y* -axis and *y* -coordinate). | 5.G.A.1. Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate). | . |
| 5.G.2. Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. | 5.G.A.2. Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. | . |
| **Classify two-dimensional figures into categories based on their properties.** | **B. Classify two-dimensional figures into categories based on their properties.** | . |
| 5.G.3 Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. *For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.* | 5.G.A.3. Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles. | . |

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| 5.G.4. Classify two-dimensional figures in a hierarchy based on properties. | 5.G.A.4. Classify two-dimensional figures in a hierarchy based on properties. | . |

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| **GRADE 6** | | . |
| **Ratios and Proportional Relationships** | | . |
| **Understand ratio concepts and use ratio reasoning to solve problems.** | **A. Understand ratio concepts and use ratio reasoning to solve problems.** | . |
| 6.RP.1. Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."* | 6.RP.A.1. Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."* | . |
| 6.RP.2. Understand the concept of a unit rate $a/b$ associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."* [Expectations for unit rates in this grade are limited to non-complex fractions.] | 6.RP.A.2. Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0 (b not equal to zero), and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger." (Note: Expectations for unit rates in this grade are limited to non-complex fractions.)* | . |
| 6.RP.3. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. | 6.RP.A.3. Use ratio and rate reasoning to solve real-world and mathematical problems, which includes, by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. | . |

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| 6.RP.3a Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios. | 6.RP.A.3a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios. | . |
| 6.RP.3b Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?* | 6.RP.A.3b. Solve unit rate problems including those involving unit pricing and constant speed. *For example, If it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?* | . |
| 6.RP.3c Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent. | 6.RP.A.3c. Know that a percent of a quantity is a rate per 100. For example, 30% of a quantity means 30/100 times the quantity. Solve problems involving finding the whole given a part and the percent, finding the percent given the part and the whole, and finding a part of a whole given the percent. | NYS added finding the percent and finding a part, when given the other missing values in a problem involving percentages. |

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| 6.RP.3d Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. | 6.RP.A.3d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.<br>(Note: Conversion of units can occur within a given measurement system and across different measurement systems.) | NYS added a note for the teacher.<br><br>[Consistency across the standards for how notes are punctuated would be helpful. In this grade parentheses are used but not in earlier grades.] |
| **The Number System** | | . |
| **Apply and extend previous understandings of multiplication and division to divide fractions by fractions.** | **A. Apply and extend previous understandings of multiplication and division to divide fractions by fractions.** | . |
| 6.NS.1. Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?* | 6.NS.A.1. Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, which includes using visual fraction models, the standard algorithm, and equations to represent the problem. *For example, create a context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi? (In general, (a/b) ÷ (c/d) = ad/bc.)* | . |

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| **Compute fluently with multi-digit numbers and find common factors and multiples.** | **B. Compute fluently with multi-digit numbers and find common factors and multiples.** | . |
| 6.NS.2. Fluently divide multi-digit numbers using the standard algorithm. | 6.NS.B.2. Fluently divide multi-digit numbers using the standard algorithm. | NYS added a note about limitations on fluency for this grade level to the third column but it is not part of the recommended standard. It is not clear whether or not this is intentional or an oversight. |
| 6.NS.3. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation. | 6.NS.B.3. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation. | NYS added a note about limitations on fluency for this grade level to the third column but it is not part of the recommended standard. It is not clear whether or not this is intentional or an oversight. |
| 6.NS.4. Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. *For example, express 36 + 8 as 4 (9 + 2).* | 6.NS.B.4. Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. *For example, express 36 + 8 as 4 (9 + 2).* | . |

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| **Apply and extend previous understandings of numbers to the system of rational numbers.** | **C. Apply and extend previous understandings of numbers to the system of rational numbers.** | . |
| 6.NS.5. Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. | 6.NS.C.5. Understand that positive and negative numbers are used together to describe quantities having opposite directions or values; use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. *For example, temperature above/below zero, elevation above/below sea level, debits/credits, positive/negative electric charge.* | NYS moved the examples to the end of the standard. |
| 6.NS.6. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. | 6.NS.C.6. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. | . |
| 6.NS.6a Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite. | 6.NS.C.6a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself. For example, –(–3) = 3, and that 0 is its own opposite. | . |

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| 6.NS.6b Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. | 6.NS.C.6b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. (Note: This standard is not intended to be the beginning of transformational geometry.) | NYS added a clarification to ensure focus. |
| 6.NS.6c Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane. | 6.NS.C.6c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane. | . |
| 6.NS.7. Understand ordering and absolute value of rational numbers. | 6.NS.C.7. Understand ordering and absolute value of rational numbers. | . |
| 6.NS.7a Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret –3 > –7 as a statement that –3 is located to the right of –7 on a number line oriented from left to right.* | 6.NS.C.7a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret –3 > –7 as a statement that –3 is located to the right of –7 on a number line oriented from left to right* . | . |
| 6.NS.7b Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write –3 oC > –7 oC to express the fact that –3 oC is warmer than –7 oC.* | 6.NS.C.7b. Write, interpret, and explain statements of order for rational numbers in real-world contexts. For example, write –3°C > –7°C to express the fact that –3°C is warmer than –7°C. | . |

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| 6.NS.7c Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. *For example, for an account balance of –30 dollars, write \|–30\| = 30 to describe the size of the debt in dollars.* | 6.NS.C.7c. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. For example, for an account balance of –30 dollars, write \|–30\| = 30 to describe the size of the debt in dollars. | . |
| 6.NS.7d Distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than –30 dollars represents a debt greater than 30 dollars.* | 6.NS.C.7d. Distinguish comparisons of absolute value from statements about order. *For example, someone with a balance of $100 in their bank account has more money than someone with a balance of –$1000, because 100 > –1000. But the second person's debt is much larger than the first person's credit because \|–1000\| > \|100\|.* | NYS added absolute value comparison of bank balances to the example. The new example is confusing, however. Credit is not the same thing as a positively valued bank balance. Further, the example is really trying to establish how far each account balance is from zero. Perhaps comparing debts would make more sense. |
| 6.NS.8. Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate. | 6.NS.C.8. Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate. | . |
| **Expressions and Equations** | | . |
| **Apply and extend previous understandings of arithmetic to algebraic expressions.** | **A. Apply and extend previous understandings of arithmetic to algebraic expressions.** | . |
| 6.EE.1. Write and evaluate numerical expressions involving whole-number exponents. | 6.EE.A.1. Write and evaluate numerical expressions involving whole-number exponents. | . |

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| 6.EE.2. Write, read, and evaluate expressions in which letters stand for numbers. | 6.EE.A.2. Write, read, and evaluate expressions in which letters stand for numbers. | . |
| 6.EE.2a Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 – y.* | 6.EE.A.2a. Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 – y.* | . |
| 6.EE.2b Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms.* | 6.EE.A.2b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, and coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression 2(8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms.* | . |
| 6.EE.2c Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole- number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas V = s^3 and A = 6 s^2 to find the volume and surface area of a cube with sides of length s = 1/2.* | 6.EE.A.2c. Evaluate expressions at specific values for their variables. Include expressions that arise from formulas in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas V = s^3 and A = 6 s^2 to find the volume and surface area of a cube with sides of length s = 1/2.* | . |

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| 6.EE.3. Apply the properties of operations to generate equivalent expressions. *For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y.* | 6.EE.A.3. Apply the properties of operations to generate equivalent expressions. *For example, apply the distributive property to the expression 3(2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y.* | . |
| 6.EE.4. Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). *For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.* | 6.EE.A.4. Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). *For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.* | . |
| **Reason about and solve one-variable equations and inequalities.** | **B. Reason about and solve one-variable equations and inequalities.** | . |
| 6.EE.5. Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. | 6.EE.B.5. Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. | . |

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| 6.EE.6. Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. | 6.EE.B.6. Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. | . |
| 6.EE.7. Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which $p$, $q$ and $x$ are all nonnegative rational numbers. | 6.EE.B.7. Solve real-world and mathematical problems by writing and solving equations of the form x + p = q and px = q for cases in which p, q and x are all nonnegative rational numbers and where x represents the unknown quantity. (Note: This standard includes subtraction and division, the inverse operations of addition and multiplication.) | NYS defined "x" as the representative of the unknown value, which should not be necessary. They also added a note to clarify the operations that are required, but the purpose of the note is unclear. What is meant by "the standard includes subtraction?" Is it that solving x + p = q requires subtraction? Or is NY introducing x - p = q to the forms? This should be made clear. In the case of division, care should be taken to provide a specific example, as it should be made clear that x/p is allowed but p/x is not. |
| 6.EE.8. Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams. | 6.EE.B.8. Write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form x > c or x < c have infinitely many solutions; represent solutions of such inequalities on number line diagrams. (Note: Inequalities using less than or equal to and greater than or equal to are included in this standard.) | NYS added a note to include inclusive inequalities. |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **Represent and analyze quantitative relationships between dependent and independent variables.** | **C. Represent and analyze quantitative relationships between dependent and independent variables** | . |
| 6.EE.9. Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.* | 6.EE.C.9. Use variables to represent two quantities in a real-world problem that change in relationship to one another; given an equation to express one quantity, identify the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and given the equation d = 65t to represent the relationship between distance and time. | The phrase, "given an equation to express one quantity, identify the dependent variable, in terms of the other quantity, thought of as the independent variable," is difficult to decipher. In the CCSS the equation should clearly involve two quantities. This is trickier to see in the NYS version. In the CCSS, the students are to create the equation with one variable written in terms of the other. In the NYS, the students are given the equation and are, seemingly, expected to only identify the dependent variable.<br><br>In addition, the phrase "an equation TO express... " should probably be "an equation THAT expressES..." |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **Geometry** | | . |
| **Solve real-world and mathematical problems involving area, surface area, and volume.** | **A. Solve real-world and mathematical problems involving area, surface area and volume.** | . |
| 6.G.1. Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems. | 6.G.A.1. Find area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other special quadrilaterals; apply these techniques in the context of solving real-world and mathematical problems. Explore square numbers through area. | NYS added development of the concept of square numbers through a connection to area. |
| 6.G.2. Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = l\ w\ h$ and $V = b\ h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems. | 6.G.A.2. Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = l w h and V = B h to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems. Explore cubic numbers through volume. | NYS changed the variable that represents the area of the base of a prism from lower to upper case and added a requirement to explore cubic numbers through volume. "Explore cubic number through volume" seems immeasurable and lacking specificity.<br><br>Coherence: It is curious that this volume standard, which is closely tied to the area standard in Gr 5 (5.NF.4b) is not changed in the same way. |

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| 6.G.3. Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems. | 6.G.A.3. Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems. | . |
| 6.G.4. Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems. | 6.G.4. Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems. | . |
| **Statistics and Probability** | | . |
| **Develop understanding of statistical variability.** | **A. Develop understanding of statistical variability.** | . |
| 6.SP.1. Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.* | 6.SP.A.1. Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.* | . |

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| 6.SP.2. Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. | 6.SP.A.2. Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. | . |
| 6.SP.3. Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number. | 6.SP.A.3. Recognize that a measure of center for a numerical data set summarizes all of its values with a single number while a measure of variation describes how its values vary with a single number. | . |
| **Summarize and describe distributions.** | **B. Summarize and describe distributions.** | . |
| 6.SP.4. Display numerical data in plots on a number line, including dot plots, histograms, and box plots. | 6.SP.B.4. Display numerical data in plots on a number line, including dot plots, histograms, and box plots. | . |

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| 6.SP.5 Summarize numerical data sets in relation to their context, such as by:<br>a. Reporting the number of observations.<br>b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.<br>c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.<br>d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered. | 6.SP.B.5. Summarize numerical data sets in relation to their context, such as by: | NYS left the colon at the end of this stem statement but separated the sub parts into independent standards. This makes the stem grammatically incorrect and the sub parts do not describe a performance. In making this separation, NYS created separate standards for each of the CCSS sub parts. |
| | 6.SP.B.5a. Reporting the number of observations. | Measurability: While this NYS matches the language of the sub part of the CCSS, making it a separate standard created one that does not describe a performance (missing a verb). This sub part needs the stem statement attached for it to make sense. If a teacher takes this separated standard out of the context of its stem statement, there is no way to know what student performance is required or how to measure it. |
| | 6.SP.B.5b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. | Measurability: While this NYS matches the language of the sub part of the CCSS, making it a separate standard created one that does not describe a performance (missing a verb). This sub part needs the stem statement attached for it to make sense. If a teacher takes this separated standard out of the context of its stem statement, there is no way to know what student performance is required or how to measure it. |

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| | 6.SP.B.5c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data was gathered. | Measurability: While this NYS matches the language of the sub part of the CCSS, making it a separate standard created one that does not describe a performance (missing a verb). This sub part needs the stem statement attached for it to make sense. If a teacher takes this separated standard out of the context of its stem statement, there is no way to know what student performance is required or how to measure it. |
| | 6.SP.B.5d. Understanding that the choice of measures of center and variability relates to the shape of the data distribution and the context in which the data was gathered. | Measurability: While this NYS matches the language of the sub part of the CCSS, making it a separate standard created one that does not describe a performance (missing a verb). This sub part needs the stem statement attached for it to make sense. If a teacher takes this separated standard out of the context of its stem statement, there is no way to know what student performance is required or how to measure it. |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **GRADE 7** | | . |
| **Ratios and Proportional Relationships** | | . |
| **Analyze proportional relationships and use them to solve real-world and mathematical problems.** | **A. Analyze proportional relationships and use them to solve real-world problems.** | . |
| 7.RP.1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. *For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction 1/2/1/4 miles per hour, equivalently 2 miles per hour.* | 7.RP.A.1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. *For example, if a person walks 1/2 mile in each 1/4 hour, compute the rate as the complex fraction (1/2)/(1/4) miles per hour, equivalently 2 miles per hour with 2 being the unit rate.* | NYS added parentheses to make the complex fraction more clear and defines 2 as a unit rate. |
| 7.RP.2. Recognize and represent proportional relationships between quantities. | 7.RP.A.2. Recognize and represent proportional relationships between quantities. | . |
| 7.RP.2a Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. | 7.RP.A.2a. Decide whether two quantities are in a proportional relationship, which includes testing for equivalent ratios in a table and graphing on a coordinate plane and observing whether the graph is a straight line through the origin. | NYS changed "table … or … graph" to "table … and … graph," presumably to ensure that both are addressed. |
| 7.RP.2b Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. | 7.RP.A.2b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. | . |

