



# Mathematics Item Specifications

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GRADE 7

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## Introduction

The Arizona Statewide Achievement Assessment for English Language Arts and Mathematics (AzMERIT) is Arizona's statewide achievement test. AzMERIT assesses the Arizona English Language Arts Standards and Arizona Mathematics Standards adopted by the Arizona State Board of Education in December 2016. AzMERIT will inform students, teachers, and parents about preparedness for college and careers upon graduating from high school. AzMERIT tests are computer-based, meaning that they can better assess students' critical thinking skills and provide them with opportunities to demonstrate a deeper understanding of the materials. Computer-based testing also allows for the use of a variety of innovative items types.

During the item-development process, all AzMERIT items are written in accordance with the Item Specifications and are reviewed and approved by a committee of Arizona educators to confirm alignment and appropriateness for inclusion in the test. AzMERIT items are generally representative of Arizona's geographic regions and culturally diverse population. Items are reviewed for the following kinds of bias: gender, racial, ethnic, linguistic, religious, geographic, and socioeconomic. Item reviews also include consideration of issues related to individuals with disabilities. Arizona community members also have an opportunity to review items for issues of potential concern to members of the community at large. Reviewers are asked to consider the variety of cultural, regional, philosophical, political, and religious backgrounds throughout Arizona, and then to determine whether the subject matter will be acceptable to Arizona students, families, and other members of Arizona communities.

This *AzMERIT Item Specifications* is a resource document that defines the content and format of the test and test items for item writers and reviewers. Each *Item Specifications* document indicates the alignment of items with the Arizona Mathematics Standards. It also serves to provide all stakeholders with information about the scope and function of assessment items. This document can also serve to assist educators to understand how assessment items are developed in alignment with the standards for English language arts and math. These item specifications for AzMERIT are intended to provide information regarding standards, item formats and response types. The descriptions of math blueprints and depth of knowledge in this document are meant to provide an overview of the test. Item specifications are meant for the purposes of assessment, not instruction. They are not intended to be tools for instruction or the basis for curricula. AzMERIT has a test blueprint that was developed by Arizona and is different from any other state or consortium test blueprint.

For the math portion of AzMERIT, all of the test questions are aligned to the mathematic content standards for these subject areas. Any item specifications that are absent for standards listed in this document may be under development. This document does not endorse the exclusion of the instruction of any grade-level content standards. The test will ask questions that check a student's conceptual understanding of math as well as their procedural skills. These items have been written to be free from bias and sensitivity, and widely vary in their degree of difficulty.

## Item Development Process

AzMERIT items go through a rigorous review before they are operational. When an item is “operational” it means it is used to determine a student’s score on the assessment. This is a description of the process every item must go through before it is operational on AzMERIT.



Sample tests are available online for the math portion of AzMERIT. For more information view the Guide to the Sample Tests at [www.azmeritportal.org](http://www.azmeritportal.org).

## Test Construction Guidelines

The construction of the AzMERIT assessment is guided by the depth and rigor of the Arizona College and Career Ready Standards. Items are created to address key components of the standards and assess a range of important skills. The AzMERIT Blueprint provides an overview of the distribution of items on the AzMERIT according to the standards. The standards for Math Practices are embedded within all AzMERIT items. Further, the AzMERIT blueprint outlines the Depth of Knowledge distribution of items.

## Blueprint

<b>Grade 7 AzMERIT Blueprint 2016 Standards</b>		
<b>Reporting Category</b>	<b>Min.</b>	<b>Max.</b>
Ratios & Proportions	19%	23%
The Number System	19%	23%
Expressions & Equations	23%	27%
Geometry and Statistics & Probability	27%	35%
<i>Geometry</i>	<i>15%</i>	<i>19%</i>
<i>Statistics and Probability</i>	<i>12%</i>	<i>16%</i>

## Depth of Knowledge (DOK)

DOK refers to the level of rigor or sophistication of the task in a given item, designed to reflect the complexity of the Arizona Mathematics Standards. Items at DOK level 1 focus on the recall of information, such as definitions, terms, and simple procedures. Items at DOK 2 require students to make decisions, solve problems, or recognize patterns; in general, they require a greater degree of engagement and cognitive processing than items at DOK 1. Items at DOK 3 feature higher-order cognitive tasks that assess students' capacities to approach abstract or complex problems.

<b>Percentage of Points by Depth of Knowledge (DOK) Level</b>			
<b>Grade 7</b>	DOK Level 1	DOK Level 2	DOK Level 3
	10% - 20%	60% - 70%	12% - 30%

For more information on DOK go to [www.azed.gov/AzMERIT](http://www.azed.gov/AzMERIT).

## Calculators

Arizona Desmos Scientific Calculator is permitted for the paper-based and computer-based assessment for Grade 7 Math.

## Item Formats

The AzMERIT Assessments are composed of item formats that include traditional multiple-choice response items and technology-enhanced response items (TEI). TEIs are computer-delivered response items that require students to interact with test content to select, construct, and/or support their responses. TEIs are better able to assess a deeper level of understanding.

Currently, there are nine types of TEIs that may appear on the Math computer based assessment for AzMERIT:

- Editing Tasks (ET)
- Editing Task Choice (ETC)
- Equation Editor (EQ)
- Graphic Response Item Display (GRID)
- Hot Text (HT)
  - Selectable Hot Text
  - Drag-and-Drop Hot Text
- Matching Item (MI)
- Multi-Select (MS)
- Open Response
- Table Item (TI)

For paper-based assessments (including those for students with an IEP or 504 plan that specifies a paper-based accommodation), TEIs will be modified so that they can be scanned and scored electronically or hand-scored.

See the table below for a description of each TEI. In addition, for examples of each response item format described, see the AzMERIT Training Tests at [www.azmeritportal.org](http://www.azmeritportal.org).

