Mathematics

Grade 7

Maryland College and Career Ready

Curriculum Framework, 2017

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Introduction

These Standards define what students should understand and be able to do in their study of mathematics. Asking a student to understand something means asking a teacher to assess whether the student has understood it. But what does mathematical understanding look like? One hallmark of mathematical understanding is the ability to justify, in a way appropriate to the student's mathematical maturity, *why* a particular mathematical statement is true or where a mathematical rule comes from. There is a world of difference between a student who can summon a mnemonic device to expand a product such as $(a+b)(x+y)$ and a student who can explain where the mnemonic comes from. The student who can explain the rule understands the mathematics, and may have a better chance to succeed at a less familiar task such as expanding $(a+b+c)(x+y)$. Mathematical understanding and procedural skill are equally important, and both are assessable using mathematical tasks of sufficient richness.

The Standards set grade-specific standards but do not define the intervention methods or materials necessary to support students who are well below or well above grade-level expectations. It is also beyond the scope of the Standards to define the full range of supports appropriate for English language learners and for students with special needs. At the same time, all students must have the opportunity to learn and meet the same high standards if they are to access the knowledge and skills necessary in their post-school lives. The Standards should be read as allowing for the widest possible range of students to participate fully from the outset, along with appropriate accommodations to ensure maximum participation of students with special education needs. For example, for students with disabilities reading should allow for use of Braille, screen reader technology, or other assistive devices, while writing should include the use of a scribe, computer, or speech-to-text technology. In a similar vein, speaking and listening should be interpreted broadly to include sign language. No set of grade-specific standards can fully reflect the great variety in abilities, needs, learning rates, and achievement levels of

students in any given classroom. However, the Standards do provide clear signposts along the way to the goal of college and career readiness for all students.

How to Read the Maryland Common Core Curriculum Framework for Grade 7

This framework document provides an overview of the standards that are grouped together to form the domains of study for Grade 7 mathematics. The standards within each domain are grouped by clusters and are in the same order as they appear in the Common Core State Standards for Mathematics. This document is not intended to convey the exact order in which the standards within a domain will be taught nor the length of time to devote to the study of the unit.

The framework contains the following:

- **Domains** are intended to convey coherent groupings of content.
- **Clusters** are groups of related standards.
- **Standards** define what students should understand and be able to do.
- **Essential Skills and Knowledge** Statements provide language to help teachers develop common understandings and valuable insights into what a student must know and be able to do to demonstrate proficiency with each standard. Maryland mathematics educators thoroughly reviewed the standards and, as needed, provided statements to help teachers comprehend the full intent of each standard. The wording of some standards is so clear, however, that only partial support or no additional support seems necessary.
- **Framework Vocabulary Words** provide definitions of key mathematics vocabulary words found in the document

Standards for Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council’s report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one’s own efficacy).

1. Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

2. Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

3. Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

4. Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

5. Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website,

and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

6. Attend to Precision

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

7. Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well-remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers *x* and *y*.

8. Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y – 2)/(x – 1)$ equals 3. Noticing the regularity in the way terms cancel when expanding $(x – 1)(x + 1)$, $(x-1)(x^2 + x + 1)$ and $(x-1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the Process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Connecting the Standards for Mathematical Practice to the Standards for Mathematical Content

The Standards for Mathematical Practice describe ways in which developing student practitioners of the discipline of mathematics increasingly ought to engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle and high school years. Designers of curricula, assessments, and professional development should all attend to the need to connect the mathematical practices to mathematical content in mathematics instruction. The Standards for Mathematical Content are a balanced combination of procedure and understanding. Expectations that begin with the word "understand" are often especially good opportunities to connect the practices to the content. Students who lack understanding of a topic may rely on procedures too heavily. Without a flexible base from which to work, they may be less likely to consider analogous problems, represent problems coherently, justify conclusions, apply the mathematics to practical situations, use technology mindfully to work with the mathematics, explain the mathematics accurately to other students, step back for an overview, or deviate from a known procedure to find a shortcut. In short, a lack of understanding effectively prevents a student from engaging in the mathematical practices. In this respect, those content standards which set an expectation of understanding are potential "points of intersection" between the Standards for Mathematical Content and the Standards for Mathematical Practice. These points of intersection are intended to be weighted toward central and generative concepts in the school mathematics curriculum that most merit the time, resources, innovative energies, and focus necessary to qualitatively improve the curriculum, instruction, assessment, professional development, and student achievement in mathematics.