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| 7.RP.2c Represent proportional relationships by equations. *For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn* . | 7.RP.A.2c. Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn. | . |
| 7.RP.2d Explain what a point *(x, y)* on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, *r)* where *r* is the unit rate. | 7.RP.A.2d. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate. | . |
| 7.RP.3. Use proportional relationships to solve multistep ratio and percent problems. *Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error* . | 7.RP.A.3. Use proportional relationships to solve multistep ratio and percent problems which includes simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease. | NYS removed "percent error." |
| **The Number System** | | . |
| **Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.** | **A. Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.** | . |
| 7.NS.1. Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. | 7.NS.A.1. Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 7.NS.1a Describe situations in which opposite quantities combine to make 0. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged*. | 7.NS.A.1a. Describe situations in which opposite quantities combine to make 0. For example, a hydrogen atom has 0 charge because it has one negatively charged electron and one positively charged proton. | NYS added more detail to the science example. |
| 7.NS.1b Understand $p + q$ as the number located a distance $\|q\|$ from $p$, in the positive or negative direction depending on whether $q$ is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts. | 7.NS.A.1b. Understand p + q as the number located a distance \|q\| from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts. *Examples: If a football player gains 5 yards on the first play and loses 5 yards on the second play, the player has gained 0 yards. A bird flying 5 feet above the surface of the water (+5) sees a fish below the surface of the water and descends 6.5 feet (-6.5) to catch the fish. The fish was 1.5 feet below (-1.5) the surface of the water (sum of +5 and -6.5).* | NYS added examples. |
| 7.NS.1c Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts. | 7.NS.A.1c. Understand subtraction of rational numbers as adding the additive inverse, p – q = p + (–q). Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts. | . |

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| 7.NS.1d Apply properties of operations as strategies to add and subtract rational numbers. | 7.NS.A.1d. Apply properties of operations as strategies to add and subtract rational numbers. | . |
| 7.NS.2. Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. | 7.NS.A.2. Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. | . |
| 7.NS.2a Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts. | 7.NS.A.2a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts. | . |
| 7.NS.2b Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If $p$ and $q$ are integers, then $–(p/q) = (–p)/q = p/(–q)$. Interpret quotients of rational numbers by describing real- world contexts. | 7.NS.A.2b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers then –(p/q) = (–p)/q = p/(–q). Interpret quotients of rational numbers by describing real-world contexts. | . |
| 7.NS.2c Apply properties of operations as strategies to multiply and divide rational numbers. | 7.NS.A.2c. Apply properties of operations as strategies to multiply and divide rational numbers. | . |
| 7.NS.2d Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats. | NS.A.2d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats. | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 7.NS.3. Solve real-world and mathematical problems involving the four operations with rational numbers. [Comuptations with rational numbers extend the rules for manipulating fractions to complex fractions.] | 7.NS.A.3. Solve real-world and mathematical problems involving the four operations with rational numbers. (Note: Computations with rational numbers extend the rules for manipulating fractions to complex fractions.) | . |
| **Expressions and Equations** | | . |
| **Use properties of operations to generate equivalent expressions.** | **A. Use properties of operations to generate equivalent expressions.** | . |
| 7.EE.1. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. | 7.EE.A.1. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. | . |
| 7.EE.2. Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. *For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."* | 7.EE.A.2. Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. *For example, a + 0.05a and 1.05a are equivalent expressions meaning that "increase by 5%" is the same as "multiply by 1.05."* | . |
| **Solve real-life and mathematical problems using numerical and algebraic expressions and equations.** | **B. Solve real-life and mathematical problems using numerical and algebraic expressions and equations (inequalities).** | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 7.EE.3. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. *For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.* | 7.EE.B.3. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using mathematically appropriate strategies. Apply properties of operations as strategies to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. *For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.* | NYS changed the strategic use of tools to "mathematically appropriate strategies." |
| 7.EE.4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. | 7.EE.B.4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 7.EE.4a Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where $p$, $q$, and $r$ are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?* | 7.EE.B.4a. Fluently solve word problems leading to equations of the form px + q = r and p(x + q) = r, where p, q, and r are rational numbers and x represents the unknown quantity. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, The perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?* | NYS added a fluency requirement for word problems leading to simple linear equations. |
| 7.EE.4b Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where $p$, $q$, and $r$ are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. *For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.* | 7.EE.B.4b. Solve word problems leading to inequalities of the form px + q > r or px + q < r, where p, q, and r are rational numbers and x represents the unknown quantity. Graph the solution set of the inequality and interpret it in the context of the problem. *For example, As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions. (Note: Inequalities using less than or equal to and greater than or equal to are included in this standard.)* | NYS added a note about inclusive inequalities to this requirement. |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **Geometry** | | . |
| **Draw, construct, and describe geometrical figures and describe the relationships between them.** | **A. Draw, construct and describe geometrical figures and describe the relationships between them.** | . |
| 7.G.1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. | 7.G.A.1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. | . |
| 7.G.2. Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle. | 7.G.A.2. Explore geometric shapes through the use of freehand drawings, rulers, protractors, and/or technology. Focus on constructing triangles with given conditions from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle. | NYS added the idea of exploring shapes, possibly through the use of drawings, but does not specifically require that students draw figures.<br><br>They changed the performance for this standard to "explore." It is not clear in the glossary of verbs whether this is an even exchange in terms of rigor. |
| 7.G.3. Describe the two-dimensional figures that result from slicing three- dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids. | 7.G.A.3. Explore and describe the two-dimensional figures that result from slicing three-dimensional figures parallel or perpendicular to a base, as in plane sections of right rectangular prisms and right rectangular pyramids. | NYS limits the sections to those that are parallel or perpendicular to the base. |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.** | **B. Solve real-life and mathematical problems involving angle measure, area, surface area and volume.** | . |
| 7.G.4. Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle. | 7.G.B.4. Use the formulas for the area and circumference of a circle to solve problems; give an informal derivation of the relationship between the circumference and area of a circle. (Note: Calculating the radius of a circle given its area is not expected.) | NYS changed from "know" to "use," making it clear that students would be given the formulas. |
| 7.G.5. Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure. | 7.G.B.5. Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure. | . |
| 7.G.6. Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. | 7.G.B.6. Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, special quadrilaterals, cubes, and right rectangular prisms. | NYS limited their version to special quadrilaterals and removed the general category of "polygons" from the list of required shapes. A definition for "special quadrilaterals" may be needed. For example, would kites and trapezoids be included?<br><br>NYS also added "rectangular" to right prisms. In the CCSS for Gr 5 and Gr 6, prisms are restricted to "right rectangular," but Gr 7 expands to "three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes and right prisms." |
| **Statistics and Probability** | | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **Use random sampling to draw inferences about a population.** | **A. Use random sampling to draw inferences about a population.** | . |
| 7.SP.1. Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences. | 7.SP.A.1. Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences. | . |
| 7.SP.2. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.* | 7.SP.A.2. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to evaluate the variation in estimates or predictions. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Evaluate how far off the estimate or prediction might be.* | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **Draw informal comparative inferences about two populations.** | **B. Draw informal comparative inferences about two populations.** | . |
| 7.SP.3. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. *For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable* . | 7.SP.B.3. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. F*or example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.* | . |
| 7.SP.4. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.* | 7.SP.B.4. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.* | . |
| **Investigate chance processes and develop, use, and evaluate probability models.** | **C. Investigate chance processes and develop, use and evaluate probability models.** | . |

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| 7.SP.5. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. | 7.SP.C.5. Understand that the probability of a chance event is a number between 0 and 1 inclusive that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. | NYS clarified that both 0 and 1 are included in the possible values for the probabilities. (Typo: Inclusive should be within commas.) |
| 7.SP.6. Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. *For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.* | 7.SP.C.6. Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. *For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.* | . |
| 7.SP.7. Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. | 7.SP.C.7. Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 7.SP.7a Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. *For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.* | 7.SP.C.7a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. *For example, the probability of rolling a fair number cube and landing on a 2 is 1/6. The probability of landing on an even number is also 3/6.* | NYS changed the example. |
| 7.SP.7b Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. *For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?* | 7.SP.C.7b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. *For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?* | . |
| 7.SP.8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. | 7.SP.C.8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. | . |
| 7.SP.8a Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. | 7.SP.C.8a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 7.SP.8b Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event. | 7.SP.C.8b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language, identify the outcomes in the sample space which compose the event. *For example, "rolling double sixes".* | NYS moved the example to the end of the standard.<br><br>[Typo: The period is outside the end quotes at the end of the sentence.] |
| 7.SP.8c Design and use a simulation to generate frequencies for compound events. *For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?* | 7.SP.C.8c. Design and use a simulation to generate frequencies for compound events. *For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?* | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **GRADE 8** | | . |
| **The Number System** | | . |
| **Know that there are numbers that are not rational, and approximate them by rational numbers.** | **A. Know that there are numbers that are not rational and approximate them by rational numbers.** | . |
| 8.NS.1. Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number. | 8.NS.A.1. Understand informally that every number has a decimal expansion; the rational numbers are those with decimal expansions that terminate in 0s or eventually repeat. Know that other numbers are called irrational. | NYS removed the requirement to convert repeating decimals into rational numbers. They changed other wording slightly and moved the first statement in the CCSS to the end of the standard. |
| 8.NS.2. Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., √2). *For example, by truncating the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.* | 8.NS.A.2. Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions, which includes, π^2. For example, by truncating the decimal expansion of √2 (square root of 2), show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations. | NYS specifically included π^2 as a value that must be estimated. It is not clear why this value is singled out, especially when it has no connection to the example. |
| **Expressions and Equations** | | . |
| **Work with radicals and integer exponents.** | **A. Work with radicals and integer exponents.** | . |
| 8.EE.1. Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example, 3^2 × 3^(–5) = 3^(–3 )= 1/3^3 = 1/27.* | 8.EE.A.1. Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example, 3^2 × 3^(–5) = 3^(–3) =1/(3^3)= 1/27.* | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 8.EE.2. Use square root and cube root symbols to represent solutions to equations of the form *x*^ 2 = *p* and *x*^ 3 = *p* , where *p* is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. | 8.EE.A.2. Use square root and cube root symbols to represent solutions to equations of the form x^2 = p and x^3 = p, where p is a positive rational number. Know square roots of perfect squares up to 225 and cube roots of perfect cubes up to 125. Know that the square root of a non-perfect square is irrational. *For example, the √2 is irrational.* | NYS used specific limitations rather than "small," which is used in the CCSS. They also included a more general statement about irrational numbers and put the specific one used in the CCSS in an example. |
| 8.EE.3. Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. *For example, estimate the population of the United States as 3 × 10^8 and the population of the world as 7 × 10^9, and determine that the world population is more than 20 times larger.* | 8.EE.A.3. Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. *For example, estimate the population of the United States as 3 × 108 and the population of the world as 7 × 109, and determine that the world population is more than 20 times larger.* | . |
| 8.EE.4. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology. | 8.EE.A4. Perform operations with numbers expressed in scientific notation, including problems where both standard decimal form and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities. Interpret scientific notation that has been generated by technology. | NYS changed "decimal" to "standard decimal form" and removed the example. |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **Understand the connections between proportional relationships, lines, and linear equations.** | **B. Understand the connections between proportional relationships, lines and linear equations.** | . |
| 8.EE.5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.* | 8.EE.B.5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 8.EE.6. Use similar triangles to explain why the slope *m* is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation *y* = *mx* for a line through the origin and the equation *y* = *mx* + *b* for a line intercepting the vertical axis at *b* . | 8.EE.B.6. Derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b. Explore similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane. | NYS changed the order of the statements and changed "use" to "explore." In this case simply replacing "use" with "explore" is awkward. Is it possible to "explore… to explain why?" Perhaps it should be, "explore … and explain why." This ordering also changed the emphasis of the progression that existed in the earlier standards. The point of the existing standard was to use the earlier work on similarity, connect it to slope, and proceed to the form y = mx + b. This development is outlined in the progressions documents and also reflects the emphasis of the cluster to connect linear equations to proportional relationships. The note indicates the goal is to emphasize the connection to proportional relationships, but the re-phrasing will likely have the opposite impact.<br><br>Also: "Explore similar triangles," given the glossary definition of "explore" does not make sense here, as students have already learned about similar triangles in Grade 7. |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **Analyze and solve linear equations and pairs of simultaneous linear equations.** | **C. Analyze and solve linear equations and pairs of simultaneous linear equations.** | . |
| 8.EE.7. Solve linear equations in one variable. | 8.EE.C.7. Solve linear equations in one variable. | . |
| 8.EE.7a Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers). | 8.EE.C.7a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers). | . |
| 8.EE.7b Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. | 8.EE.C.7b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and combining like terms. This includes equations that contain variables on both sides of the equation. | NYS added a further explanation of this requirement. |
| 8.EE.8. Analyze and solve pairs of simultaneous linear equations. | 8.EE.C.8. Analyze and solve pairs of simultaneous linear equations. | . |
| 8.EE.8a Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. | 8.EE.C.8a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 8.EE.8b Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. *For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.* | 8.EE.C.8b. Solve systems of two linear equations in two variables with integral coefficients: graphically, numerically using a table, and algebraically by substitution.<br>Note: Solving systems algebraically by substitution will be limited to at least one equation containing at least one variable whose coefficient is 1.<br>Solve simple cases by inspection fluently. *For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.* | NYS added a fluency requirement. They also limited this standard by requiring "integral coefficients," with at least one being 1 for those solved algebraically, and substitution as the only algebraic method. (In this case it is not clear why "integral" was used rather than "integer," which would better match the terms in cluster 8.EE.A.)<br><br>This is a shift in focus. NYS expects students to be able to solve a system of linear equations numerically using a table, and algebraically, limited to substitution. Substitution questions are further limited to one variable with a coefficient of one. It is not clear, however, what limitations would be placed on the precision of answers for tables or graphs. Would students be expected to find the solution to [7x - 13y = 42, -12x + 23y = 14] both graphically and by a table? (The answer, now, is yes). The CCSS expects students to estimate solutions using graphs, NYS does not, and does not expect such a problem to be solved in a table. The CCSS does not limit algebra approaches to substitution nor to coefficients of 1. It is interesting that NYS did not replace the example with one that includes at least one coefficient of 1, especially since the example given would be a good one for solving by combining the two equations. (3x + 2y = 5 combined with -3x + -2y = -6 produces 0 = -1, which cannot not be true for any values of x and y.)<br><br>Fluency, as defined here, will be very challenging to measure. |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 8.EE.8c Solve real-world and mathematical problems leading to two linear equations in two variables. *For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.* | 8.EE.C.8c. Solve real-world and mathematical problems involving systems of two linear equations in two variables with integral coefficients. | NYS slightly changed the wording and removed the example. |
| **Functions** | | . |
| **Define, evaluate, and compare functions.** | **A. Define, evaluate and compare functions.** | . |
| 8.F.1. Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. [Function notation is not required in Grade 8.] | 8.F.A.1. Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. (Note: The use of function notation and the terms domain and range are not required at this level.) | . |
| 8.F.2. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.* | 8.F.A.2. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic equation, determine which function has the greater rate of change. | NYS changed "expression" to "equation." |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 8.F.3. Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *For example, the function A = s^2 giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.* | 8.F.A.3. Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function A = s^2 giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line. | . |
| **Use functions to model relationships between quantities.** | **B. Use functions to model relationships between quantities.** | . |
| 8.F.4. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two ($x$ , $y$ ) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. | 8.F.B.4. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
|---|---|---|
| 8.F.5. Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. | 8.F.B.5. Describe qualitatively the functional relationship between two quantities by analyzing a graph. For example, where the function is increasing or decreasing or whether the function is linear or nonlinear. Sketch a graph that exhibits the qualitative features of a function that has been described in a real-world context. | NYS slightly changed some wording and added "a real world context." |
| **Geometry** | | . |
| **Understand congruence and similarity using physical models, trans- parencies, or geometry software.** | **A. Understand congruence and similarity using physical models, transparencies, or geometry software.** | |
| 8.G.1 Verify experimentally the properties of rotations, reflections, and translations:<br>a. Lines are taken to lines, and line segments to line segments of the same length.<br>b. Angles are taken to angles of the same measure.<br>c. Parallel lines are taken to parallel lines. | 8.G.A.1. Verify experimentally the properties of rotations, reflections, and translations: | NYS left the colon at the end of this stem statement but separated the sub parts into independent standards. This makes the stem grammatically incorrect and the sub parts do not describe a performance. Typo? |
| | 8.G.A.1a. Lines are taken to lines, and line segments to line segments of the same length. | Measurability: This is a definition, not a performance standard. |
| | 8.G.A.1b. Angles are taken to angles of the same measure. | Measurability: This is a definition, not a performance standard. |
| | 8.G.A.1c. Parallel lines are taken to parallel lines. | Measurability: This is a definition, not a performance standard. |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| 8.G.2. Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. | 8.G.A.2. Know that a two-dimensional figure is congruent to another if the corresponding angles are congruent and the corresponding sides are congruent. Also, understand that the image can be obtained from the pre-image by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that maps the congruence between them. | NYS changed the CCSS definition of congruence that continues into high school standards. In the CCSS, congruence is defined by transformations. In NYS, it is defined by relationships between corresponding angles and sides. In high school, NYS returns to the CCSS definition.<br><br>There is no explanation of what the image and pre-image is in this additional statement. This may need to be included an a glossary of terms. |
| 8.G.3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. | 8.G.A.3. Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates. | |
| 8.G.4. Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two- dimensional figures, describe a sequence that exhibits the similarity between them. | 8.G.A.4. Know that a two-dimensional figure is similar to another if the corresponding angles are congruent and the corresponding sides are in proportion. Also understand that the image can be obtained from the pre-image by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that maps the similarity between them. | NYS changed the CCSS definition of similarity that continues into high school standards. In the CCSS, similarity is defined by transformations. In NYS, it is defined by relationships between corresponding angles and sides.<br><br>There is no explanation of what the image and pre-image is in this additional statement. This may need to be included an a glossary of terms. |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
|---|---|---|
| 8.G.5. Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.* | 8.G.A.5. Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the three angles appear to form a line, and give an argument in terms of transversals why this is so. (Note: This standard does not include formal geometric proof. Multiple representations may be used to demonstrate understanding.)* | NYS added a note to clarify that formal proof is not part of the requirement. However, since the standard, itself, starts with "use informal arguments," this note should be unnecessary. |
| **Understand and apply the Pythagorean Theorem.** | **B. Understand and apply the Pythagorean Theorem.** | . |
| 8.G.6. Explain a proof of the Pythagorean Theorem and its converse. | 8.G.B.6. Explore and understand a proof of the Pythagorean Theorem and its converse. | NYS changed "explain a proof" to "explore and understand a proof" with respect to the Pythagorean Theorem.<br><br>It is not clear in the change in the performance verbs for this standard whether there is an even exchange in terms of rigor. |
| 8.G.7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. | 8.G.B.7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. | . |
| 8.G.8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. | 8.G.B.8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
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| **Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.** | **C. Solve real-world and mathematical problems involving volume of cylinders, cones and spheres.** | . |
| 8.G.9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. | 8.G.C.9. Explore and use the formulas for the volume of cones, cylinders, and spheres and use them to solve simple real-world and mathematical problems with limited complexity. | NYS changed "know the formulas" to "explore and use the formulas." Typo: The verb "use" is included in two places in the same sentence. One or the other should be eliminated.<br><br>It is not clear from definitions in the glossary of verbs whether the change in the performance verbs for this standard is an even exchange in terms of rigor. |
| **Statistics and Probability** | | . |
| **Investigate patterns of association in bivariate data.** | **A. Investigate patterns of association in bivariate data.** | . |
| 8.SP.1. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. | 8.SP.A.1. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
|---|---|---|
| 8.SP.2. Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line. | 8.SP.A.2. Understand that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line. (Note that lines of best fit are approximations.) | NYS changed "know" to "understand" and added a note. |
| 8.SP.3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.* | 8.SP.A.3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.* | . |