Item Format	Description
<b>Editing Task (ET)</b>	The student clicks on a highlighted word or phrase that may be incorrect, which reveals a text box. The directions in the text box direct the student to replace the highlighted word or phrase with the correct word or phrase. For paper-based assessments, this item type may be replaced with another item type that assesses the same standard and can be scanned and scored electronically.
<b>Editing Task Choice (ETC)</b>	The student clicks a highlighted word or phrase, which reveals a drop-down menu containing options for correcting an error as well as the highlighted word or phrase as it is shown in the sentence to indicate that no correction is needed. The student then selects the correct word or phrase from the drop-down menu. For paper-based assessments, the item is modified so that it can be scanned and scored electronically. The student fills in a circle to indicate the correct word or phrase.

Item Format	Description
<p><b>Equation Editor (EQ)</b></p>	<p>The student is presented with a toolbar that includes a variety of mathematical symbols that can be used to create a response. Responses may be in the form of a number, variable, expression, or equation, as appropriate to the test item. For paper-based assessments, this item type may be replaced with a modified version of the item that can be scanned and scored electronically or replaced with another item type that assesses the same standard and can be scanned and scored electronically.</p>
<p><b>Graphic Response Item Display (GRID)</b></p>	<p>The student selects numbers, words, phrases, or images and uses the drag-and-drop feature to place them into a graphic. This item type may also require the student to use the point, line, or arrow tools to create a response on a graph. For paper-based assessments, this item type may be replaced with another item type that assesses the same standard and can be scanned and scored electronically.</p>
<p><b>Hot Text (HT)</b></p>	<p><b>Selectable Hot Text</b> - Excerpted sentences from the text are presented in this item type. When the student hovers over certain words, phrases, or sentences, the options highlight. This indicates that the text is selectable (“hot”). The student can then click on an option to select it. For paper-based assessments, a “selectable” hot text item is modified so that it can be scanned and scored electronically. In this version, the student fills in a circle to indicate a selection.</p> <p><b>Drag-and-Drop Hot Text</b> - Certain numbers, words, phrases, or sentences may be designated “draggable” in this item type. When the student hovers over these areas, the text highlights. The student can then click on the option, hold down the mouse button, and drag it to a graphic or other format. For paper-based assessments, drag-and-drop hot text items will be replaced with another item type that assesses the same standard and can be scanned and scored electronically.</p>
<p><b>Matching Item (MI)</b></p>	<p>The student checks a box to indicate if information from a column header matches information from a row. For paper-based assessments, this item type may be replaced with another item type that assesses the same standard and can be scanned and scored electronically.</p>
<p><b>Multi-Select (MS)</b></p>	<p>The student is directed to select all of the correct answers from among a number of options. These items are different from multiple-choice items, which allow the student to select only one correct answer. These items appear in the online and paper-based assessments.</p>
<p><b>Open Response</b></p>	<p>The student uses the keyboard to enter a response into a text field. These items can usually be answered in a sentence or two. For paper-based assessments, this item type may be replaced with another item type that assesses the same standard and can be scanned and scored electronically.</p>



Item Format	Description
<b>Table Item (TI)</b>	The student types numeric values into a given table. The student may complete the entire table or portions of the table depending on what is being asked. For paper-based assessments, this item type may be replaced with another item type that assesses the same standard and can be scanned and scored electronically.

## Arizona Math Standards Grade 7

Ratio and Proportion (RP)		
<b>7.RP.A</b> Analyze proportional relationships and use them to solve mathematical problems and problems in real-world context.	<b>7.RP.A.1</b>	Compute unit rates associated with ratios involving both simple and complex fractions, including ratios of quantities measured in like or different units.
	<b>7.RP.A.2</b>	Recognize and represent proportional relationships between quantities. <ol style="list-style-type: none"> <li>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).</li> <li>Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.</li> <li>Represent proportional relationships by equations. <i>For example, if total cost <math>t</math> is proportional to the number <math>n</math> of items purchased at a constant price <math>p</math>, the relationship between the total cost and the number of items can be expressed as <math>t = pn</math>.</i></li> <li>Explain what a point <math>(x, y)</math> on the graph of a proportional relationship means in terms of the situation, with special attention to the points <math>(0, 0)</math> and <math>(1, r)</math> where <math>r</math> is the unit rate.</li> </ol>
	<b>7.RP.A.3</b>	Use proportional relationships to solve multi-step ratio and percent problems (e.g., simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).
The Number System (NS)		
<b>7.NS.A</b> Apply and extend previous understanding of operations with fractions to add, subtract, multiply, and divide rational numbers except division by zero.	<b>7.NS.A.1</b>	Add and subtract integers and other rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. <ol style="list-style-type: none"> <li>Describe situations in which opposite quantities combine to make 0.</li> <li>Understand <math>p + q</math> as the number located a distance <math> q </math> from <math>p</math>, in the positive or negative direction depending on whether <math>q</math> 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 context.</li> <li>Understand subtraction of rational numbers as adding the additive inverse, <math>p - q = p + (-q)</math>. 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 context.</li> <li>Apply properties of operations as strategies to add and subtract rational numbers.</li> </ol>

7.NS.A (cont.)	7.NS.A.2	<p>Multiply and divide integers and other rational numbers.</p> <p>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 <math>(-1)(-1) = 1</math> and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world context.</p> <p>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 <math>p</math> and <math>q</math> are integers, then <math>-(p/q) = (-p)/q = p/(-q)</math>. Interpret quotients of rational numbers by describing real-world context.</p> <p>c. Apply properties of operations as strategies to multiply and divide rational numbers.</p> <p>d. Convert a rational number to decimal form using long division; know that the decimal form of a rational number terminates in 0's or eventually repeats.</p>
	7.NS.A.3	Solve mathematical problems and problems in real-world context involving the four operations with rational numbers. Computations with rational numbers extend the rules for manipulating fractions to complex fractions where $a/b \div c/d$ when $a, b, c,$ and $d$ are all integers and $b, c,$ and $d \neq 0$ .
<b>Expressions and Equations (EE)</b>		
7.EE.A Use properties of operations to generate equivalent expressions.	7.EE.A.1	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
	7.EE.A.2	Rewrite an expression in different forms, and understand the relationship between the different forms and their meanings in a problem context. <i>For example, <math>a + 0.05a = 1.05a</math> means that "increase by 5%" is the same as "multiply by 1.05."</i>
7.EE.B Solve mathematical problems and problems in real-world context using numerical and algebraic expressions and equations.	7.EE.B.3	Solve multi-step mathematical problems and problems in real-world context posed with positive and negative rational numbers in any form. Convert between forms as appropriate and assess the reasonableness of answers. <i>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 per hour.</i>
	7.EE.B.4	<p>Use variables to represent quantities in mathematical problems and problems in real-world context, and construct simple equations and inequalities to solve problems.</p> <p>a. Solve word problems leading to equations of the form <math>px+q = r</math> and <math>p(x+q) = r</math>, where <math>p, q,</math> and <math>r</math> 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.</p> <p>b. Solve word problems leading to inequalities of the form <math>px+q &gt; r</math> or <math>px+q &lt; r</math>, where <math>p, q,</math> and <math>r</math> are rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.</p>