Codes for Common Core State Standards: Mathematics Grades K – 12

Elementary Grades

Domain Code	Domain Name	Applicable Grades
CC	Counting & Cardinality	K
EE	Expressions & Equations	6, 7, 8
F	Functions	8
G	Geometry	K, 1, 2, 3, 4, 5, 6, 7, 8
MD	Measurement & Data	K, 1, 2, 3, 4, 5
NBT	Number & Operations (Base Ten)	K, 1, 2, 3, 4, 5
NF	Number & Operations (Fractions)	3, 4, 5
NS	Number System	6, 7, 8
OA	Operations & Algebraic Thinking	K, 1, 2, 3, 4, 5
RP	Ratios & Proportional Relationship	6, 7
SP	Statistics & Probability	6, 7, 8

High School

Conceptual Category: Number & Quantity (N)

Domain Code	Domain Name	Applicable Grades
N-CN	Complex Number System	Not determined
N-Q	Quantities	Not determined
N-RN	Real Number System	8–12
N-VM	Vector & Matrix Quantities	Not determined

Conceptual Category: Algebra (A)

Domain Code	Domain Name	Applicable Grades
A-APR	Arithmetic with Polynomial & Rational Expressions	8–12
A-CED	Creating Equations	8–12
A-REI	Reasoning with Equations & Inequalities	8–12
A-SSE	Seeing Structure in Expressions	8–12

Conceptual Category: Functions (F)

Domain Code	Domain Name	Applicable Grades
F-BF	Building Functions	8–12
F-IF	Interpreting Functions	8–12
F-LE	Linear, Quadratic & Exponential Models	8–12
F-TF	Trigonometric Functions	Not determined

Conceptual Category: Geometry (G)

Domain Code	Domain Name	Applicable Grades
G-C	Circles	Not determined
G-CO	Congruence	Not determined
G-GMD	Geometric Measurement & Dimension	Not determined
G-MG	Modeling with Geometry	Not determined
G-GPE	Expressing Geometric Properties with Equations	Not determined
G-SRT	Similarity, Right Triangles & Trigonometry	Not determined

Conceptual Category: Statistics & Probability (S)

Domain Code	Domain Name	Applicable Grades
S-ID	Interpreting Categorical & Quantitative Data	8–12
S-IC	Making Inferences & Justifying Conclusions	Not determined
S-CP	Conditional Probability & Rules of Probability	Not determined
S-MD	Using Probability to Make Decisions	Not determined

Domain: Ratios and Proportional Relationships (RP)

Cluster: Analyze proportional relationships and use them to solve real-world and mathematical problems.

Standard(s): 7.RP.1

Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like and or different units. *For example, if a person walks* $\frac{1}{2}$ *mile in each* $\frac{1}{4}$ *hour, compute the unit rate as the complex fraction* $\frac{\frac{1}{2}}{\frac{1}{4}}$ *miles per hour, equivalently 2 miles per hour.*

Assessment Clarifications and Emphases

- **i.** Tasks have a real-world context.
- **ii.** Tasks do not assess unit conversions.

Essential Skills and Knowledge

- Ability to describe and identify complex fractions (see 7.NS.3)
- Ability to recognize the difference(s) between a unit rate and a ratio (see 7.G.1)

Standard(s): 7.RP.2

Recognize and represent proportional relationships between quantities.

- **a.** 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.

Assessment Clarifications and Emphases

- **i.** Tasks have “thin context” or no context.
- **ii.** Tasks are not limited to ratios of whole numbers.
- **iii.** Tasks use only coordinates in Quadrant I and use only a positive constant of proportionality.

Essential Skills and Knowledge

- Ability to recognize in a given proportional situation that the two "between ratios" and the two "within ratios" are the same
- Ability to distinguish between additive and multiplicative situations
- Ability to recognize that two equal ratios represent a proportion
- Ability to recognize and represent the connection between equivalent ratios, values in a table, and graphed ordered pairs (see 7.G.1)

b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams and verbal descriptions of proportional relationships.

Assessment Clarifications and Emphases

i. Tasks may or may not have a context.
ii. Tasks sample equally across the listed representations (graphs, equations, diagrams, and verbal descriptions).
iii. Tasks use only coordinates in Quadrant I and use only a positive constant of proportionality.

Essential Skills and Knowledge

- Ability to express unit rates using a variety of representations, given a contextual situation

c. Represent proportional relationships by equations. *For example, if total cost t is proportional to the number of n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as* $t = pn$.