| CCSS/Current NYS | 2018-19 NYS | Notes and Comments |
|---|---|---|
| 8.SP.4. Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. *For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?* | 8.SP.A.4. Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. *For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?* | . |

The CCSS identified as for those students planning careers or studies in higher mathematics with the (+) are further identified in this chart in green highlighted cells. CCSS that are identified as modeling standards have an asterisk (*).
In the state column any standard shaded in green is addressed earlier and in pink is addressed one year later than in the CCSS.
In the CCSS column standards shaded in orange are (+) standards, or those indicated for students intending to pursue studies or careers in the STEM fields.

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| **NUMBER AND QUANTITY** | | | | | |
| **The Real Number System** | **The Real Number System (N-RN)** | **The Real Number System (N-RN)** | | | . |
| **Extend the properties of exponents to rational exponents.** | . | **A. Extend the properties of exponents to rational exponents.** | . | . | . |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| N-RN.1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define 5^(1/3) to be the cube root of 5 because we want (5^(1/3))^3 = 5^(1/3)^3 to hold, so (5^1/3)^3 must equal 5.* | . | N-RN.A.1 Explore how the meaning of rational exponents follows from extending the properties of integer exponents. | . | . | NYS removed the example and slightly rephrased the standard to specifically call out the use of radicals for expressions involving rational exponents. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| N-RN.2. Rewrite expressions involving radicals and rational exponents using the properties of exponents. | . | N-RN.A.2 Convert between radical expressions and expressions with rational exponents using the properties of exponents. Include expressions with variable factors, such as cube-rt(27 ^5 ^3), being equivalent to (27x^5y^3)^(1/3) which equals 3x^(5/3)y. | . | . | NYS added an example to clarify the scope for this standard. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
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| **Use properties of rational and irrational numbers.** | **B. Use properties of rational and irrational numbers.** | | | | |
| N-RN.3. Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational. | N-RN.B.3. Use properties and operations to understand different forms of rational and irrational numbers. | . | . | . | This NYS addition is unclear and has a measurability issue. How would "properties and operations" be used to understand the different forms? |
| | 3a. Perform operations and apply properties to generate equivalent forms of rational and irrational numbers (limited to square roots), without rationalizing denominators. | . | . | . | NYS added a requirement to operate with rational and irrational numbers, including a limitation of square roots only. Also, it is not clear what is meant by "equivalent forms of rational and irrational numbers." What sort of equivalent forms would be expected for √7, for example? This hints at what is traditionally thought of as "simplifying radicals," but if that is the intent, it should be made clear. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| | 3b. Explain why (using definitions): i) the sum or product of two rational numbers is rational; ii) the sum of a rational number and an irrational number is irrational; iii) the product of a nonzero rational number and an irrational number is irrational; and iv) the product of two irrationals could be either rational or irrational. | . | . | . | This sub part of the NYS version is a near match with the CCSS counterpart. NYS added the product of two irrationals |
| **Quantities*** | **Quantities (N-Q)** | **Quantities (N-Q) ★** | . | . | This header does not have the modeling indicator for Algebra I. However, it was added to the cluster title below. |
| **Reason quantitatively and use units to solve problems.** | **A. Reason quantitatively and use units to solve problems. ★** | | | | The modeling indicator on this cluster would also apply to the standards below. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| N-Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.* | N-Q.A.1. Use units as a way to: i) interpret and guide the solution of multi-step problems; ii) choose and interpret units consistently in formulas; and iii) choose and interpret the scale and the origin in graphs and data displays. | . | . | . | NYS changed "understand problems" to "interpret… the solution." |
| N-Q.2. Define appropriate quantities for the purpose of descriptive modeling.* | . | . | . | . | NYS believes this is addressed adequately by MP.2 and MP.4. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| N-Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.* | N-Q.A.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. The greatest precision for a result is only at the level of the least precise data point. For example, if units are tenths and hundredths, then the appropriate preciseness is tenths. | . | . | . | NYS added a definition and example. The added example should be carefully re-evaluated, as level of accuracy is much more nuanced than implied here. (Clarity) |
| **The Complex Number System** | | **The Complex Number System (N-CN)** | | | . |
| **Perform arithmetic operations with complex numbers.** | . | **A. Perform arithmetic operations with complex numbers.** | | | |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| N-CN.1. Know there is a complex number *i* such that *i*^ 2 = –1, and every complex number has the form *a* + *bi* with *a* and *b* real. | . | N-CN.A.1 Know there are imaginary numbers that cannot be represented on the real number line, and that i, derived from i^2=-1, is the imaginary unit. Know that there are complex numbers which have the form a +bi, where a and b are real. | . | . | NYS added more detail. |
| N-CN.2. Use the relation *i*^ 2 = –1 and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. | . | N-CN.A.2. Use the relation i^2 = –1 and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. | . | . | . |
| N-CN.3. (+) Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers. | . | . | . | N-CN.A.3+ Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers. | . |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
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| **Represent complex numbers and their operations on the complex plane.** | . | . | . | **B. Represent complex numbers and their operations on the complex plane.** | |
| N-CN.4. (+) Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and explain why the rectangular and polar forms of a given complex number represent the same number. | . | . | . | N-CN.B.4+ 4a. Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and convert between rectangular and polar forms of a given complex number. | NYS added conversion between rectangle and polar forms for complex numbers. This is not explicitly stated in the CCSS, but it is implied.<br><br>The (+) is missing in the pdf version of the standards documents on these additional sub standards. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| | | | | N-CN.B.4+ 4b. Determine whether rectangular or polar form is more efficient given the context. | NYS changed "explain why" to "determine whether," creating a shift from the CCSS. The CCSS expectation is that students know that both forms represent the same mathematical entity. Arguably, the NYS assumes this, and expects students to make a judgment on which form is better given the context.<br><br>Note: The (+) is missing in the pdf version of the standards documents on these additional sub standards. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| N-CN.5. (+) Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation. *For example, (–1 + √3 i)^3 = 8 because (–1 + √3 i) has modulus 2 and argument 120°.* | . | . | . | N-CN.B.5+ 5. Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation. For example, (-1 + √3 i)3 = 8 because (-1 + √3 i) has modulus 2 and argument 120°. For example: DeMoivre's Theorem | NYS included two different examples. The second appears to be an unfinished thought. Clarity is needed. |
| N-CN.6. (+) Calculate the distance between numbers in the complex plane as the modulus of the difference, and the midpoint of a segment as the average of the numbers at its endpoints. | . | . | . | N-CN.B.6+ 6a. Calculate the distance between two points in the complex plane. | NYS removed the connection between distance and the modulus of the difference. |
| | | | | N-CN.B.6+ 6b. Find the midpoint of the segment whose endpoints are in the complex plane. | NYS removed the explanation of how to find the midpoint. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
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| **Use complex numbers in polynomial identities and equations.** | . | **C. Use complex numbers in polynomial identities and equations.** | | | |
| N-CN.7 Solve quadratic equations with real coefficients that have complex solutions. | . | N-CN.C.7. Solve quadratic equations with real coefficients that have complex solutions. | . | . | . |
| N-CN.8 (+) Extend polynomial identities to the complex numbers. *For example, rewrite x^ 2 + 4 as* $(x + 2i)(x - 2i)$. | . | . | . | N-CN.C.8+ Extend polynomial identities to the complex numbers. For example, rewrite x^2 + 4 as (x + 2i)(x – 2i). | . |
| N-CN.9 (+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials. | . | . | . | N-CN.C.9+ State and apply the Fundamental Theorem of Algebra. | NYS changed "know" to "state and apply," which are similar in meaning and rigor. For clarity, an example of how it would be applied might be needed. NYS also removed the requirement to show that the Theorem is true for quadratics. |
| **Vector and Matrix Quantities** | | . | . | . | . |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| **Represent and model with vector quantities.** | . | . | . | **A. Represent and model with vector quantities.** | |
| N-VM.1. (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., ***v***, \|***v***\|, \|\|***v***\|\|, *v*). | . | . | . | N-VM.A.1+ Represent a vector analytically and geometrically. For example: rectangular form, polar form, unit form. | NYS changed "recognize" to "represent" and removed the explanation of vector quantities. In the information/notes, it is stated that this explanation should be in a glossary rather than a standard. However, there is no mention of vectors in the glossary included with the standards, which contains only verbs. The meaning of "unit form" will need to be defined, as it is not a common term and could be interpreted in different ways. |
| N-VM.2. (+) Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point. | . | . | . | N-VM.A.2+ Find the magnitude and direction of a given vector. | NYS replaced "components" with "magnitude and direction." They also removed the CCSS clarification of how to find them. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| N-VM.3. (+) Solve problems involving velocity and other quantities that can be represented by vectors. | . | . | . | N-VM.A.3+ Solve problems using vectors analytically and geometrically (e.g. velocity and forces). | NYS changed the wording, adding both analytic and geometric solutions. |
| **Perform operations on vectors.** | . | . | . | **B. Perform operations on vectors.** | |
| N-VM.4. (+) Add and subtract vectors. | . | . | . | N-VM.B.4+ Add and subtract vectors analytically and geometrically. | NYS added "analytically and geometrically" as required methods for operating with vectors. |
| N-VM.4a Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes. | . | . | . | . | NYS intends this to be covered by N-VM.B.4+ through the inclusion of "analytically and geometrically," although the understanding in the CCSS may not be clear to readers. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| N-VM.4b Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum. | . | . | . | . | NYS intends this to be covered by N-VM.B.4+ through the inclusion of "analytically and geometrically," although the specifics of the CCSS expectation are not clear in N-VM.B.4+. |
| N-VM.4c Understand vector subtraction ***v*** – ***w*** as ***v*** + (–***w***), where –***w*** is the additive inverse of ***w***, with the same magnitude as ***w*** and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction component-wise. | . | . | . | . | NYS intends this to be covered by N-VM.B.4+ through the inclusion of "analytically and geometrically," although the understanding about subtraction in the CCSS may not be clear to readers. |
| N-VM.5. (+) Multiply a vector by a scalar. | . | . | . | N-VM.B.5+ Multiply a vector by a scalar analytically and geometrically. | NYS added "analytically and geometrically" as required methods for operating with vectors. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
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| N-VM.5a Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g., as $c(v_x, v_y) = (cv_x, cv_y)$. | . | . | . | . | NYS intends this to be covered by N-VM.B.5+ through the inclusion of "analytically and geometrically." |
| N-VM.5b Compute the magnitude of a scalar multiple $c\,\mathbf{v}$ using $\|\|c\,\mathbf{v}\|\| = \|c\|v$. Compute the direction of $c\,\mathbf{v}$ knowing that when $\|c\|v \neq 0$, the direction of $c\,\mathbf{v}$ is either along $\mathbf{v}$ (for $c > 0$) or against $\mathbf{v}$ (for $c < 0$). | . | . | . | . | NYS intends this to be covered by N-VM.B.5+ through the inclusion of "analytically and geometrically." |
| **Perform operations on matrices and use matrices in applications.** | . | . | . | **C. Perform operations on matrices and use matrices in applications.** | |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| N-VM.6. (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network. | . | . | . | N-VM.C.6+ Use matrices to represent and model real world situations. For example: networks. | NYS changed "manipulate data" to "model real world situation" and changed the example. More explanation for the example may be needed to make the modeling requirement clear. |
| N-VM.7. (+) Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled. | . | . | . | N-VM.C.7+ Multiply matrices by scalars. | NYS removed "to produce new matrices," which is likely implied. |
| N-VM.8. (+) Add, subtract, and multiply matrices of appropriate dimensions. | . | . | . | N-VM.C.8+ Add, subtract, and multiply matrices. | NYS removed "appropriate dimensions," which would be implied. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
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| N-VM.9. (+) Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties. | . | . | . | N-VM.C.9+ Determine if matrices are a group under addition and multiplication. | The NYS shift in expectation to work with the algebraic structures of groups is significant given that there is no other mention of defining or working with groups in the standards. (Coherence) |
| N-VM.10. (+) Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse. | . | . | . | | This CCSS requirement to understand the identity and inverse would be part of what is intended in N-VM.C.9+, but that may need to be clearer for teachers.<br><br>The NYS also removes foundational understandings of determinants. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
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| N-VM.11. (+) Multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors. | . | . | . | N-VM.C.11+ Use matrices to perform linear transformations in the plane. For example: multiplying a vector by 2x2 matrix. | NYS rephrases this standard to focus more on linear transformations without a strict restriction to vectors. |
| N-VM.12. (+) Work with 2 X 2 matrices as transformations of the plane, and interpret the absolute value of the determinant in terms of area. | | | | N-VM.C.12+ Calculate and interpret the determinant of a matrix. For example: calculating area. | NYS focused this standard on the application of the determinant of a matrix. The NYS example needs to be more clearly connected to the requirement. It would be clearer to say: "For example: Interpret the absolute value of the determinant in terms of area." This NYS is missing the 2x2 limitation. |
| **ALGEBRA** | | . | . | . | . |
| **Seeing structure in expressions** | **Seeing Structure in Expressions (A-SSE)** | **Seeing Structure in Expressions (A-SSE)** | . | . | . |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
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| **Interpret the structure of expressions** | **A. Interpret the structure of expressions.** | **A. Interpret the structure of expressions.** | | | |
| A-SSE.1. Interpret expressions that represent a quantity in terms of its context.* | A-SSE.A.1. Interpret expressions that represent a quantity in terms of its context. ★ | . | . | . | The modeling indicator on this standard would also apply to the sub parts below. |
| A-SSE.1a Interpret parts of an expression, such as terms, factors, and coefficients.* | A-SSE.A.1a. Given a polynomial, write the standard form and interpret the parts of the polynomial: terms, factors, coefficients, degree, leading coefficient, and constant term. | . | . | . | NYS specified that this standard is only about polynomials, rather than all expressions, and added other vocabulary and the requirement to write a polynomial in standard (general?) form. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
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| A-SSE.1b Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret P* (1+*r* )^n *as the product of P and a factor not depending on P.** | A-SSE.A.1b. Fluently interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret P(1+r)^n as the product of P and a factor not depending on P. | . | . | . | NYS added fluency to this requirement. It is not clear how fluency applies here. Which part of the glossary definition should be applied here: "just knowing some answers," "knowing some answers from patterns," or "knowing some answers from the use of strategies?" |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| A-SSE.2. Use the structure of an expression to identify ways to rewrite it. *For example, see x^ 4 – y^ 4 as (x^ 2)^2 – (y^ 2)^2, thus recognizing it as a difference of squares that can be factored as (x^ 2 – y^ 2)(x^ 2 + y^ 2).* | A-SSE.A.2a. Use the structure of an expression to identify ways to rewrite it. For example, see x^4 - y^4 as (x^2)^2 - (y^2)^2, thus recognizing it as a difference of squares that can be factored as (x^2 - y^2)(x^2 + y^2). Note: Does not include factoring by grouping and factoring the sum and difference of cubes. | A-SSE.A.2b. Fluently use the structure of an expression to identify ways to rewrite it, including factoring by grouping and factoring the sum and difference of cubes. Tasks are limited to polynomial, rational or exponential expressions. Examples include, but are not limited to:<br>a) 81 ^4−16 ^4 is equivalent to (9 ^2)2−(4 ^2)^2 or (9 ^2−4^ 2)(9 ^2+4 ^2) or<br>(3 +2 )(3 −2 )(9 ^2+ 4 ^2)<br>b) ^2+4 +4+ ^2=25 is equivalent to<br>( +2)^2+ 2=5 2<br>c) ( ^2+4)/( ^2+3) is equivalent to<br>[( ^2+3)+1)/( ^2+3) | . | . | For Alg I, NYS excluded factoring by grouping and the sum/difference of cubes.<br>For Alg II, NYS added back the specific exclusions for Alg I and added fluency and several polynomial examples (and rational expressions involving polynomials). More clarity is needed to ensure "fluency" is consistently understood regarding exponential expressions. Which part of the glossary definition should be applied here: "just knowing some answers," "knowing some answers from patterns," or "knowing some answers from the use of strategies?" |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| **Write expressions in equivalent forms to solve problems** | **B. Write expressions in equivalent forms to reveal their characteristics. ★** | **B. Write expressions in equivalent forms to solve problems. ★** | | | NYS changed the title for this cluster for Alg I, to remove problem solving. It is not clear what "characteristics" of an expression would be revealed. Is it possible that the intention is to match the requirement of A-SSE.B.3? In that case this title should be focused on the properties of the quantity represented by the expression. |
| A-SSE.3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.* | A-SSE.B.3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. | A-SSE.B.3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. (Shared with A1) | . | . | There is no progression defined or explained for Alg I and II. The limits between the levels needs to be clarified (measurability). |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| A-SSE.3a Factor a quadratic expression to reveal the zeros of the function it defines.* | A-SSE.B.3a. Factor quadratic expressions completely: i) using the greatest common factor; ii) recognizing the difference of two perfect squares; and iii) with trinomials where the leading coefficient is +/- 1 only after removing possible GCF. | A-SSE.B.3a. Factor quadratic expressions including leading coefficients other than 1 to reveal the zeros of the function it defines. | . | . | NYS added limitations and progression from Alg I to Alg II. It should be noted that the Alg I version does not appear to focus on revealing the characteristics of the function. |