<b>Geometry (G)</b>		
7.G.A Draw, construct, and describe geometrical figures, and describe the relationships between them.	7.G.A.1	Solve problems involving scale drawings of geometric figures, such as computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
	7.G.A.2	Draw geometric shapes with given conditions using a variety of methods. 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.3	Describe the two-dimensional figures that result from slicing three-dimensional figures.
7.G.B Solve mathematical problems and problems in real-world context involving angle measure, area, surface area, and volume.	7.G.B.4	Understand and 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.
	7.G.B.5	Use facts about supplementary, complementary, vertical, and adjacent angles in multi-step problems to write and solve simple equations for an unknown angle in a figure.
	7.G.B.6	Solve mathematical problems and problems in a real-world context involving area of two-dimensional objects composed of triangles, quadrilaterals, and other polygons. Solve mathematical problems and problems in real-world context involving volume and surface area of three-dimensional objects composed of cubes and right prisms.
<b>Statistics and Probability (SP)</b>		
7.SP.A Use random sampling to draw inferences about a population.	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.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 gauge the variation in estimates or predictions. <i>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.</i>
7.SP.B Draw informal comparative inferences about two populations.	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. <i>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.</i>

7.SP.B (cont.)	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. <i>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.</i>
7.SP.C Investigate chance processes and develop, use and evaluate probability models.	7.SP.C.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.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. <i>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.</i>
	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.  a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. <i>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.</i>  b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. <i>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?</i>

# Grade 7 Item Specifications

## Expressions and Equations

7.EE.A.1

<b>Content Standards</b>	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.	
<b>Explanations</b>	Apply and extend previous understanding of operations with fractions to add, subtract, multiply, and divide rational numbers except division by zero.	
<b>Content Limits</b>	<p>Using negative numbers and multiple operations should be emphasized to distinguish from 6.EE.3</p> <p>Linear expressions</p> <p>Do not use the word “simplify” in items - wording for items using the EQ response mechanism must be precise in order to elicit a correct form of the expression (i.e. use “by combining all like terms” so that the given expression is not a correct answer)</p>	
<b>Context</b>	Context is allowed.	
<b>Sample Task Demands</b>		<b>Common Item Formats</b>
Students will be required to perform operations to construct equivalent expressions.		<ul style="list-style-type: none"> <li>• Equation Response</li> <li>• Multiple Choice Response</li> <li>• Multi-Select Reponse</li> </ul>

### Performance Level Descriptors

<b>Minimally Proficient</b>	<b>Partially Proficient</b>
Identify properties of operations used to add, subtract, factor, and expand linear expressions with integer coefficients.	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with integer coefficients.
<b>Proficient</b>	<b>Highly Proficient</b>
Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients and interpret the meaning in a real-world context.

7.EE.A.2

<b>Content Standards</b>	Rewrite an expression in different forms and understand the relationship between the different forms and their meanings in a problem context. <i>For example, <math>a + 0.05a = 1.05a</math> means that "increase by 5%" is the same as "multiply by 1.05."</i>	
<b>Explanations</b>	Use properties of operations to generate equivalent expressions.	
<b>Content Limits</b>	Rational numbers Linear expressions with an unknown	
<b>Context</b>	Context is required.	
<b>Sample Task Demands</b>		<b>Common Item Formats</b>
Students will be required to given an expression within a context, identify an equivalent expression that shows a feature of that context.		<ul style="list-style-type: none"> <li>• Equation Response</li> <li>• Multiple Choice Response</li> <li>• Multi-Select Reponse</li> <li>• Proposition Response</li> </ul>
Students will be required to given a context and an expression with different values than given in the context, interpret part of the expression that is not found in the context.		

**Performance Level Descriptors**

<b>Minimally Proficient</b>	<b>Partially Proficient</b>
Identify an expression in different forms.	Identify an expression in different forms and understand the relationship between the different forms and their meanings in a problem context. <i>For example, <math>a + 0.05a = 1.05a</math> means that "increase by 5%" is the same as "multiply by 1.05."</i>
<b>Proficient</b>	<b>Highly Proficient</b>
Rewrite an expression in different forms and understand the relationship between the different forms and their meanings in a problem context. <i>For example, <math>a + 0.05a = 1.05a</math> means that "increase by 5%" is the same as "multiply by 1.05."</i>	Rewrite an expression in different forms and explain the relationship between the different forms and their meanings in a problem context. <i>For example, <math>a + 0.05a = 1.05a</math> means that "increase by 5%" is the same as "multiply by 1.05."</i>

## 7.EE.B.3

<b>Content Standards</b>	Solve multi-step mathematical problems and problems in real-world context posed with positive and negative rational numbers in any form. Convert between forms as appropriate and assess the reasonableness of answers. <i>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 per hour.</i>	
<b>Explanations</b>	Estimation strategies for calculations with fractions and decimals extend from students' work with whole number operations.	
<b>Content Limits</b>	Rational numbers No variables Items involving estimation to assess reasonableness should not allow the student to respond with the exact answer.	
<b>Context</b>	Context is allowed.	
<b>Sample Task Demands</b>		<b>Common Item Formats</b>
Students will be required to solve a problem where only the information needed is given.		<ul style="list-style-type: none"> <li>Equation Response</li> <li>Multiple Choice Response</li> </ul>
Students will be required to choose which value is reasonable based on estimation.		
Students will be required to solve a problem where extra information not needed to find the solution is given.		