Assessment Clarifications and Emphases

i. Tasks have a context.
ii. Tasks use only coordinates in Quadrant I and use only a positive constant of proportionality.

Essential Skills and Knowledge

- Ability to recognize that multiplicative relationships are proportional

d. 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.

Assessment Clarifications and Emphases

i. Tasks require students to interpret a point (x, y) on the graph of a proportional relationship in terms of the situation. For the explain aspect of 7.RP.2d, see 7.C.6.1.

ii. Tasks use only coordinates in Quadrant I and use only a positive constant of proportionality

Essential Skills and Knowledge

- Ability to identify that a proportional relationship intersects $(0, 0)$
- Ability to determine other points using $(1, r)$

Standard: 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.

Essential Skills and Knowledge

- Ability to build on prior experience with equivalent fractions to solve multi-step problems with ratio and percent (see 6.RP.3c)
- Ability to relate “between” ratios and “within” ratios to the cross-product and factor of change algorithms

Domain: The Number System (NS)

Cluster: Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

Standard(s): 7.NS.1

Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers, and represent addition and subtraction on a horizontal or vertical number line diagram.

a. 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.*

Essential Skills and Knowledge

- Ability to build on prior experience with positive and negative rational numbers (see 6.NS.5)
- Ability to identify additive inverses using rational numbers
- Knowledge of positive or negative values for fractions and decimals

b. 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.

Assessment Clarifications and Emphases

i. Tasks do not have a context.
ii. Tasks are not limited to integers.
iii. Tasks involve a number line.
iv. Tasks do not require students to show in general that a number and its opposite have a sum of 0; for this aspect of 7.NS.1b-1, see 7.C.1.1 and 7.C.2.

v. Tasks require students to produce or recognize real-world contexts that correspond to given sums of rational numbers.

vi. Tasks do not require students to show in general that a number and its opposite have a sum of 0; for this aspect of 7.NS.1b-1, see 7.C.1.1 and 7.C.2

Essential Skills and Knowledge

- Ability to build on prior experience with absolute value (see 6.NS.7)
- Knowledge of absolute value to add and subtract rational numbers using a horizontal or a vertical number line.

c. 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.

Assessment Clarifications and Emphases

i. Tasks may or may not have a context.

ii. Tasks are not limited to integers.

iii. Contextual tasks might, for example, require students to create or identify a situation described by a specific equation of the general form $p - q = p + (-q)$ such as $3 - 5 = 3 + (-5)$.

iv. Non-contextual tasks are not computation tasks but rather require students to demonstrate conceptual understanding, for example, by identifying a difference that is equivalent to a given difference. For example, given the difference $-\frac{1}{3} - \left(\frac{1}{5} + \frac{5}{8}\right)$, the student might be asked to recognize the equivalent expression $-\frac{1}{3} + -\left(\frac{1}{5} + \frac{5}{8}\right)$.

Essential Skills and Knowledge

- See the skills and knowledge that are stated in the Standard.

d. Apply properties of operations as strategies to add and subtract rational numbers.

Assessment Clarifications and Emphases

i. Tasks do not have a context.
ii. Tasks are not limited to integers.
iii. Tasks may involve sums and differences of 2 or 3 rational numbers.
iv. Tasks require students to demonstrate conceptual understanding, for example, by producing or recognizing an expression equivalent to a given sum or difference. For example, given the sum $-8.1+7.4$, the student might be asked to recognize or produce the equivalent expression $-(8.1-7.4)$.

Essential Skills and Knowledge

- Ability to identify and apply the following properties:
  - Commutative Property of Addition
  - Associative Property of Addition
  - Identity Property of Addition

Standard(s) 7.NS.2

Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational number.

a. 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.

Assessment Clarifications and Emphases

i. Tasks do not have a context.

ii. Tasks require students to demonstrate conceptual understanding, for example by providing students with a numerical expression and requiring students to produce or recognize an equivalent expression using properties of operations. For example, given the expression $(-3)(6+-4+-3)$, the student might be asked to recognize that the given expression is equivalent to $(-3)(6+-4)+(-3)(-3)$

Essential Skills and Knowledge

- Ability to identity and apply the following properties:
  - Multiplicative Inverse
  - Commutative Property of Multiplication
  - Associative Property of Multiplication
  - Identity Property of Multiplication
- Recognize that rules for multiplying signed numbers remain the same for all rational numbers

b. 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 $-\left(\frac{p}{q}\right)=\frac{-p}{q}=\frac{p}{-q}$. Interpret quotients of rational numbers by describing real-world contexts.