| A-SSE.3b Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.* | . | A-SSE.B.3b. Factor quadratic expressions by completing the square. For example, the expression x^4 + x^2 +1 can be rewritten as x^4 + x^2 + x^2 + 1 – x^2 , which is equivalent to (x^2 +1)( x^2 +1) – x^2 or it can be rewritten as (x^2 + 1^2 ) ^2 + 3^4 . | . | . | NYS added an example but removed the purpose for completing the square, weakening the coherence with the cluster header.<br><br>Note that in Geometry completing the square is connected to finding the center (see G.GPE.A.1). |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| A-SSE.3c Use the properties of exponents to transform expressions for exponential functions. *For example the expression* 1.15^t *can be rewritten as* (1.15^(1/12))^(12*t*) ≈ 1.012^12t *to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.** | A-SSE.B.3c. Use the properties of exponents to rewrite exponential expressions. Algebra I tasks are limited to exponential expressions whose exponent contains a linear expression in which the linear term has an integer coefficient. For example 3^2x can be rewritten as (3^2)^x which is 9^x or 252.290(0.9439)^(t-30 = 252.290(0.9439)^t*(0.9439)^(-3) is approximately 300(0.9439)^t.<br><br>https://www.illustrativemathematics.org/content-standards/HSA/SSE/B/3/tasks/1305 | A-SSE.B.3c. Use the properties of exponents to rewrite exponential expressions. Exponents will be rational. For example the expression 1.15^t can be rewritten as (1.15^(1/12))^(12t) = 1.012^(12t) to reveal the approximate equivalent monthly interest rate when the annual rate is 15%. | . | . | NYS removed the idea that the expressions represent functions. They added limitations and specific examples related to the limitation for Alg I and progression from Alg I to Alg II. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
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| A-SSE.4 Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. *For example, calculate mortgage payments.** | . | F-BF.B.7. Explore the derivation of the formulas for arithmetic and finite geometric series. Use the series to solve problems. For example, calculate mortgage payments. ★ | . | . | NYS addressed this concept in the Functions domain. The NYS level of rigor is lower, since students are required to "explore" the formulas but not required to derive them. NYS also removed the word "sum" - this is may have been a mistake, as it leaves it unclear what the "formulas for ... series" should do. [Note: Both NYS and the CCSS addresses writing geometric and arithmetic sequences in F-BF.2] |
| **Arithmetic with Polynomial and Rational Expressions** | **Arithmetic with Polynomials and Rational Expressions (A-APR)** | **Arithmetic with Polynomials and Rational Expressions (A-APR)** | . | . | . |
| **Perform arithmetic operations on polynomials** | **A. Perform arithmetic operations on polynomials.** | | | | |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| A-APR.1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. | A-APR.A.1. Fluently add, subtract, and multiply polynomials. | . | . | | NYS removed the conceptual understanding required in the CCSS and added fluency to this requirement. |
| **Understand the relationship between zeros and factors of polynomials** | **B. Understand the relationship between zeros and factors of polynomials.** | **B. Understand the relationship between zeros and factors of polynomials.** | | | |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
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| A-APR.2. Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number $a$, the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$. | . | A-APR.B.2. Demonstrate knowledge of and apply the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x – a is p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x). | . | | NYS replaced "know and apply" with "demonstrate knowledge of and apply." |
| A-APR.3. Identify zeros of polynomials when suitable factorizations are | A-APR.B.3. Identify zeros of polynomials. | A-APR.B.3.Identify zeros of polynomials. | . | . | . |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
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| available, and use the zeros to construct a rough graph of the function defined by the polynomial. | A-APR.B.3a. Identify: i) the zeros of quadratic and cubic polynomials in which linear and quadratic factors are available; For example, find the zeros of (x-2) (x^2-9)=0. ii) the graph of the function defined by the polynomial equation; and iii) an appropriate equation of a function given the zeros of that function. | A-APR.B.3b. i) Identify zeros of quadratic, cubic, and quartic polynomials when suitable factorizations are available; ii) use the zeros to construct a rough graph of the function defined by the polynomial; and iii) create an appropriate equation given the zeros and/or a graph. | . | . | NYS used sub parts to add detail defining the progression from Alg I to II. However there is an overlap of quadratic and cubic polynomials in both. Is cubic intended for Alg I? And how will quadratics specifically be treated differently in the two courses? |
| **Use polynomial identities to solve problems** | . | **C. Use polynomial identities to solve problems.** | | | |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| A-APR.4. Prove polynomial identities and use them to describe numerical relationships. *For example, the polynomial identity* (*x*^ 2 + *y*^ 2)^2 = (*x*^ 2 – *y*^ 2)^2 + (2*xy* )^2 *can be used to generate Pythagorean triples.* | . | A-APR.C.4. Prove polynomial identities. For example, prove the identity (x^2 + y^2)^2 = (x^2 – y^2)^2 + (2xy)^2 or prove that the difference between squares of consecutive integers is odd. | . | . | NYS removed the purpose for proving the identities (application). This standard has become more procedural in NYS. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| A-APR.5. (+) Know and apply the Binomial Theorem for the expansion of (*x* + *y* )^n in powers of *x* and *y* for a positive integer *n* , where *x* and *y* are any numbers, with coefficients determined for example by Pascal's Triangle. [The Binomial Theorem can be proved by mathematical induction or by a combinatorial argument.] | . | . | . | A-APR.C.5+ Use the Binomial Theorem for the expansion of (x + y)^n for a positive integer n. | NYS removed the requirement to "know" the Binomial Theorem and the supporting detail. Without a glossary, more may be needed to ensure consistent delivery of this standard. |
| **Rewrite rational expressions** | . | **D. Rewrite rational expressions.** | | | |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| A-APR.6. Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system. | . | A-APR.D.6. Fluently, rewrite rational expressions in different forms: Write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x). | . | . | NYS added fluency to this requirement and removed the methods for rewriting. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| A-APR.7. (+) Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions. | . | . | . | A-APR.D.7+ Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions. | . |
| **Creating Equations*** | **Creating Equations (A-CED)** | **Creating Equations (A-CED) ★** | . | . | NYS deleted the modeling indicator for this header for Alg I. However it was added to the cluster below. |
| **Create equations that describe numbers or relationships** | **A. Create equations that describe number or relationships. ★** | **A. Create equations that describe number or relationships. ★** | | | The modeling indicator on this cluster would also apply to the standards below. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| A-CED.1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.** | A-CED.A.1a. Create equations and linear inequalities in one variable to represent a real world context. Limit equations to linear, quadratic, and simple exponentials. | A-CED.A.1b. Create equations and inequalities in one variable to represent a real world context. Include linear, quadratic, rational, and exponential functions. | . | . | NYS stopped short of a requirement to solve problems. Their version requires creating an equation to represent a context. In Alg II, NYS dropped the "simple" descriptor for rational expressions and in Alg I, added it to exponentials.<br><br>Note: NYS includes linear and quadratic functions in both Alg I and Alg II standards. It is not clear how Alg II treatment of linear and quadratic functions will be different from that of Alg I. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| A-CED.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.* | A-CED.A.2. Create equations and linear inequalities in two variables to represent a real world context. Limit equations to linear, quadratic, and simple exponentials. | . | . | . | NYS limited the standard to linear, quadratic, and simple exponential equations and only two variables and added linear inequalities. There is no NYS requirement to graph.<br><br>There is no progression for the functions addressed in Alg II even though the notes for Alg I say that three variables are an expectation for Alg II. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| A-CED.3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.** | A-CED.A.3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods. | . | . | . | There is no progression for this requirement to the functions addressed in Alg II. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| A-CED.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R.** | A-CED.A.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R. | . | . | . | There is no progression for this requirement to the functions addressed in Alg II. |
| **Reasoning with Equations and Inequalities** | **Reasoning with Equations and Inequalities (A-REI)** | **Reasoning with Equations and Inequalities (A-REI)** | . | . | . |
| **Understand solving equations as a process of reasoning and explain the reasoning** | **A. Understand solving equations as a process of reasoning and explain the reasoning.** | **A. Understand solving equations as a process of reasoning and explain the reasoning.** | | | |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| A-REI.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. | A-REI.A.1a. Identify the property used in each step when solving a linear or quadratic equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. | A-REI.A.1b. Identify the property used in each step when solving rational or radical equations as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. | . | | NYS changed "explain" to "identify the property used." They included progression of equations types for Alg I and II. While NYS specifically called out linear, quadratic, rational, and radical, it appears that exponential equations were left out of both NYS versions. Does this represent an intentional change in focus by NY? Or was it an accidental deletion? |
| A-REI.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. | . | A-REI.A.2. Solve rational and radical equations in one variable, identify extraneous solutions, and explain how they | . | . | . |
| **Solve equations and inequalities in one variable** | **B. Solve equations and inequalities in one variable.** | **B. Solve equations and inequalities in one variable.** | | | |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| A-REI.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. | A-REI.B.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. | . | . | | . |
| A-REI.4. Solve quadratic equations in one variable. | A-REI.B.4. Solve quadratic equations in one variable. Solutions may include simplifying radicals. | A-REI.B.4. Solve quadratic equations in one variable. (Shared with A1) | . | . | The Alg I version appears to be a more rigorous requirement. Without progression, this concept is redundant in Alg II. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| A-REI.4a Use the method of completing the square to transform any quadratic equation in $x$ into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form. | A-REI.B.4a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form (x-p)^2 = q that has the same solutions. Note: The quadratic's leading coefficient must be 1 and the coefficient of the linear term must be even (after factoring out any GCF). | . | . | . | NYS removed the requirement to derive the quadratic formula and placed limitations on the coefficients. There is no progression for Alg II. Is it possible that the limitations on Alg I were intended to be expanded for Alg II? |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| A-REI.4b Solve quadratic equations by inspection (e.g., for *x*^ 2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as *a* ± *bi* for real numbers *a* and *b* . | A-REI.B.4b. Solve quadratic equations by:<br>i) inspection;<br>ii) taking square roots;<br>iii) factoring;<br>iv) completing the square; and<br>v) the quadratic formula.<br>Recognize when the quadratic formula yields no real solutions. | A-REI.B.4b. Solve quadratic equations by:<br>i) inspection;<br>ii) taking square roots;<br>iii) factoring;<br>iv) completing the square; and<br>v) the quadratic formula.<br>Recognize when the quadratic formula yields no real solutions. | . | . | . |
| | | 4c. Recognize when the quadratic has complex solutions and write them in a + bi form. | . | . | |
| **Solve systems of equations** | **C. Solve systems of Equations** | **C. Solve systems of Equations** | | | |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| A-REI.5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. | A-REI.C.5. Justify that, given a system of two equations in two variables, replacing one equation by a multiple of that equation produces a system with the same solution. | . | . | | NYS changed "prove" to "justify" and removed the concept of combining the replaced equation with one of the originals to produce a solution. This is odd, mathematically, and weakened the standard. |
| A-REI.6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. | A-REI.C.6a. Solve systems of linear equations in two variables both algebraically and graphically. | . | . | A-REI.C.6b+ Solve systems of linear equations in three variables. | NYS added a progression for the Plus standards. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| A-REI.7. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. *For example, find the points of intersection between the line y = –3x* and the circle *x^ 2 + y^ 2 = 3.* | A-REI.7a. Solve a system, with rational solutions, consisting of a linear equation and a quadratic equation (parabolas only) in two variables both algebraically and graphically. | A-REI.C.7b. Solve a system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line y = –3x and the circle x^2 + y^2 = 3. | . | . | NYS added limitations and removed the example for Alg I. |
| A-REI.8. (+) Represent a system of linear equations as a single matrix equation in a vector variable. | . | . | . | A-REI.C.8+ Represent a system of linear equations as a single matrix equation in a vector variable. | . |
| A-REI.9. (+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 X 3 or greater). | . | . | . | A-REI.C.9+ Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater). | . |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| **Represent and solve equations and inequalities graphically** | **D. Represent and solve equations and inequalities graphically.** | **D. Represent and solve equations and inequalities graphically.** | | | |
| A-REI.10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). | A-REI.D.10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane. | . | . | | NYS removed the CCSS explanation. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| A-REI.11. Explain why the *x* -coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.* | A-REI.D.11. Given the equations y=f(x) and y=g(x):<br>i) recognize that each x-coordinate of the intersection(s) is the solution to the equation f(x)=g(x); and<br>ii) find the solutions approximately using technology to graph the functions or make tables of values; and<br>iii) interpret the solution in context. ★<br>Algebra I Cases are limited to where f(x) and g(x) are linear, polynomial, absolute value and simple exponential functions. | A-REI.D.11. Given the equations y=f(x) and y=g(x):<br>i) recognize that each x-coordinate of the intersection(s) is the solution to the equation f(x)=g(x); and<br>ii) find the solutions approximately using technology to graph the functions or make tables of values; and<br>iii) interpret the solution in context. ★<br>Note for Algebra II: Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. | . | . | NYS changed "explain why… the equations" to "given the equations." They removed successive approximations and added interpretation of the solution in context. Progressions are described for Alg I and II.<br><br>Note: NYS includes linear, polynomial, and absolute value functions in both Alg I and Alg II standards. It is not clear how Alg II treatment of linear, absolute value, and quadratic functions will be different from that of Alg I. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| A-REI.12. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes. | A-REI.D.12. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes. | . | . | . | . |
| **FUNCTIONS** | | . | . | . | . |
| **Interpreting Functions** | **Interpreting Functions (F-IF)** | **Interpreting Functions (F-IF)** | . | . | . |
| **Understand the concept of a function and use function notation** | **A. Understand the concept of a function and use function notation.** | **A. Understand the concept of a function and use function notation.** | | | |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| F-IF.1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If $f$ is a function and $x$ is an element of its domain, then $f(x)$ denotes the output of $f$ corresponding to the input $x$. The graph of $f$ is the graph of the equation $y = f(x)$. | F-IF.A.1. Define a function in terms of domain and range, and the graph of f is the graph of the equation y = f(x). Note: Domain and range can be expressed using inequality, set builder, or interval notations. | . | . | | NYS removed the explanation and definition provided in the CCSS and added a note regarding notation used for domain and range. There is a subtle difference here. The CCSS is about defining functions, as a whole. The NYS is about defining a function for a given instance.<br><br>The first sentence in the NYS does not define what they mean by f (compare to CCSS). The second part of the sentence reads awkwardly. Should it be, "the graph of f as the graph?" Also the comma after "domain and range" seems to be misplaced. It should either be removed or another comma added after “Define a function” so that the two performance verbs are not separated. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| F-IF.2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. | F-IF.A.2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. | . | . | . | There is no progression for this requirement to the functions addressed in Alg II. |
| F-IF.3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≠1.* | F-IF.A.3a. Recognize that a sequence is a function whose domain is a subset of the integers. Sequences must be written explicitly and only in subscript notation. Functional notation for sequences and recursive forms should be introduced in Algebra II. | F-IF.A.3b. Fluently recognize that sequences are functions, sometimes defined recursively in subscript notation, whose domain is a subset of the integers. | . | . | NYS addresses recursive sequences in Alg II and added an explanationfor Alg I. |
| **Interpret functions that arise in applications in terms of the context** | **B. Interpret functions that arise in applications in terms of the context. ★** | **B. Interpret functions that arise in applications in terms of the context. ★** | | | |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| F-IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* | F-IF.B.4a. For a function that models a relationship between two quantities: i) interpret key features of graphs and tables in terms of the quantities; and ii) sketch graphs showing key features given a verbal description of the relationship. Algebra I Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; maxima, minima; and symmetries. Tasks have a real-world context and are limited to the following functions: linear, quadratic, square root, cube root, piece-wise defined (including | F-IF.B.4b. For a function that models a relationship between two quantities: i) interpret key features of graphs and tables in terms of the quantities; and ii) sketch graphs showing key features given a verbal description of the relationship. Algebra II Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maxima and minima; symmetries; end behavior; and periodicity. Tasks may involve real-world context and may include polynomial, exponential, logarithmic, and trigonometric | . | | NYS includes progression information for Alg I and II.<br><br>It is not clear how square and cube root functions will be approached in Alg I since higher order polynomials (cube) and inverse functions will not be addressed until Alg II. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| F-IF.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.* * | F-IF.B.5. Determine the domain of a function from its graph and, where applicable, identify the appropriate domain for a function in context. | . | . | . | NYS removed the example and changed the wording involving the relationship between the domain and the quantitative relationship, which created a change in focus. The cluster is about functions that arise in context, but this standard makes it about the graph, rather then the function itself. The context should drive the conversation about the domain, but that is not the main emphasis here. There is no progression for this requirement to the functions addressed in Alg II. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| F-IF.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.* | F-IF.B.6a. Calculate and interpret the average rate of change of a function presented over a specified interval. Algebra I tasks have a real-world context and are limited to the following functions: linear, quadratic, square root, cube root, piece-wise defined (including step and absolute value), and simple exponential. | F-IF.B.6b. Calculate and interpret the average rate of change of a function over a specified interval. Algebra II tasks have a real-world context and may involve polynomial, exponential, logarithmic, and trigonometric functions. | . | . | NYS included limitations and a progression for Alg I and II. Neither course requires estimation of the rate of change from a graph. This is a change in focus.<br><br>It is not clear how square and cube root functions will be approached in Alg I since higher order polynomials (cube) and inverse functions will not be addressed until Alg II. |