## Performance Level Descriptors

<b>Minimally Proficient</b>	<b>Partially Proficient</b>
Solve multi-step mathematical problems and problems in real-world context posed with positive and negative rational numbers in one form.	Solve multi-step mathematical problems and problems in real-world context posed with positive and negative rational numbers in any form. Convert between forms as appropriate.
<b>Proficient</b>	<b>Highly Proficient</b>
Solve multi-step mathematical problems and problems in real-world context posed with positive and negative rational numbers in any form. Convert between forms as appropriate and assess the reasonableness of answers. <i>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 per hour.</i>	Create problems with a real-world context given multi-step equations with positive and negative rational numbers. Convert between forms as appropriate and interpret the reasonableness of answers.

7.EE.B.4, 7.EE.B.4a, and 7.EE.B.4b

<p><b>Content Standards</b></p>	<p><b>7.EE.B.4</b> Use variables to represent quantities in mathematical problems and problems in real-world context, and construct simple equations and inequalities to solve problems.</p> <p><b>7.EE.B.4a</b> Solve word problems leading to equations of the form <math>px + q = r</math> and <math>p(x + q) = r</math>, where <math>p</math>, <math>q</math>, and <math>r</math> 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.</p> <p><b>7.EE.B.4b</b> Solve word problems leading to inequalities of the form <math>px + q &gt; r</math> or <math>px + q &lt; r</math>, where <math>p</math>, <math>q</math>, and <math>r</math> are rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.</p>	
<p><b>Explanations</b></p>	<p>Solve mathematical problems and problems in real-world context using numerical and algebraic expressions and equations.</p>	
<p><b>Content Limits</b></p>	<p>Rational numbers</p>	
<p><b>Context</b></p>	<p>Context is allowed.</p>	
<p><b>Sample Task Demands</b></p>		<p><b>Common Item Formats</b></p>
<p>Students will be required to solve an equation or inequality for an unknown value, without context. (a, b)</p>		<ul style="list-style-type: none"> <li>• Equation Response</li> <li>• Graphic Response</li> <li>• Multiple Choice Response</li> <li>• Multi-Select Response</li> </ul>
<p>Students will be required to create an equation or inequality that models the situation, and then find the solution. (a, b)</p>		
<p>Students will be required to construct an algebraic equation or inequality that models a word problem. (a, b)</p>		
<p>Students will be required to graph the solution set of an inequality. (b)</p>		
<p>Students will be required to interpret the solution set of an inequality in the context of the problem. (b)</p>		



### Performance Level Descriptors

Minimally Proficient	Partially Proficient
<p>Use variables to represent quantities in mathematical problems and problems in real-world context, and construct simple equations and inequalities to solve problems.</p> <p>a. Solve word problems leading to equations of the form <math>px + q = r</math> and <math>p(x + q) = r</math>, where <math>p</math>, <math>q</math>, and <math>r</math> are integers.</p> <p>b. Solve word problems leading to inequalities of the form <math>px + q &gt; r</math> or <math>px + q &lt; r</math>, where <math>p</math>, <math>q</math>, and <math>r</math> are integers.</p>	<p>Use variables to represent quantities in mathematical problems and problems in real-world context, and construct simple equations and inequalities to solve problems.</p> <p>a. Solve word problems leading to equations of the form <math>px + q = r</math> and <math>p(x + q) = r</math>, where <math>p</math>, <math>q</math>, and <math>r</math> are integers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.</p> <p>b. Solve word problems leading to inequalities of the form <math>px + q &gt; r</math> or <math>px + q &lt; r</math>, where <math>p</math>, <math>q</math>, and <math>r</math> are rational numbers. Graph the solution set of the inequality.</p>
Proficient	Highly Proficient
<p>Use variables to represent quantities in mathematical problems and problems in real-world context, and construct simple equations and inequalities to solve problems.</p> <p>a. Solve word problems leading to equations of the form <math>px + q = r</math> and <math>p(x + q) = r</math>, where <math>p</math>, <math>q</math>, and <math>r</math> 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.</p> <p>b. Solve word problems leading to inequalities of the form <math>px + q &gt; r</math> or <math>px + q &lt; r</math>, where <math>p</math>, <math>q</math>, and <math>r</math> are rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.</p>	<p>Use variables to represent quantities in mathematical problems and problems in real-world context, and construct simple equations and inequalities to solve problems.</p> <p>a. Solve real-world problems leading to equations of the form <math>px + q = r</math> and <math>p(x + q) = r</math>, where <math>p</math>, <math>q</math>, and <math>r</math> are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, explaining the sequence of the operations used in each approach.</p> <p>b. Solve real-world problems leading to inequalities of the form <math>px + q &gt; r</math> or <math>px + q &lt; r</math>, where <math>p</math>, <math>q</math>, and <math>r</math> are rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.</p>

## Geometry & Statistics and Probability

### 7.G.A.1

<b>Content Standards</b>	Solve problems involving scale drawings of geometric figures, such as computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.	
<b>Explanations</b>	Draw, construct and describe geometrical figures and describe the relationships between them.	
<b>Content Limits</b>	Two-dimensional polygons Keep any conversions within one system (e.g., inches to feet is okay but inches to meters is not okay).	
<b>Context</b>	Context is allowed.	
<b>Sample Task Demands</b>		<b>Common Item Formats</b>
Students will be required to find the length of a side or measure of area/perimeter given a shape and a scale factor.		<ul style="list-style-type: none"> <li>• Equation Response</li> <li>• Graphic Response</li> </ul>
Students will be required to find the scale factor given two figures where one is a scale drawing of the other.		
Students will be required to draw a scale model given a shape and a scale factor.		
Students will be required to determine a scale factor and create a scale model based on given parameters.		