Assessment Clarifications and Emphases

i. Tasks do not have a context.

ii. Tasks require students to demonstrate conceptual understanding, for example, by providing students with a numerical expression and requiring students to produce or recognize an equivalent expression.

Essential Skills and Knowledge

- Ability to explore and justify the result of division by 0 (zero)
- Ability to apply and extend knowledge of addition and subtraction of integers (i.e., two color counters, arrows on a number line) to extend to multiplication and division
- Ability to use patterns and concrete models to devise a general rule for dividing integers: $-\left(\frac{p}{q}\right)=\frac{-p}{q}=\frac{p}{-q}$

c. Apply properties of operations as strategies to multiply and divide rational numbers.

Assessment Clarifications and Emphases

i. Tasks do not have a context.

ii. Tasks are not limited to integers.

iii. Tasks may involve products and quotients of 2 or 3 rational numbers.

iv. Tasks require students to compute a product or quotient, or demonstrate conceptual understanding, for example, by producing or recognizing an expression equivalent to a given expression. For example, given the expression $\frac{(-8)(6)}{(-3)}$, the student might be asked to recognize or produce the equivalent expression $-\left(\frac{8}{3}\right)(-6)$.

Essential Skills and Knowledge

- Ability to identify and apply the following properties:
  - Distributive Property
  - Associative Properties
  - Commutative Properties
  - Identity Properties

d. Convert a rational number to a decimal using long division; and know that the decimal form of a rational number terminates in 0s or eventually repeats.

Essential Skills and Knowledge

- Ability to recognize that when rational numbers in fractional form are converted to decimals, they either terminate or repeat

Standard(s) 7.NS.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.)

Assessment Clarifications and Emphases

i. Tasks are one-step word problems.
ii. Tasks sample equally between addition/subtraction and multiplication/division.
iii. Tasks involve at least one negative number.
iv. Tasks are not limited to integers.

Essential Skills and Knowledge

- Ability to describe and identify complex fractions (see 7.RP.1)
- Ability to apply knowledge of Order of Operations

Domain: Expressions and Equations (EE)

CLUSTER: Use properties of operations to generate equivalent expressions.

Standard(s): 7.EE.1

Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

Assessment Clarifications and Emphases

i. Tasks are not limited to integer coefficients.

ii. Tasks may involve issues of strategy, e.g., by providing a factored expression such as $y(3+x+k)$ and a fully expanded expression $3y+xy+ky$, and requiring students to produce or identify a new expression equivalent to both (such as $y(3+x)+yk$).

Essential Skills and Knowledge

- Ability to understand linear expression terminology: sum, difference, term, product, factor, quotient, coefficient
- Ability to factor by using division to express a linear expression by its factors; i.e., $2x-6=2(x-3)$.
- Ability to expand by using multiplication to rewrite the factors in a linear expression as a product; i.e., $5(x+12)=5x+60$.

Standard(s): 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."*

Essential Skills and Knowledge

- Ability to utilize Properties of Operations in order to rewrite expressions in different forms
- Ability to develop understanding of equivalent forms of numbers, their various uses and relationships, and how they apply to a problem

Cluster: Solve real-life mathematical problems using numerical and algebraic expressions and equations.

Standard(s): 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* $\frac{1}{10}$ *of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar* $9\frac{3}{4}$ *inches long in the center of a door that is* $27\frac{1}{2}$ *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.*

Essential Skills and Knowledge

- See the skills and knowledge that are stated in the Standard.

Standard(s): 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.

a. 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 54cm. Its length is 6cm. What is its width?*

Assessment Clarifications and Emphases

i. Each task requires students to solve two equations (one of each of the given two forms). Only the answer is required.

ii. Comparison of an algebraic solution to an arithmetic solution is not assessed here.

Essential Skills and Knowledge

- Ability to differentiate between an algebraic solution and an arithmetic solution

b. 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.*

Assessment Clarifications and Emphases

i. Tasks may involve $<$, $>$, $\leq$, or $\geq$.

Essential Skills and Knowledge

- Ability to develop correct usage of all four inequality symbols and related terminology (*at least*, *no more than*, etc.)
- Ability to solve inequalities to determine the solution set

Domain: Geometry (G)

Cluster: Draw, construct, and describe geometrical figures and describe the relationships between them.

Standard(s): 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.

Assessment Clarifications and Emphases

i. Tasks may or may not have context.