| **Analyze functions using different representations** | **C. Analyze functions using different representations.** | **C. Analyze functions using different representations.** | | | |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| F-IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.* | F-IF.C.7. Graph functions expressed as an equation and show key features of the graph, by hand in simple cases and by using technology in cases that are more complicated. ★ | F-IF.C.7. Graph functions expressed as an equation and show key features of the graph, by hand in simple cases and using technology in more complicated cases. ★ | . | | NYS changed the wording slightly only in Alg I. |
| F-IF.7a Graph linear and quadratic functions and show intercepts, maxima, and minima.* | F-IF.C.7a. Graph linear, quadratic and simple exponential functions and show intercepts, maxima, and minima. Note: Graphing linear functions is a fluency expectation for Algebra I. | . | . | . | NYS added fluency to the requirement for Alg I. |
| F-IF.7b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.* | F-IF.C.7b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. | . | . | . | It is not clear why this concept would be required in Alg I and not Alg II, where the graphs of inverse functions (square root and cube root) would be more appropriate. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| F-IF.7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.* | . | F-IF.C.7c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. | . | . | |
| F-IF.7d (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.* | . | . | . | F-IF.C.7d+ Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. ★ | . |
| F-IF.7e Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.* | . | F-IF.C.7e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. | . | . | |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| F-IF.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. | F-IF.C.8. Write a function in different but equivalent forms to reveal and explain different properties of the function. | F-IF.C.8. Write a function in different but equivalent forms to reveal and explain different properties of the function. | . | . | NYS does not clarify the progression from Alg I to Alg II. |
| F-IF.8a Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. | F-IF.C.8a. Use the process of factoring and completing the square in a quadratic function to show zeros, maxima, minima, and symmetry of the graph, and interpret these in terms of a context. | . | . | . | NYS changed "extreme value" to "maxima, minima." |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| F-IF.8b Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change in functions such as y = (1.02)^t, y = (0.97)^t, y = (1.01)^(12t), y = (1.2)^(t/10), and classify them as representing exponential growth or decay.* | . | F-IF.C.8b. Use the properties of exponents to interpret exponential functions, and classify them as representing exponential growth or decay. Include real world problems involving compound and continuous interest. | . | . | NYS removed the specific example and added language to describe types of problems that should be addressed. They also added the classification part of the example to the standard. Clarity is needed to determine whether "continuous interest" is intended to mean "interest compounded continuously." |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| F-IF.9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.* | F-IF.C.9a. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). A1 Course: Tasks are limited to the following functions: linear, quadratic, square root, cube root, piecewise defined (including step and absolute value), and simple exponential. | F-IF.C.9b. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Algebra II tasks may involve polynomial, exponential, logarithmic and trigonometric functions. | . | . | It is not clear how square and cube root functions will be approached in NYS Alg I since higher order polynomials (cube) and inverse functions will not be addressed until Alg II. |
| **Building Functions** | | **Building Functions (F-BF)** | . | . | . |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| **Build a function that models a relationship between two quantities** | **A. Build a function that models a relationship between two quantities.** | **A. Build a function that models a relationship between two quantities. ★** | | | The modeling indicator on this cluster would also apply to the Alg II standards below. (There is no indicator for Alg I so only those specifically identified will be modeling standards.) |
| F-BF.1. Write a function that describes a relationship between two quantities.* | F-BF.A.1. Write a function that describes a relationship between two quantities. ★ Algebra I Course is limited to linear, quadratic and simple exponential functions. | F-BF.A.1. Write a function that describes a relationship between two quantities. | . | | NYS included limitations for Alg I but did not describe the progression for Alg II. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| F-BF.1a Determine an explicit expression, a recursive process, or steps for calculation from a context.* | F-BF.A.1a. Determine a function from context.<br>Algebra I: Define a sequence explicitly or steps for calculation from a context. | F-BF.A.1a. Determine a function from context.<br>Algebra II: Determine an explicit expression, a recursive process, or steps for calculation from a context. Tasks may involve linear functions, quadratic functions, and exponential functions. | . | . | NYS added language to define the progression from Alg I to II.<br><br>Note: NYS includes linear, quadratic, and exponential functions in both Alg I and Alg II standards. It is not clear how Alg II treatment of these functions will be different from that of Alg I. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| F-BF.1b Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.** | . | F-BF-A.1b. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model. | . | . | . |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| F-BF.1c (+) Compose functions. *For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.** | . | . | . | F-BF.A.1c+ Compose functions. For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time. ★ | . |
| F-BF.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.* | . | F-BF-A.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. | . | . | . |
| **Build new functions from existing functions** | **B. Build new functions from existing functions.** | **B. Build new functions from existing functions.** | | | |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| F-BF.3. Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, and $f(x + k)$ for specific values of $k$ (both positive and negative); find the value of $k$ given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. | F-BF.B.3a. Using f(x) + k, k f(x), and f(x + k):<br>i) Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), and f(x + k) for specific values of k (both positive and negative);<br>ii) Find the value of k given the graphs;<br>iii) Write a new function using the value of k; and<br>iv) Use technology to experiment with cases and explore the effects on the graph. Algebra I tasks are limited to linear functions, quadratic functions, square root functions, cube root functions, absolute value functions, and simple exponential functions. | F-BF.B.3b. Using f(x) + k, k f(x), f(kx) and f(x + k):<br>i) Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), and f(x + k) for specific values of k (both positive and negative);<br>ii) Find the value of k given the graphs;<br>iii) Write a new function using the value of k; and<br>iv) Use technology to experiment with cases and explore the effects on the graph.<br>A2 Course: Include recognizing even and odd functions from their graphs. Tasks may involve polynomial, exponential, logarithmic, and trigonometric functions. | . | F-BF.B.3c+ Determine algebraically whether or not a function is even or odd. | NYS added progression information for Alg I and II, and a requirement to write new functions to both Alg I and II, and moved algebraic recognition of even and odd functions to the Plus standards. The intention for part iii is unclear. Will g(x)=k(f(x)) suffice? Will any new function work so long as it includes k?<br>The postponement of the algebraic meaning of even/odd is a shift in focus. It is not clear how square and cube root functions will be approached in Alg I since higher order polynomials (cube) and inverse functions will not be addressed until Alg II. |
| F-BF.4. Find inverse functions. | . | F-BF.B.4. Find inverse functions. | . | . | . |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| F-BF.4a Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. *For example, f(x) =2 x^3 or f(x) = (x+1)/(x–1) for x ≠ 1.* | . | F-BF.B.4a4a. Find the inverse of a one-to-one function both algebraically and graphically. | . | . | NYS removed the requirement to solve the equation with an inverse. NYS needs to clarify what it means to find the inverse of a function graphically. |
| F-BF.4b (+) Verify by composition that one function is the inverse of another. | . | . | . | F-BF.B.4b+ Verify by composition that one function is the inverse of another. | . |
| F-BF.4c (+) Read values of an inverse function from a graph or a table, given that the function has an inverse. | . | . | . | F-BF.B.4c+ Given the graph or table of an invertible function, determine coordinates of its inverse. | NYS changed the order and some of the vocabulary in the wording of this standard, but not the meaning or rigor of this CCSS. |
| F-BF.4d (+) Produce an invertible function from a non-invertible function by restricting the domain. | . | . | . | F-BF.B.4d+ Determine an invertible function from a non-invertible function by restricting the domain. For example: F.TF.B.6(+) | NYS changed the wording slightly and referenced a trigonometry standard as an example. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| F-BF.5 (+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents. | . | F.BF.B.5a. Understand inverse relationships between exponents and logarithms algebraically and graphically. | . | F-BF.B.5+ 5b. Use inverse relationships to solve problems involving logarithms and exponents (+). | NYS added a progression to this (+) standard to Alg II. |
| | | | | F-BF.B.5+ 5c. Apply the properties of logarithms to rewrite logarithmic expressions in equivalent forms and solve logarithmic equations. (+) | NYS added this logarithmic requirement to the Plus course standards. |
| | | F-BF.B.6a. Convert between the expanded form of a series and summation notation for the series and evaluate.<br>6b. Write arithmetic and geometric series in summation notation. | . | . | This seems to be more related to A-SSE than F-BF. How are students building a function, as expected of standards in this cluster? Also, it is not clear from this wording whether this addresses only finite series. [Note: the a and b parts are not listed as separate standards in the NYS.] |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| **Linear, Quadratic, and Exponential Models*** | **Linear, Quadratic and Exponential Models (F-LE) ★** | **Linear, Quadratic and Exponential Models (F-LE) ★** | . | . | The modeling indicator on this cluster would also apply to the standards below. |
| **Construct and compare linear, quadratic, and exponential models and solve problems** | **A. Construct and compare linear, quadratic, and exponential models and solve problems.** | | | | |
| F-LE.1. Distinguish between situations that can be modeled with linear functions and with exponential functions.* | F-LE.A.1. Distinguish between situations that can be modeled with linear functions and with exponential functions. | . | . | | |
| F-LE.1a Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.* | F-LE.A.1a. Justify that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. | . | . | . | Justify seems the wrong verb to use here. In this case it might be better to use "show that" or "demonstrate how you know." |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| F-LE.1b Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.* | F-LE.A.1b.Recognize when a model has a constant rate of change and identify the model as linear. | . | . | . | NYS added the requirement to identify the model as linear. It also lost the concept of the constant rate "per unit interval."<br>Also, It is more precise to speak of the quantities in a model having a constant rate relationship. A constant rate is a relationship between varying quantities. |
| F-LE.1c Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.* | F-LE.A.1c. Recognize when a model has a constant percent rate of change and identify the model as exponential. | . | . | . | NYS added the requirement to identify the model as linear. It also lost the concept of the percent rate "per unit interval."<br>Also, It is more precise to speak of the quantities in a model having a constant percent rate relationship. A constant percent rate is a relationship between varying quantities. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| F-LE.2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).* | F-LE.A.2a. Construct a linear or exponential function rule given:<br>i) a graph;<br>ii) a description of the relationship; and<br>iii) two input-output pairs (include reading these from a table).<br>Simple exponential function limit for Algebra I. | F-LE.A.2b. Construct a linear, exponential, arithmetic or geometric function rule given:<br>i) a graph;<br>ii) a description of the relationship; and<br>iii) two input-output pairs (include reading these from a table). | . | . | NYS added a limitation for Alg I.<br><br>Note: NYS includes linear and exponential functions in both Alg I and Alg II standards. It is not clear how Alg II treatment of linear functions will be different from that of Alg I. |
| F-LE.3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.* | F-LE.A.3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. | . | . | . | |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| F-LE.4. For exponential models, express as a logarithm the solution to *ab^(* ct) = *d* where *a* , *c* , and *d* are numbers and the base *b* is 2, 10, or *e* ; evaluate the logarithm using technology.* | . | F-LE.A.4. Use common or natural logarithms to solve exponential equations, such as ab^ct = d where a,b, c, and d are real numbers. Evaluate the logarithm using technology. | . | . | NYS changed the punctuation. |
| **Interpret expressions for functions in terms of the situation they model** | **B. Interpret expressions for functions in terms of the situation they model.** | | | | |
| F-LE.5. Interpret the parameters in a linear or exponential function in terms of a context.* | F-LE.B.5. Interpret the parameters in a linear or exponential function in terms of a context. Simple exponential function limit for Algebra I. | F-LE.B.5. Interpret the parameters in a linear or exponential function in terms of a context. | . | | NYS added a limitation on exponential functions for Alg I and removed the modeling indicator on this standard.<br><br>Note: NYS includes linear and exponential functions in both Alg I and Alg II standards. It is not clear how Alg II treatment of linear functions will be different from that of Alg I. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| **Trigonometric Functions** | | . | . | . | . |
| **Extend the domain of trigonometric functions using the unit circle** | . | **A. Extend the domain of trigonometric functions using the unit circle.** | | | |
| F-TF.1. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. | . | F-TF.A.1. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. | . | | . |
| F-TF.2. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle. | . | F-TF.A.2. Apply concepts of the unit circle in the coordinate plane to calculate the values of the six trigonometric functions given angles in radian measure. | . | . | NYS changed "explain how" to "apply concepts of" and removed much of the CCSS explanation and detail. In doing so, the NYS deemphasizes the extension of the functions to all real numbers as well as the continuous nature of the circular functions. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| F-TF.3. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for π/3, π/4 and π/6, and use the unit circle to express the values of sine, cosine, and tangent for $\pi - x$, $\pi + x$, and $2\pi - x$ in terms of their values for $x$, where $x$ is any real number. | . | . | F.TF.A.3 Use special triangles to determine geometrically the values of sine, cosine and tangent for 30, 45 and 60 degrees. Use the special triangles with the unit circle to find the values for sine, cosine and tangent of 30, 45, 60, 120, 135 and 150 degrees. *Note: Side lengths could be given in radical form.* Eliminate (+) | . | This NYS Geometry standard is a partial match with the CCSS (+) standard. NYS limits angle measures to degrees and the unit circle to quadrants 1 and 2. This change may have created a coherence issue: Will students be taking Geometry before Alg II? If so, how will they use the unit circle? This standard may need further reduction and an expanded version for Alg II. |
| F-TF.4. (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions. | . | F-TF.A.4+. Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions. | . | . | In NYS F-BF.B.3, odd and even functions are moved to Plus standards. Putting this CCSS (+) in Alg II presents a progression problem. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| **Model periodic phenomena with trigonometric functions** | . | **B. Model periodic phenomena with trigonometric functions. ★** | | | The modeling indicator on this cluster would also apply to the standards below. |
| F-TF.5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.* | . | F-TF.B.5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. | . | | . |
| F-TF.6. (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed. | . | . | . | F-TF.B.6+ Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed. | NYS added a modeling indicator to this cluster, and so to this standard. The modeling aspect of this standard should be clearly explained. This standard is used as an example in NYS F-BF.4d. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| F-TF.7. (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.* | . | . | . | F-TF.B.7+ Use inverse functions to solve trigonometric equations that arise in modeling contexts, evaluate the solutions using technology, and interpret them in terms of the context. ★ | . |
| **Prove and apply trigonometric identities** | . | . | . | **C. Prove and apply trigonometric identities.** | . |
| F-TF.8. Prove the Pythagorean identity sin^2(θ) + cos^2(θ) = 1 and use it to find sin(θ), cos(θ), or tan(θ) given sin(θ), cos(θ), or tan(θ) and the quadrant of the angle. | . | F-TF.8a. Prove the Pythagorean identity sin^2(θ) + cos^2(θ) = 1. | . | . | . |
| | . | F-TF.8b. Find the value of any of the six trigonometric functions given any other trigonometric function value. | . | . | NYS removed the part about the quadrant of the angle, which removes the connection to the unit circle and makes this mathematically impossible. What is THE value of cos(t) when sin(t)= -(1/2)? There are two possibilities within the interval [0, 360]. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| F-TF.9. (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems. | . | . | . | F-TF.C.9+ Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems. | . |
| **GEOMETRY** | . | . | . | . | |
| **Congruence** | | . | . | . | . |
| **Experiment with transformations in the plane** | . | . | **A. Experiment with transformations in the plane.** | | |
| G-CO.1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. | . | . | G.CO.A.1. Know precise definitions of angle, circle, perpendicular lines, parallel lines, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc as these exist within a plane. | . | The NYS added clarification about the figures. |