### Performance Level Descriptors

Minimally Proficient	Partially Proficient
Solve problems involving scale drawings of geometric figures, by identifying the scale.	Solve problems involving scale drawings of geometric figures, with a given scale.
Proficient	Highly Proficient
Solve problems involving scale drawings of geometric figures, such as computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.	Solve complex problems involving scale drawings of geometric figures, such as computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

## 7.G.A.2

<b>Content Standards</b>	Draw geometric shapes with given conditions using a variety of methods. 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.	
<b>Explanations</b>	Conditions may involve points, line segments, angles, parallelism, congruence, angles, and perpendicularity.	
<b>Content Limits</b>	<p>Limit to two-dimensional polygons</p> <p>Include questions about the sum of two side lengths of a triangle is greater than the third side length.</p> <p>Given conditions should not focus on similarity or congruence or that sum of angles in a triangle is 180 degrees.</p> <p>Be aware of the scoring capabilities for the graphic response tool when designing these items.</p> <p>To distinguish from previous grades, conditions should include factors outside of parallel/perpendicular lines and angle measure, such as symmetry and side length.</p>	
<b>Context</b>	Context is allowed.	
<b>Sample Task Demands</b>		<b>Common Item Formats</b>
Students will be required to draw a figure based on given conditions.		<ul style="list-style-type: none"> <li>• Equation Response</li> <li>• Graphic Response</li> <li>• Multiple Choice Response</li> <li>• Multi-Select Response</li> </ul>
Students will be required to select appropriate side lengths that will determine a triangle.		

**Performance Level Descriptors**

<b>Minimally Proficient</b>	<b>Partially Proficient</b>
Classify geometric shapes with given conditions using a variety of methods. 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.	Identify geometric shapes with given conditions using a variety of methods. 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.
<b>Proficient</b>	<b>Highly Proficient</b>
Draw geometric shapes with given conditions using a variety of methods. 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.	Draw complex geometric shapes with given conditions using a variety of methods. Focus on constructing triangles from three measures of angles or sides, explaining when the conditions determine a unique triangle, more than one triangle, or no triangle.

7.G.A.3

<b>Content Standards</b>	Describe the two-dimensional figures that result from slicing three-dimensional figures.	
<b>Explanations</b>	Draw, construct, and describe geometrical figures, and describe the relationships between them.	
<b>Content Limits</b>	<p>Limited to right prisms and pyramids up to ones with a hexagonal base.</p> <p>Spheres, cones and cylinders are allowed.</p> <p>Diagonals are limited to slices which will result in shapes that have been described in previous grade level standards.</p>	
<b>Context</b>	Context is allowed.	
<b>Sample Task Demands</b>		<b>Common Item Formats</b>
Students will be required to match a two-dimensional cross section with its (possible) 3-D figure(s).		<ul style="list-style-type: none"> <li>• Graphic Response</li> <li>• Multiple Choice Response</li> <li>• Matching Item Response</li> <li>• Multi-Select Response</li> </ul>
Students will be required to draw a two-dimensional figure that represents the cross section of a 3-D figure.		

**Performance Level Descriptors**

<b>Minimally Proficient</b>	<b>Partially Proficient</b>
Identify the two-dimensional figures that result from slicing three-dimensional figures parallel or perpendicular to the base.	Identify the two-dimensional figures that result from slicing three-dimensional figures.
<b>Proficient</b>	<b>Highly Proficient</b>
Describe the two-dimensional figures that result from slicing three-dimensional figures.	Describe the two-dimensional figures that result from slicing irregular three-dimensional figures.

7.G.B.4

<b>Content Standards</b>	Understand and 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.	
<b>Explanations</b>	Solve mathematical problems and problems in real-world context involving angle measure, area, surface area, and volume.	
<b>Content Limits</b>	Circles and semi-circles.	
<b>Context</b>	Context is allowed.	
<b>Sample Task Demands</b>		<b>Common Item Formats</b>
Students will be required to find the area of a circle given diameter or radius.		<ul style="list-style-type: none"> <li>Equation Response</li> </ul>
Students will be required to find the radius or diameter of a circle given the circumference.		
Students will be required to find circumference given the radius or diameter.		
Students will be required to find the area of shapes created by the intersection of circles and other shapes.		
Students will be required to find the area given the circumference.		

**Performance Level Descriptors**

<b>Minimally Proficient</b>	<b>Partially Proficient</b>
Identify area and circumference of a circle to solve problems.	Understand and use the formulas for the area and circumference of a circle to solve problems.
<b>Proficient</b>	<b>Highly Proficient</b>
Understand and 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.	Understand and use the formulas for the area and circumference of a circle to solve problems and interpret the solution; explain the relationship between the circumference and area of a circle.

7.G.B.5

<b>Content Standards</b>	Use facts about supplementary, complementary, vertical, and adjacent angles in multi-step problems to write and solve simple equations for an unknown angle in a figure.	
<b>Explanations</b>	Angle relationships that can be explored include but are not limited to: same-side (consecutive) interior and same-side (consecutive) exterior angles are supplementary.	
<b>Content Limits</b>	Angle measurements are shown only in degrees and should not be greater than 180. Students should not be required to know the sum of the interior angles of any polygon.	
<b>Context</b>	Context is allowed.	
<b>Sample Task Demands</b>		<b>Common Item Formats</b>
Students will be required to find the unknown measure of a supplementary, complementary, vertical, or adjacent angle.		<ul style="list-style-type: none"> <li>Equation Response</li> </ul>
Students will be required to create an expression that can be used to find an unknown angle measurement.		

**Performance Level Descriptors**

<b>Minimally Proficient</b>	<b>Partially Proficient</b>
Identify supplementary, complementary, vertical, and adjacent angles in a figure.	Use facts about supplementary, complementary, vertical, and adjacent angles in multi-step problems to solve simple equations for an unknown angle in a figure.
<b>Proficient</b>	<b>Highly Proficient</b>
Use facts about supplementary, complementary, vertical, and adjacent angles in multi-step problems to write and solve simple equations for an unknown angle in a figure.	Use facts about supplementary, complementary, vertical, and adjacent angles in multi-step problems to write and solve simple equations for an unknown angle in a figure and explain the solution.