Essential Skills and Knowledge

- Ability to describe and identify ratios and proportions (see 7.RP.1 and 7.RP.2)
- Ability to reproduce scale drawing at a different scale

Standard(s): 7.G.2

Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing (drawing?) triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

Assessment Clarifications and Emphases

ii. Tasks do not have a context.

iii. Most of tasks should focus on the drawing component of this evidence statement.

Essential Skills and Knowledge

- See the skills and knowledge that are stated in the Standard.

Standard(s) 7.G.3

Describe the two-dimensional figures resulting from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

Assessment Clarifications and Emphases

i. Tasks have "thin context" or no context.

Essential Skills and Knowledge

- Ability to build on prior knowledge with 2-dimensional figures and 3-dimensional figures
- Ability to differentiate between the characteristics of right rectangular prisms and right rectangular pyramids
- Ability to compare the attributes of right rectangular prisms and right rectangular pyramids

Cluster: Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

Standard(s): 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.

Assessment Clarifications and Emphases

i. Tasks may or may not have context.

ii. Tasks may require answers to be written in terms of pi (π).

iii. Tasks require students to identify or produce a logical conclusion about the relationship between the circumference and the area of a circle.

Essential Skills and Knowledge

- Ability to identify and apply the vocabulary for a circle – radius, diameter, chord, circumference, center, $pi(\pi) \approx 3.14159$ and $\frac{22}{7}$
- Ability to use a near-parallelogram to discover the formula for area of a circle

Standard(s): 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. (SC 7)

Assessment Clarifications and Emphases

i. Tasks may or may not have context.

ii. Tasks involving writing or solving an equation should not go beyond the equation types described in 7.EE.4a. [$px + q = r$ and $p(x + q) = r$ where p, q, and r are specific rational numbers.]

Essential Skills and Knowledge

- Ability to explore the relationship between the angles of intersecting lines and figures

Standards 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.

Assessment Clarifications and Emphases

i. Tasks may or may not have context.

Essential Skills and Knowledge

- See the skills and knowledge that are stated in the Standard.

Domain: Statistics and Probability (SP)

Cluster: Use random sampling to draw inferences about a population.

Standard(s):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.

Essential Skills and Knowledge

- Ability to describe and identify population, sample of a population, random sampling, validity, reliability, invalid, inferences

Standard(s): 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.*

Essential Skills and Knowledge

- See the skills and knowledge that are stated in the Standard

Cluster: Draw informal comparative inferences about two populations.

Standard(s): 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, 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.*

Assessment Clarifications and Emphases

i. Tasks may use mean absolute deviation, range, or interquartile range as a measure of variability.

Essential Skills and Knowledge

- Ability to describe and identify deviation, standard deviation, absolute deviation, measures of central tendency, measures of variability
- Ability to build on prior experience with dot plots to compare/contrast data displayed on two dot plots (see 6.SP.4) and to make inferences from the data

Standard(s): 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 words in a chapter of a seventh-grade science book are generally longer than words in a chapter of a fourth-grade science book.*

Essential Skills and Knowledge

- Ability to determine which measure of central tendency is most appropriate for a given situation
- Ability to use statistical findings to draw inferences about populations

Cluster: Investigate chance processes and develop, use, and evaluate probability models.

Standard(s): 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 $\frac{1}{2}$ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

Assessment Clarifications and Emphases

i. Tasks may involve probabilities that are certain (1) or impossible (0).

Essential Skills and Knowledge

- Ability to devise models where outcomes are equally likely versus not equally likely

Standard(s):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.* (SC 7)

Assessment Clarifications and Emphases

i. Tasks require the student to make a prediction based on long-run relative frequency in data from a chance process.

Essential Skills and Knowledge

- See the skills and knowledge that are stated in the Standard.

Standard(s) 7.SP.7

Develop a probability model and use it to find probabilities of events; compare probabilities from a model to observed frequencies; and if the agreement is not good, explain possible sources of the discrepancy.

a. 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.*

Assessment Clarifications and Emphases

i. Simple events only.

Essential Skills and Knowledge

- See the skills and knowledge that are stated in the Standard.

b. 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?*

Essential Skills and Knowledge

- Ability to describe and identify possibility versus probability

Standard(s): 7.SP.8

Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

a. 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. (SC 7)

Essential Skills and Knowledge

- Ability to compare simple events with compound events

b. 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. (SC 7)

Essential Skills and Knowledge

- See the skills and knowledge that are stated in the Standard.

c. 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?*

Essential Skills and Knowledge

- Ability to use models and simulate a variety of events