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| G-CO.2. Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch). | . | . | G.CO.A.2. Represent transformations as geometric functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle measure to those that do not (e.g., translation versus horizontal stretch). Note: Use a variety of strategies which include transparencies and software programs. | . | The usage of the phrase "represent...geometric functions" is unclear, undefined, and implies some new kind of function. In the CCSS, the notion of function is invariant, using inputs and outputs. If the intent is to represent geometric transformations as functions, it should be phrased that way. This clarification is needed to ensure there is consistent understanding and application of that term. |
| G-CO.3. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. | . | . | G.CO.A.3. Given a regular or irregular polygon, describe the rotations and reflections that carry it onto itself. | . | NYS modified the descriptions of the shapes but does not specifically call for rectangles, parallelograms, or trapezoids. A definition for "irregular polygon" may be needed in this case. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| G-CO.4. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. | . | . | G.CO.A.4. Develop definitions of rotations, reflections, and translations in terms of points, angles, circles, perpendicular lines, parallel lines, and line segments. | . | NYS added "points" to the terms, presumably to include image points. |
| G-CO.5. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another. | . | . | G.CO.A.5. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure. Specify a sequence of transformations that will carry a given figure onto another. *Note: Drawing tools, which could include graph paper, tracing paper and geometry software.* | . | NYS moved the example to a note and changed the punctuation between the statements.<br><br>Typo: The note is missing a verb so is not a complete sentence. Removing "which could" would be a possible repair for this typo. |
| **Understand congruence in terms of rigid motions** | . | . | **B. Understand congruence in terms of rigid motions.** | | |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| G-CO.6. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent. | . | . | G.CO.B.6. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure. Given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent. *Note: With rotations, the center of the transformation must be specified.* | . | NYS changed the punctuation between the two statements and added a limitation in the note. The definition of congruence was modified in Grade 8 to avoid defining congruence through transformations. Either this standard or the Grade 8 standard needs to be changed to restore coherence.<br><br>Clarity: How will the center of the transformation be specified? Is this something the student must do or must it be part of the elements provided in the task? |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| G-CO.7. Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent. | . | . | G.CO.B.7. Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent. | . | . |
| G-CO.8. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions. | . | . | G.CO.B.8. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions. | . | . |
| **Prove geometric theorems** | . | . | **C. Prove geometric theorems.** | | |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| G-CO.9. Prove theorems about lines and angles. *Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.* | . | . | G.CO.C.9. Prove and apply theorems about lines and angles. *Note: Include multi-step proofs and algebraic problems built upon these concepts.* | . | NYS added "and apply" to the requirement and provides a note with an explanation of the types and scope of the proofs. The phrase "algebraic problems built upon these concepts" is vague and will need clarification. |
| | . | . | G.CO.C.9a. Prove and apply theorems about relationships, specifically: i. Vertical angles. ii. Angles created by a transversal intersecting parallel lines. iii. points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints. | . | NYS used the CCSS examples of possible proofs to create this separate standard. If this separate NYS standard is taken without its stem, it will not necessarily be clear that this is about lines and angles. The sub points of this standard have different levels of specificity, and the overall structure is unclear, in that "vertical angles" is not a "relationship." |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| G-CO.10. Prove theorems about triangles. *Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.* | . | . | G.CO.C.10. Prove and apply theorems about triangles. *Note: Include multi-step proofs and algebraic problems built upon these concepts.* | | NYS added "and apply" to the requirement and provides a note with an explanation of the types and scope of the proofs. Specificity: The phrase "algebraic problems built upon these concepts" is vague and will need clarification. |
| | . | . | G.CO.C.10a. Prove and apply theorems about angle relationships, specifically:<br>i. Interior angles sum to 180 degrees.<br>ii. Exterior angles sum to 360 degrees.<br>iii. The measure of an exterior angle of a triangle is equal to the sum of the measures of its two non-adjacent interior angles of the triangle. | . | NYS used the CCSS examples of possible proofs to create this separate standard. The NYS version focuses on the angles associated with triangles. If this separate NYS standard is taken without its stem, it will not necessarily be clear that this is about triangles (except for the mention in sub part iii). |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
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| | . | . | G.CO.C.10b. Prove and apply theorems about isosceles triangles. | . | NYS made one of the CCSS examples into this separate standard. |
| | . | . | G.CO.C.10c. Prove and apply theorems about the mid-segment of a triangle (parallel to the third side and half the length). | . | NYS made one of the CCSS examples into this separate standard.<br>Clarity: It is not clear from this standard whether the parenthetical is comprehensive or whether other theorems beyond those mentioned would be allowed. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| G-CO.11. Prove theorems about parallelograms. *Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.* | . | . | G.CO.C.11. Prove and apply theorems about parallelograms. *Note: Include multi-step proofs and algebraic problems built upon these concepts.* *Note: Based on the inclusive definition of a trapezoid (specifically a quadrilateral with at least one pair of parallel sides), a parallelogram is a trapezoid.* | . | NYS added "and apply" to this performance requirement and also added notes to explain the scope of the proof and to clarify the definition of trapezoid. NYS also used the CCSS examples of possible proofs to create separate standards. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| | . | . | G.CO.C.11a. Prove and apply theorems about properties which include opposite sides are congruent, opposite angles are congruent and that the diagonals bisect each other. | . | NYS used the CCSS examples of possible proofs to create separate standards. If this separate NYS standard is taken without its stem, it will not necessarily be clear that this is about parallelograms. Typo: In the beginning it appears that "properties" should be "parallelograms." Or perhaps it should read, "...about the properties of parallelograms?" |
| | . | . | G.CO.C.11b. Prove and apply theorems about special parallelograms and the properties that distinguish them. | . | This NYS seems to be subsumed by the previous one. All the properties in the example for G.CO.C11a are of "special parallelograms." NYS will need to define special parallelograms. |
| **Make geometric constructions** | . | . | **D. Make geometric constructions.** | | . |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| G-CO.12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line. | . | . | G.CO.D.12. Make formal geometric constructions while developing fluency with the use of construction tools. *Note: Use a variety of tools and methods for construction, which include compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.* | . | NYS added fluency with construction and a note to include the CCSS examples for possible tools and methods. |
| | . | . | 12a. Copy segments and angles. | . | |
| | . | . | 12b. Bisect segments and angles. | . | |
| | . | . | 12c. Construct perpendicular lines including through a point on or off a given line. | . | The NYS requirement goes beyond constructing the perpendicular bisector. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| | . | . | 12d. Construct a line parallel to a given line through a point not on the line. | . | |
| | . | . | 12e. Construct an isosceles triangle with given lengths. | . | NYS added this specific construction requirement. |
| | . | . | 12f. Construct points of concurrency of a triangle (centroid, circumcenter, and incenter). | . | NYS added this specific construction requirement. |
| G-CO.13. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle. | . | . | G.CO.D.13. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle. | . | NYS added this specific construction requirement. |
| **Similarity, Right Triangles, and Trigonometry** | | . | . | . | . |
| **Understand similarity in terms of similarity transformations** | . | . | **A. Understand similarity in terms of similarity transformations.** | | |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| G-SRT.1 Verify experimentally the properties of dilations given by a center and a scale factor:<br>a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.<br>b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor. | . | . | G.SRT.A.1. Verify experimentally the properties of dilations given by a center and a scale factor. | . | NYS removed the colon on this stem statement and split the CCSS into separate standards. If they are to stand alone as performance objectives, revision is needed to make the descriptive statements of the original CCSS describe student performance. |
| | . | . | G.SRT.A.1a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. | . | This sub part is a definition and does not describe student performance. |
| | . | . | G.SRT.A.1b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor. | . | This sub part is a definition and does not describe student performance. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| G-SRT.2. Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides. | . | . | G.SRT.A.2. Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar. Explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides. Note: With dilations or rotations, the center of the transformation must be specified. | . | NYS added a limitation note to require the center of dilations and rotations be given. The definition of similarity was modified in Grade 8 to avoid defining similarity through transformations. Either this standard or the Grade 8 standard needs to be changed to restore coherence.<br><br>Clarity: How will the center of the transformation be specified? Is the standard stating that this is something the student must do? Or must it be part of the elements provided in the task? |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| G-SRT.3. Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. | . | . | G.SRT.A.3. Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. | . | . |
| **Prove theorems involving similarity** | . | . | **B. Prove theorems involving similarity.** | | |
| G-SRT.4. Prove theorems about triangles. *Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.* | . | . | G.SRT.B.4. Prove and apply theorems about triangles. Note: Include multi-step proofs and algebraic problems built upon these concepts. | . | NYS added "and apply" to the requirement and provides a note with an explanation of the types and scope of the proofs. |
| | . | . | G.SRT.B.4a. Prove that a line parallel to one side of a triangle divides the other two proportionally, and conversely. | . | NYS used the CCSS examples of possible proofs to create this separate standard. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| | . | . | G.SRT.B.4b. Prove that the length of the altitude drawn from the vertex of the right angle of a right triangle to its hypotenuse is the geometric mean between the lengths of the two segments of the hypotenuse. | . | NYS added this to the list of examples of proofs about triangles. |
| | . | . | G.SRT.B.4c. Prove the Pythagorean Theorem using triangle similarity. | . | NYS used the CCSS examples of possible proofs to create this separate standard. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| G-SRT.5. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. | . | . | G.SRT.B.5. Use congruence and similarity criteria for triangles with fluency to:<br>a. solve problems algebraically and geometrically.<br>b. prove relationships in geometric figures.<br>*Note:* ASA, SAS, SSS, AAS, and Hypotenuse-Leg (HL) theorems are valid criteria for triangle congruence. AA, SAS, and SSS are valid criteria for triangle similarity. | . | NYS added "algebraically and geometrically" to the problem solving strategies and added a note to identify the theorems to be used in proofs. They also added a fluency requirement. |
| **Define trigonometric ratios and solve problems involving right triangles** | . | . | **C. Define trigonometric ratios and solve problems involving right triangles.** | | |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| G-SRT.6. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. | . | . | G.SRT.C.6. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of sine, cosine and tangent ratios for acute angles. | . | NYS limited "trigonometric ratios" to sine, cosine, and tangent. |
| G-SRT.7. Explain and use the relationship between the sine and cosine of complementary angles. | . | . | G.SRT.C7. Explain and use the relationship between the sine and cosine of complementary angles. | . | . |
| G-SRT.8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.* | . | . | G.SRT.C.8. Use sine, cosine and tangent as well as the Pythagorean Theorem to solve right triangles in applied problems. ★ | . | NYS limited "trigonometric ratios" to sine, cosine, and tangent. |
| **Apply trigonometry to general triangles** | . | . | **D. Apply Trigonometry to general triangles.** | | |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| G-SRT.9. (+) Derive the formula *A* = 1/2 *ab* sin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side. | . | . | G.SRT.D.9 Explore the derivation of the formula A = 1/2 ab sin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side. Apply the formula A= 1/2 ab sin (C) to find the area of any triangle. Eliminate (+) | . | NYS eliminated the (+) on this CCSS and addressed the concept in the Geometry course. The CCSS requirement to "derive" was changed to "explore the derivation." |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| G-SRT.10. (+) Prove the Laws of Sines and Cosines and use them to solve problems. | . | . | G.SRT.D.10 Explore the proofs and apply the Laws of Sines* and Cosines to solve problems.<br>*The ambiguous case for Law of Sines (given one angle and two sides, find the other angle) is NOT addressed in this course.<br>Eliminate (+) | G-SRT.D.11a + Prove the Law of Sines and the Law of Cosines and apply in all cases including the ambiguous case and resultant forces. ★ | For the purposes of using this CCSS (+) standard in the Geometry course, NYS changed "prove" to "explore the proofs" and added a note to explain the limitations. They also note that the (+) is to be removed. Since the proof is addressed in the Plus standards, this CCSS (+) is fully aligned in the NYS.<br><br>NYS added a modeling indicator to the Plus standard. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| G-SRT.11. (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces). | . | . | G.SRT.D. 11 Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in any triangle. At this level, force diagrams should not be included. ★ Eliminate (+) | G-SRT.D.11a + Prove the Law of Sines and the Law of Cosines and apply in all cases including the ambiguous case and resultant forces. ★ | In the Geometry course version of this standard, a limitation is provided and the (+) removed. There is not a clear distinction between G.SRT.D.10 and G.SRT.D11 in the geometry standards. NYS added a modeling indicator to this standard. Perhaps an explanation is needed to ensure understanding of how mathematical modeling will be applied to this standard.<br><br>NYS added a modeling indicator to both the Geometry and Plus versions of this standard. |
| **Circles** | | . | . | . | . |
| **Understand and apply theorems about circles** | . | . | **A. Understand and apply theorems about circles.** | | |
| G-C.1. Prove that all circles are similar. | . | . | G.C.A.1. Prove that all circles are similar. | . | . |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| G-C.2. Identify and describe relationships among inscribed angles, radii, and chords. *Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles ; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.* | . | . | G.C.A.2. Identify, describe and apply geometric properties of circles. | . | NYS added "and apply" and changed this stem to a separate standard that generally addresses the properties of circles.<br>Measurability: If this standard is considered without its sub parts, it is too broad and vague to know how to measure student performances.<br>Specificity: This standard is too vague. What properties of circles are intended, that are not also a part of things specified in G.C.A.2a? |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| | . | . | G.C.A.2a. Identify, describe and apply relationships among angles and intercepted arcs, specifically:<br>i. central<br>ii. inscribed<br>iii. circumscribed<br>iv. angles and arcs formed by any combination of intersecting tangents, secants or chords. | . | NYS added specific requirements about the angles and arcs of a circle. In the current NYS (2016), this was not listed as a separate standard. If this separate NYS standard was to be taken without its stem, it will not be immediately clear that this is about circles.<br>Clarity: The language of this NYS is unclear. Which relationships? The first bullet only lists "central" which is not a relationship. Does this intend "relationship between central, inscribed, and circumscribed angles?" If so, why change the language to something less precise?<br>Specificity: The specificity of the last item doesn't match the other items. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| | . | . | G.C.A.2b. Identify, describe and apply relationships among segments, specifically:<br>i. radii<br>ii. chords<br>iii. tangents<br>iv. secants | . | NYS added tangents and secants to the list of segments of a circle. In the current NYS, this is not a separate standard. If this separate NYS standard is taken without its stem, it will not be immediately clear that this is about circles.<br>Clarity: It not clear what is meant by "relationships among segments" that are related to radii? What does that mean? |
| G-C.3. Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle. | . | . | G.C.A.3. Prove properties of angles for a quadrilateral inscribed in a circle. | . | NYS removed the construction requirements. |
| G-C.4. (+) Construct a tangent line from a point outside a given circle to the circle. | . | . | G.C.A.4 Construct a tangent line from a point outside a given circle to the circle. Eliminate (+) | . | NYS addressed this CCSS (+) standard in Geometry, eliminating the (+) but not limiting the scope. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| **Find arc lengths and areas of sectors of circles** | . | . | **B. Find arc lengths and areas of sectors of circles.** | . | . |
| G-C.5. Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector. | . | . | G.C.B.5. Using proportionality, find one of the following given two others: the central angle, arc length, radius or area of sector. | . | NYS only vaguely matched the CCSS counterpart here, but drastically reduced the scope by eliminating the requirement to "derive." The work in the CCSS standard was to establish that radian measure, through proportionality, follows directly from the previous work. This NYS removes the key part of the standard and focuses instead on finding an unknown quantity. Radians are completely absent in the NYS. |
| **Expressing Geometric Properties with Equations** | | . | . | . | . |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| **Translate between the geometric description and the equation for a conic section** | . | . | **A. Translate between the geometric description and the equation of a conic section.** | | |
| G-GPE.1 Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation. | . | . | G.GPE.A.1. Derive the equation of a circle of given center and radius using the Pythagorean Theorem. Complete the square to find the center and radius of a circle given by an equation. | . | NYS changed the punctuation between the two statements. |
| G-GPE.2 Derive the equation of a parabola given a focus and directrix. | . | . | . | G-GPE.A.2+ Explore the relationship among the parabola, focus, and directrix and use the equation to model a real life situation. ★ | NYS moved this non-(+) CCSS to Plus course and added a modeling indicator. It will be important to provide an explanation as to how this standard will be used to model with mathematics. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| G-GPE.3 (+) Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant. | . | . | . | G.GPE.A.3+ Derive the equations of ellipses and hyperbolas given the foci and use the equations to model real life situations. ★ | NYS added a modeling indicator. It will be important to provide an explanation as to how this standard will be used to model with mathematics. |
| **Use coordinates to prove simple geometric theorems algebraically** | . | . | **B. Use coordinates to prove simple geometric theorems algebraically.** | | |
| G-GPE.4. Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point* | . | . | G.GPE.B.4. On the coordinate plane algebraically prove and apply with fluency geometric theorems and properties. | . | NYS added "and apply" and a fluency requirement. The CCSS examples were used to create separate sub standards. |
| | . | . | G.GPE.B.4a. Given points and/or characteristics, prove or disprove a polygon is a specified quadrilateral or triangle based on its properties. | . | NYS used the CCSS examples to create this separate standard. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| *(0, 2).* | . | . | G.GPE.B.4b. Given a point that lies on a circle centered at the origin, prove or disprove that a specified point lies on the same circle. Note: coordinates of points could be given in radical form. | . | NYS used the CCSS examples to create this separate standard, including a note to explain the scope of the requirement. |
| G-GPE.5. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point). | . | . | G.GPE.B.5. On the coordinate plane:<br>i) explore the proof for the relationship between slopes of parallel and perpendicular lines;<br>ii) fluently determine if lines are parallel, perpendicular, or neither, based on their slopes; and<br>iii) fluently apply properties of parallel and perpendicular lines to solve geometric problems. | . | NYS changed "prove" to "explore the proof " and added fluency to the requirement. Parts ii and iii are connected to the CCSS examples. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| G-GPE.6. Find the point on a directed line segment between two given points that partitions the segment in a given ratio. | . | . | G.GPE.B.6. Find the point on a directed line segment between two given points that partitions the segment in a given ratio. | . | . |
| G-GPE.7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.* | . | . | G.GPE.B.7. Use coordinates with fluency to compute perimeters of polygons and areas of triangles and rectangles.★ *Note: Values may be given or computed in radical form.* | . | NYS added fluency and a modeling indicator and removed the CCSS example. The added note provides an explanation of the scope of the requirement. |
| **Geometric Measurement and Dimension** | | . | . | . | . |
| **Explain volume formulas and use them to solve problems** | . | . | **A. Explain volume formulas and use them to solve problems.** | | |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| G-GMD.1. Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments. | . | . | G.GMD.A.1. Explore informal arguments for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. | . | NYS changed "give" to "explore." |
| G-GMD.2. (+) Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures. | . | . | . | . | NYS stated that this concept belongs in integral calculus. EngageNY Precalculus materials for Lesson 9 of Module 3 clearly illustrate this is not the case. |
| G-GMD.3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.* | . | . | G.GMD.A.3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. ★ | . | . |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| **Visualize relationships between two-dimensional and three- dimensional objects** | . | . | **B. Visualize relationships between two-dimensional and three-dimensional objects.** | | |
| G-GMD.4. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. | . | . | G.GMD.B.4. Identify the shapes of plane-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. *Note: Plane sections are not limited to being parallel or perpendicular to the base.* | . | NYS used slightly different vocabulary and added a note to explain the scope of the requirement.<br><br>NOTE: This will be the first time NY students see non-parallel or perpendicular cross-sections. In Gr 7 (7.G.A.3), they were specifically excluded. |
| **Modeling with Geometry*** | | . | **Modeling with Geometry (G-MG) ★** | . | The modeling indicator on this cluster would also apply to the standards below. |
| **Apply geometric concepts in modeling situations** | . | . | **A. Apply geometric concepts in modeling situations.** | | |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| G-MG.1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).* | . | . | G.MG.A.1. Use geometric shapes, their measures, and their properties to describe objects. | . | NYS removed the CCSS examples. |
| G-MG.2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).* | . | . | G.MG.A.2. Apply concepts of density based on area and volume in modeling situations using geometric figures. | . | NYS removed the CCSS examples. Clarity: How would one "apply concepts…using geometric figures?" |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| G-MG.3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).* | . | . | G.MG.A.3. Apply geometric methods to solve design problems. *Note: Applications could include designing an object or structure to satisfy physical constraints or minimize cost, or to investigate applications of classical geometric problems like the Golden Ratio.* | . | NYS changed the examples. Clarity: The "Golden Ratio" is not a "problem." The intent here is not clear. |
| **STATISTICS AND PROBABILITY** | **Statistics and Probability** | **Statistics and Probability ★** | . | . | NYS added a modeling indicator to this domain title for Alg II, inferring that all standards below are to be taught in a modeling context. An explanation of how modeling should be approached in this domain is needed, especially since the same treatment was not required in Alg I. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| **Interpreting Categorical and Quantitative Data** | **Interpreting categorical and quantitative data (S-ID)** | **Interpreting categorical and quantitative data (S-ID) ★** | . | . | NYS added a modeling indicator to the cluster title, which would apply to all standards below. The modeling connection should be made more clear since it is not required in Alg I. |
| **Summarize, represent, and interpret data on a single count or measurement variable** | **A. Summarize, represent, and interpret data on a single count or measurement variable.** | . | . | | . |
| S-ID.1. Represent data with plots on the real number line (dot plots, histograms, and box plots). | S-ID.A.1. Represent data with plots on the real number line (dot plots, histograms, and box plots). | . | . | . | . |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| S-ID.2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. | S-ID.A.2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (inter-quartile range, standard deviation) of two or more different data sets. | . | . | . | . |
| S-ID.3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). | S-ID.A.3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). | . | . | . | . |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| S-ID.4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. | . | S-ID.A.4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. | . | . | Since the header for this domain in Alg II includes a modeling indicator, it is assumed that this standard would also require modeling. The connection to mathematical modeling should be made more clear. |
| **Summarize, represent, and interpret data on two categorical and quantitative variables** | **B. Summarize, represent, and interpret data on two categorical and quantitative variables.** | **B. Summarize, represent, and interpret data on two categorical and quantitative variables.** | | | NYS added a modeling indicator to the domain title for Alg II, which would apply to all Alg II standards below. The modeling connection should be made more clear since it is not required in Alg I. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| S-ID.5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. | S-ID.B.5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. | . | . | | . |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| S-ID.6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. | S-ID.B.6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. | S-ID.B.6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. | . | . | There is no progression for this requirement to the functions addressed in Alg II. NOTE: Since 6b and 6c were removed, there are no gradations of this requirement included in the NYS. It is possible that those cold be used to explain the progression for this stem standard.<br><br>Since the header for this domain in Alg II includes a modeling indicator, it is assumed that this standard would also require modeling. The connection to mathematical modeling should be made more clear. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| S-ID.6a Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.* | S-ID.B.6a. Fit a function to real-world data; use functions fitted to data to solve problems in the context of the data. Use the given functions or choose a function suggested by the context. Algebra I emphasis is on linear, quadratic, and exponential models and includes the regression capabilities of the calculator. | S-ID.B.6a. Fit a function to real-world data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. | . | . | The NYS Alg I standard matched all the requirements of the CCSS and added the requirement to use a calculator to find regression equations. [Note: the addition of "the" gives the appearance that specific functions are to be provided. It is not clear why the article was added.]<br><br>It is not clear in the NYS how the Alg II version of this standard will show progression from Alg I. Also, is it expected that Alg II students will not be using a calculator?<br><br>Since the header for this domain in Alg II includes a modeling indicator, it is assumed that this standard would also require modeling. The connection to mathematical modeling should be made more clear. |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| S-ID.6b Informally assess the fit of a function by plotting and analyzing residuals. | . | . | . | . | In the notes, NYS suggests that this standard belongs in a statistics class. This requirement might be identified for Alg II as a way of differentiating between Alg I and II. |
| S-ID.6c Fit a linear function for a scatter plot that suggests a linear association. | . | . | . | . | According to the notes, NYC intends that this is contained in S-ID.B.6 and S-ID.C.8. This seems reasonable. |
| **Interpret linear models** | **C. Interpret linear models.** | | | | |
| S-ID.7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. | S-ID.C.7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. | . | . | | . |
| S-ID.8. Compute (using technology) and interpret the correlation coefficient of a linear fit. | S-ID.C.8. Calculate (using technology) and interpret the correlation coefficient of a linear fit. | . | . | . | . |