7.G.B.6

<b>Content Standards</b>	Solve mathematical problems and problems in a real-world context involving area of two-dimensional objects composed of triangles, quadrilaterals, and other polygons. Solve mathematical problems and problems in real-world context involving volume and surface area of three-dimensional objects composed of cubes and right prisms.	
<b>Explanations</b>	Students understanding of volume can be supported by focusing on the area of base times the height to calculate volume. Students understanding of surface area can be supported by focusing on the sum of the area of the faces. Nets can be used to evaluate surface area calculations.	
<b>Content Limits</b>	3D shapes include right prisms and pyramids. If the base of the right prism has more than four sides, then the area of the base should be given.	
<b>Context</b>	Context is allowed.	
<b>Sample Task Demands</b>		<b>Common Item Formats</b>
Students will be required to find the volume or surface area of an object.		<ul style="list-style-type: none"> <li>• Equation Response</li> <li>• Table Response</li> </ul>
Students will be required to find dimensions when the area, surface area, or volume is given.		
Students will be required to find the volume of a cube given the surface area. (Area of each face is limited to 100 square units)		
Students will be required to find the volume of an object composed of two objects.		

### Performance Level Descriptors

<b>Minimally Proficient</b>	<b>Partially Proficient</b>
Identify solutions mathematical problems and problems in a real-world context involving area of two-dimensional objects composed of triangles, quadrilaterals, and other polygons.	Solve mathematical problems and problems in a real-world context involving area of two-dimensional objects composed of triangles, quadrilaterals, and other polygons. Identify solutions to mathematical problems and problems in real-world context involving volume and surface area of three-dimensional objects composed of cubes and right prisms.
<b>Proficient</b>	<b>Highly Proficient</b>
Solve mathematical problems and problems in a real-world context involving area of two-dimensional objects composed of triangles, quadrilaterals, and other polygons. Solve mathematical problems and problems in real-world context involving volume and surface area of three-dimensional objects composed of cubes and right prisms.	Solve mathematical problems and problems in a real-world context involving area of two-dimensional objects composed of triangles, quadrilaterals, and other polygons. Solve mathematical problems and problems in real-world context involving volume and surface area of three-dimensional objects.



7.SP.A.1

<b>Content Standards</b>	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.	
<b>Explanations</b>	Use random sampling to draw inferences about a population.	
<b>Content Limits</b>	Use random sampling to draw inferences about a population.	
<b>Context</b>	Context is required.	
<b>Sample Task Demands</b>		<b>Common Item Formats</b>
Students will be required to identify a valid sample (random, representative, and proportional to population).		<ul style="list-style-type: none"> <li>• EBSR Response</li> <li>• Multiple Choice Response</li> <li>• Multi-Select Response</li> </ul>
Students will be required to justify a chosen sampling method.		

**Performance Level Descriptors**

<b>Minimally Proficient</b>	<b>Partially Proficient</b>
Identify statistics that 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.	Recognize 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. Recognize that random sampling tends to produce representative samples and support valid inferences.
<b>Proficient</b>	<b>Highly Proficient</b>
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.	Interpret statistics that 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.2

<b>Content Standards</b>	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. <i>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.</i>	
<b>Explanations</b>	Use random sampling to draw inferences about a population.	
<b>Content Limits</b>	Rational numbers Given dot plots should have an approximately normal distribution	
<b>Context</b>	Context is required.	
<b>Sample Task Demands</b>		<b>Common Item Formats</b>
Students will be required to draw inferences about a population based on a set of random samples.		<ul style="list-style-type: none"> <li>• Equation Response</li> <li>• Graphic Response</li> <li>• Multiple Choice Response</li> </ul>
Students will be required to explore the variation among a set of random samples.		

**Performance Level Descriptors**

<b>Minimally Proficient</b>	<b>Partially Proficient</b>
Use data from a random sample to identify inferences about a population with an unknown characteristic of interest.	Use data from a random sample to identify 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.
<b>Proficient</b>	<b>Highly Proficient</b>
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.	Interpret data from a random sample to draw inferences about multiple populations with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.

## 7.SP.B.3

<b>Content Standards</b>	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. <i>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.</i>	
<b>Explanations</b>	<p>Researching data sets provides opportunities to connect mathematics to their interests and other academic subjects. Students can utilize statistic functions in graphing calculators or spreadsheets for calculations with larger data sets or to check their computations. Students calculate mean absolute deviations in preparation for later work with standard deviations.</p> <p>Measures of center include mean, median, and mode. The measures of variability include range, mean absolute deviation, and interquartile range.</p>	
<b>Content Limits</b>	Data displays should be dot plots or box plots with approximately normal distributions	
<b>Context</b>	Context is allowed.	
<b>Sample Task Demands</b>		<b>Common Item Formats</b>
Students will be required to given sets of data displays that represent data distributions, select the set that shows the most visual overlap.		<ul style="list-style-type: none"> <li>• Equation Response</li> <li>• Graphic Response</li> <li>• Multiple Choice Response</li> <li>• Multi-Select Response</li> </ul>
Students will be required to given two data displays with different centers but the same variability, compute the difference in centers in terms of the mean absolute deviation and informally assess the degree of overlap.		

### Performance Level Descriptors

<b>Minimally Proficient</b>	<b>Partially Proficient</b>
Compare the degree of visual overlap of two numerical data distributions with similar variabilities.	Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities.
<b>Proficient</b>	<b>Highly Proficient</b>
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.	Interpret 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.

## 7.SP.B.4

<b>Content Standards</b>	Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. <i>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.</i>
<b>Explanations</b>	<p>Researching data sets provides opportunities to connect mathematics to their interests and other academic subjects. Students can utilize statistic functions in graphing calculators or spreadsheets for calculations with larger data sets or to check their computations. Students calculate mean absolute deviations in preparation for later work with standard deviations.</p> <p>Measures of center include mean, median, and mode. The measures of variability include range, mean absolute deviation, and interquartile range.</p>
<b>Content Limits</b>	Data displays should be dot plots or box plots with approximately normal distributions
<b>Context</b>	Context is allowed.
<b>Sample Task Demands</b>	<b>Common Item Formats</b>
Students will be required to evaluate data displays or measures regarding evidence (center and variation, based on overlap of the data) that the data for one population is greater than another.	<ul style="list-style-type: none"> <li>• Equation Response</li> <li>• Graphic Response</li> <li>• Multiple Choice Response</li> <li>• Multi-Select Response</li> </ul>

## Performance Level Descriptors

<b>Minimally Proficient</b>	<b>Partially Proficient</b>
Identify measures of center and measures of variability for numerical data from random samples for two populations.	Use measures of center and measures of variability for numerical data from random samples to identify informal comparative inferences about two populations.
<b>Proficient</b>	<b>Highly Proficient</b>
Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. <i>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.</i>	Interpret measures of center and measures of variability for numerical data from random samples to draw comparative inferences about two populations.