| CCSS/NY HS | NYS ALG I | NYS ALG II | NYS GEO | Plus | Notes and Comments |
|---|---|---|---|---|---|
| S-ID.9. Distinguish between correlation and causation. | S-ID.C.9. Distinguish between correlation and causation. | S-IC.B.6b. Use the language of statistics to critique claims from informational texts. For example, cause and effect vs correlation, bias, measures of center and spread. | . | . | In NYS Alg II, this CCSS was deleted. However the additional substandard for S-ID.B.6 is related. |
| **Making Inferences and Justifying Conclusions** | | **Making Inferences and Justifying Conclusions (S-IC) ★** | . | . | NYS added a modeling indicator to the cluster title, which would apply to all standards below. |
| **Understand and evaluate random processes underlying statistical experiments** | . | **A. Understand and evaluate random processes underlying statistical experiments.** | | | Clarity: Will this cluster title be treated as a standard by teachers? If not likely, this should not be used to replace S-IC.1. |

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| S-IC.1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population. | . | . | . | . | NYS removed this standard stating it is redundant with the cluster title. However, all standards *should* have redundancy with the cluster title. Standards are what are measured, the clusters inform the standards. How will this understanding be addressed if it is not included in the standards? [Note: the concept of randomness was removed elsewhere, as well.] |