## 7.SP.C.5

<b>Content Standards</b>	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.
<b>Explanations</b>	Probability can be expressed in terms such as impossible, unlikely, likely, or certain or as a number between 0 and 1 as illustrated on the number line.
<b>Content Limits</b>	Rational numbers Probabilities should not be given as percentages
<b>Context</b>	Context is allowed.
<b>Sample Task Demands</b>	
Students will be required to identify the likelihood of a chance event occurring.	<ul style="list-style-type: none"> <li>• Equation Response</li> <li>• Multiple Choice Response</li> <li>• Matching Item Response</li> <li>• Multi-Select Response</li> </ul>
Students will be required to given a likelihood of an event occurring, identify a possible probability.	
Students will be required to compare probabilities as being more or less likely.	
<b>Common Item Formats</b>	

## Performance Level Descriptors

Minimally Proficient	Partially Proficient
Identify that 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.	Identify 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.
Proficient	Highly Proficient
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.	Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring and use this to solve real-world problems.

## 7.SP.C.6

<b>Content Standards</b>	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.
<b>Explanations</b>	Students can perform experiments multiple times, pool data with other groups, or increase the number of trials in a simulation to look at the long-run relative frequencies.
<b>Content Limits</b>	Probabilities should not be given as percentages All numbers are whole, other than probabilities For TD1, the student should only be required to find one probability
<b>Context</b>	Context is allowed.
<b>Sample Task Demands</b>	
Students will be required to approximate/estimate the probability of a chance event by observing collected data (empirical/experimental probability).	<ul style="list-style-type: none"> <li>Equation Response</li> </ul>
Students will be required to predict the approximate relative frequency given the theoretical probability.	

**Performance Level Descriptors**

<b>Minimally Proficient</b>	<b>Partially Proficient</b>
Identify the approximate probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency.	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 identify the approximate relative frequency given the probability.
<b>Proficient</b>	<b>Highly Proficient</b>
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.	Explain 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.7, 7.SP.C.7a, and 7.SP.C.7b

<p><b>Content Standards</b></p>	<p><b>7.SP.C.7</b> 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.</p> <p><b>7.SP.C.7a</b> Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. <i>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.</i></p> <p><b>7.SP.C.7b</b> Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. <i>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?</i></p>	
<p><b>Explanations</b></p>	<p>Students need multiple opportunities to perform probability experiments and compare these results to theoretical probabilities. Critical components of the experiment process are making predictions about the outcomes by applying the principles of theoretical probability, comparing the predictions to the outcomes of the experiments, and replicating the experiment to compare results. Experiments can be replicated by the same group or by compiling class data.</p>	
<p><b>Content Limits</b></p>	<p>Rational numbers</p>	
<p><b>Context</b></p>	<p>Context is required.</p>	
<p><b>Sample Task Demands</b></p>		<p><b>Common Item Formats</b></p>
<p>Students will be required to, given a probability model, find the probability of a combination of events contained in the model. (a, b)</p>		<ul style="list-style-type: none"> <li>• Equation Response</li> <li>• Table Response</li> </ul>
<p>Students will be required to, given a situation that is clearly uniform (a), or given data (b), create a probability model.</p>		
<p>Students will be required to, given a situation that is clearly uniform (a), or given data (b), create a probability model and find the probability of a combination of events contained in the model.</p>		



### Performance Level Descriptors

Minimally Proficient	Partially Proficient
<p>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.</p> <p>a. Identify a uniform probability model that assigns equal probability to all outcomes to determine probabilities of events.</p> <p>b. Identify a probability model (which may not be uniform) that observes frequencies in data generated from a chance process.</p>	<p>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.</p> <p>a. Use a uniform probability model that assigns equal probability to all outcomes to determine probabilities of events.</p> <p>b. Use a probability model (which may not be uniform) that observes frequencies in data generated from a chance process.</p>
Proficient	Highly Proficient
<p>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.</p> <p>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.</p> <p>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?</p>	<p>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.</p> <p>a. Develop and explain 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.</p> <p>b. Develop and explain 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?</p>

## The Number System

7.NS.A.1, 7.NS.A.1a, 7.NS.A.1b, 7.NS.A.1c, and 7.NS.A.1d

<b>Content Standards</b>	<p><b>7.NS.A.1</b> Add and subtract integers and other rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.</p> <p><b>7.NS.A.1a</b> Describe situations in which opposite quantities combine to make 0.</p> <p><b>7.NS.A.1b</b> Understand <math>p + q</math> as the number located a distance <math> q </math> from <math>p</math>, in the positive or negative direction depending on whether <math>q</math> 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 context.</p> <p><b>7.NS.A.1c</b> Understand subtraction of rational numbers as adding the additive inverse, <math>p - q = p + (-q)</math>. 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 context.</p> <p><b>7.NS.A.1d</b> Apply properties of operations as strategies to add and subtract rational numbers.</p>	
<b>Explanations</b>	Visual representations may be helpful as students begin this work; they become less necessary as students become more fluent with the operations.	
<b>Content Limits</b>	Rational numbers: use integers, fractions, and decimals Limit decimals to the hundredths place Limit fractions to halves, fourths, and eighths.	
<b>Context</b>	Context is allowed.	
<b>Sample Task Demands</b>		<b>Common Item Formats</b>
Students will be required to calculate the sum of a number and its opposite. (b)		<ul style="list-style-type: none"> <li>• Equation Response</li> <li>• Graphic Response</li> <li>• Multiple Choice Response</li> <li>• Multi-Select Response</li> </ul>
Students will be required to calculate the distance between two points on a number line. (b or c)		
Students will be required to identify the location of a point that is a specified distance from another point on a number line. (b or c)		
Students will be required to find the sum or difference of two rational numbers. (d)		
Students will be required to model each step of a multi-part addition/subtraction expression on number lines, and identify the value of the expression. (b or c)		
Students will be required to identify properties of values given a number line or calculation, using variables rather than actual numbers. (b or c)		