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| S-IC.2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?* | . | S-IC.A.2. Determine if a statistic (i.e. sample proportion, difference of sample proportions, sample mean, and difference of sample means) is likely to occur based on a given simulation. For the purposes of this course, if the statistic falls within two standard deviations of the mean (95% interval centered on the mean), then the statistic is considered likely (plausible, usual). | . | . | NYS changed the wording of this CCSS but with similar expectations. In addition to using simulations, NYS clarifies the focus by adding, "For the purposes of this course, if the statistic falls within two standard deviations of the mean (95% interval centered on the mean), then the statistic is considered likely (plausible, usual)."<br><br>Since the title for this cluster in Alg II includes a modeling indicator, it is assumed that this standard would also require modeling. The connection to mathematical modeling should be made more clear. |
| **Make inferences and justify conclusions from sample surveys, experiments, and observational studies** | . | **B. Make inferences and justify conclusions from sample surveys, experiments, and observational studies.** | | | |

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| S-IC.3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. | . | S-IC.B.3. Recognize the purposes of and differences among surveys, experiments, and observational studies. Explain how randomization relates to each. | . | . | Since the header for this cluster in Alg II includes a modeling indicator, it is assumed that this standard would also require modeling. The connection to mathematical modeling should be made more clear. |
| S-IC.4. Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. | . | S-IC.B.4. Given a simulation model based on a sample, construct the 95% interval centered on the mean (mean +/- two standard deviations) and determine if a suggested parameter is plausible. | . | . | NYS changed the wording of this standard to improve clarity.<br><br>Since the header for this cluster in Alg II includes a modeling indicator, it is assumed that this standard would also require modeling. The connection to mathematical modeling should be made more clear. |

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| S-IC.5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. | . | . | . | . | NYS stated in the notes that this concept was incorporated into S-IC.A.2. However, randomization is not clearly addressed there or elsewhere. This deletion may warrant a second look. |
| S-IC.6. Evaluate reports based on data. | . | S-IC.B.6a. Use the language of statistics to draw conclusions from numerical summaries. | . | . | NYS provides more detail about both the types of reports and the types of evaluation, in addition to specifically calling out the use of the language of statistics. |
| | | S-IC.B.6b. Use the language of statistics to critique claims from informational texts. For example, cause and effect vs correlation, bias, measures of center and spread. | . | | This NYS is also aligned partially to S-ID.9. |

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| **Conditional Probability and the Rules of Probability** | . | **Conditional Probability and the Rules of Probability (S-CP)★** | | | NYS added a modeling indicator to the cluster title, which would apply to all standards below. The modeling connection should be made more clear. |
| **Understand independence and conditional probability and use them to interpret data** | . | . | . | | . |
| S.CP.1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not"). | . | S-CP.A.1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not"). | . | . | Since the header for this cluster in Alg II includes a modeling indicator, it is assumed that this standard would also require modeling. The connection to mathematical modeling should be made more clear. |

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| S-CP.2. Understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their probabilities, and use this characterization to determine if they are independent. | . | S-CP.A.2.Within a given context, determine if two events A and B are independent by showing:<br>i) the probability of A and B occurring together is the product of their probabilities (P(A and B)=P(A) x P(B));<br>ii) the probability of A given B is same as the probability of A (P(A\|B)=P(A)); or<br>iii) the probability of B given A is the same as the probability of B (P(B\|A)=P(B)). | . | . | NYS removed the conceptual understanding part of the CCSS and added parts ii and iii, which overlap to align with the changes in S-CP.A.3.<br><br>Since the header for this cluster in Alg II includes a modeling indicator, it is assumed that this standard would also require modeling. The connection to mathematical modeling should be made more clear. |

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| S-CP.3. Understand the conditional probability of *A* given *B* as *P* (*A* and *B* )/*P* (*B* ), and interpret independence of *A* and *B* as saying that the conditional probability of *A* given *B* is the same as the probability of *A* , and the conditional probability of *B* given *A* is the same as the probability of *B* . | . | S-CP.A.3. Calculate and determine the conditional probability of A given B in the context of a model. | . | . | NYS changed "understand" to "calculate and determine" and moved the independence to S-CP.A.2. It is unclear, though, what is meant by "in the context of a model" - is this about a model in a context or is it about a task in a real-life context?<br><br>Since the header for this cluster in Alg II includes a modeling indicator, it is assumed that this standard would also require modeling. The connection to mathematical modeling should be made more clear. |

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| S-CP.4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.* | . | S-CP.A.4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and calculate conditional probabilities. | . | . | NYS removed the CCSS examples.<br><br>Since the header for this cluster in Alg II includes a modeling indicator, it is assumed that this standard would also require modeling. The connection to mathematical modeling should be made more clear. |

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| S-CP.5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.* | . | . | . | . | NYS stated in the notes that this standard was "combined with other standards in the cluster for clarity" but the accommodation is not clear. |
| **Use the rules of probability to compute probabilities of compound events in a uniform probability model** | . | **B. Use the rules of probability to compute probabilities of compound events in a uniform probability model.** | | | |

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| S-CP.6. Find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A*, and interpret the answer in terms of the model. | . | . | . | | NYS stated in the notes that this standard was "combined with other standards in the cluster for clarity" but the accommodation is not clear. |
| S-CP.7. Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model. | . | S-CP.B.7. Apply the Addition Rule, P (A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model. | . | . | Since the header for this cluster in Alg II includes a modeling indicator, it is assumed that this standard would also require modeling. The connection to mathematical modeling should be made more clear. |
| S-CP.8. (+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B\|A) = P(B)P(A\|B), and interpret the answer in terms of the model. | . | . | . | . | NYS stated that this concept was merged with S.CP.A.3 in Alg II, though the connection will likely need to be clearer. |

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| S-CP.9. (+) Use permutations and combinations to compute probabilities of compound events and solve problems. | . | . | . | S-CP.B.9+ Solve problems using permutations and combinations to compute probabilities of compound events. | NYS change the wording slightly with no change to meaning or rigor. |
| **Using Probability to Make Decisions** | | . | . | . | . |
| **Calculate expected values and use them to solve problems** | . | . | . | **A. Calculate expected values and use them to solve problems.** | |
| S-MD.1. (+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions. | . | . | . | S-MD.A.1+ Graph a probability distribution for a discrete random variable based on either empirical or theoretical probabilities. | NYS removed the requirement to define the random variable and the explanation for displays. They combined empirical and theoretical probability, embedding the expectations in S-MD.3 and S-MD.4. |

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| S-MD.2. (+) Calculate the expected value of a random variable; interpret it as the mean of the probability distribution. | . | . | . | S-MD.A.2+ Calculate and interpret the expected value of a random variable. | NYS removed the "interpret it as the mean of the probability distribution" requirement. |

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| S-MD.3. (+) Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. *For example, find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.* | . | . | . | . | NYS stated that this concept "is addressed in S.MD.A.1 (+) and S.MD.A2 (+)." |

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| S-MD.4. (+) Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. *For example, find a current data distribution on the number of TV sets per household in the United States, and calculate the expected number of sets per household. How many TV sets would you expect to find in 100 randomly selected households?* | . | . | . | . | NYS stated that this concept "is addressed in S.MD.A.1 (+) and S.MD.A2 (+)." |
| **Use probability to evaluate outcomes of decisions** | . | . | . | **B. Use probability to evaluate outcomes of decisions.** | |

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| S-MD.5. (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. | . | . | . | S-MD.B.5+ Use expected values from probability distributions to evaluate and compare the outcomes of decisions. | NYS reworded the standard and removed pay off values. |
| S-MD.5a (+) Find the expected payoff for a game of chance. *For example, find the expected winnings from a state lottery ticket or a game at a fast- food restaurant.* | . | . | . | . | NYS stated that this concept "is already addressed in S.MD.B.5+." |

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| S-MD.5b (+) Evaluate and compare strategies on the basis of expected values. *For example, compare a high-deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.* | . | . | . | . | NYS stated that this concept "is already addressed S.MD.B.5+." |
| S-MD.6. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator). | . | . | . | S-MD.B.6+ Use probabilities to make fair decisions. Such as, determine if a decision making strategy produces equally probable outcomes. | NYS changed the CCSS examples. |

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| S-MD.7. (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game). | . | . | . | S-MD.B.7+ Using probability concepts, evaluate decisions and strategies. Such as, make decisions based on the most favorable outcome. | NYS changed the CCSS examples. Clarity: This example may need more explanation to be understood and to ensure consistent application of this standard. |