### Performance Level Descriptors

Minimally Proficient	Partially Proficient
<p>Add and subtract integers and other rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.</p> <p>a. Identify opposite quantities.</p> <p>b. Identify a number and its opposite that have a sum of 0.</p> <p>c. Identify the distance between two rational numbers on the number line as the absolute value of their difference.</p> <p>d. Identify properties of operations as strategies to add and subtract rational numbers.</p>	<p>Add and subtract integers and other rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.</p> <p>a. Identify situations in which opposite quantities combine to make 0.</p> <p>b. Recognize <math>p + q</math> as the number located a distance <math> q </math> from <math>p</math>, in the positive or negative direction depending on whether <math>q</math> is positive or negative. Identify a number and its opposite that have a sum of 0 (are additive inverses).</p> <p>c. Recognize subtraction of rational numbers as adding the additive inverse, <math>p - q = p + (-q)</math>. Show that the distance between two rational numbers on the number line is the absolute value of their difference.</p> <p>d. Identify properties of operations as strategies to add and subtract rational numbers.</p>
Proficient	Highly Proficient
<p>Add and subtract integers and other rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.</p> <p>a. Describe situations in which opposite quantities combine to make 0.</p> <p>b. Understand <math>p + q</math> as the number located a distance <math> q </math> from <math>p</math>, in the positive or negative direction depending on whether <math>q</math> 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 context.</p> <p>c. Understand subtraction of rational numbers as adding the additive inverse, <math>p - q = p + (-q)</math>. 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 context.</p> <p>d. Apply properties of operations as strategies to add and subtract rational numbers.</p>	<p>Add and subtract integers and other rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.</p> <p>a. Interpret situations in which opposite quantities combine to make 0.</p> <p>b. Explain <math>p + q</math> as the number located a distance <math> q </math> from <math>p</math>, in the positive or negative direction depending on whether <math>q</math> 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 context.</p> <p>c. Understand subtraction of rational numbers as adding the additive inverse, <math>p - q = p + (-q)</math>. 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 context.</p> <p>d. Apply properties of operations as strategies to add and subtract rational numbers.</p>

7.NS.A.2, 7.NS.A.2a, 7.NS.A.2b, 7.NS.A.2c, and 7.NS.A.2d

<p><b>Content Standards</b></p>	<p><b>7.NS.A.2</b> Multiply and divide integers and other rational numbers.</p> <p><b>7.NS.A.2a</b> 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 <math>(-1)(-1) = 1</math> and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world context.</p> <p><b>7.NS.A.2b</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 <math>p</math> and <math>q</math> are integers, then <math>-(p/q) = (-p)/q = p/(-q)</math>. Interpret quotients of rational numbers by describing real-world context.</p> <p><b>7.NS.A.2c</b> Apply properties of operations as strategies to multiply and divide rational numbers.</p> <p><b>7.NS.A.2d</b> Convert a rational number to decimal form using long division; know that the decimal form of a rational number terminates in 0's or eventually repeats.</p>	
<p><b>Explanations</b></p>	<p>Multiplication and division of integers is an extension of multiplication and division of whole numbers.</p>	
<p><b>Content Limits</b></p>	<p>Rational numbers</p> <p>7.NS.2a and 2b require the incorporation of a negative value</p>	
<p><b>Context</b></p>	<p>Context is allowed.</p>	
<p><b>Sample Task Demands</b></p>		<p><b>Common Item Formats</b></p>
<p>Students will be required to convert a rational number to a decimal.</p>	<ul style="list-style-type: none"> <li>• Equation Response</li> <li>• Graphic Response</li> <li>• Multiple Choice Response</li> <li>• Multi-Select Response</li> </ul>	
<p>Students will be required to determine a product or quotient given an expression or real-world situation.</p>		
<p>Students will be required to identify properties of values given a number line or calculation, using variables rather than actual numbers.</p>		

### Performance Level Descriptors

Minimally Proficient	Partially Proficient
<p>Multiply and divide integers and other rational numbers.</p> <p>a. Identify 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 <math>(-1)(-1) = 1</math> and the rules for multiplying signed numbers. Identify products of rational numbers.</p> <p>b. Identify 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 <math>p</math> and <math>q</math> are integers, then <math>-(p/q) = (-p)/q = p/(-q)</math>.</p> <p>c. Multiply and divide rational numbers.</p> <p>d. Identify decimal form of a rational number.</p>	<p>Multiply and divide integers and other rational numbers.</p> <p>a. Recognize 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 <math>(-1)(-1) = 1</math> and the rules for multiplying signed numbers. Identify products of rational numbers by describing real-world context.</p> <p>b. Recognize 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 <math>p</math> and <math>q</math> are integers, then <math>-(p/q) = (-p)/q = p/(-q)</math>. Identify quotients of rational numbers by describing real-world context.</p> <p>c. Use properties of operations as strategies to multiply and divide rational numbers.</p> <p>d. Identify decimal form of a rational number; know that the decimal form of a rational number terminates in 0's or eventually repeats.</p>
Proficient	Highly Proficient
<p>Multiply and divide integers and other rational numbers.</p> <p>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 <math>(-1)(-1) = 1</math> and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world context.</p> <p>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 <math>p</math> and <math>q</math> are integers, then <math>-(p/q) = (-p)/q = p/(-q)</math>. Interpret quotients of rational numbers by describing real-world context.</p> <p>c. Apply properties of operations as strategies to multiply and divide rational numbers.</p> <p>d. Convert a rational number to decimal form using long division; know that the decimal form of a rational number terminates in 0's or eventually repeats.</p>	<p>Multiply and divide integers and other rational numbers.</p> <p>a. Explain 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 <math>(-1)(-1) = 1</math> and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world context.</p> <p>b. Explain 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 <math>p</math> and <math>q</math> are integers, then <math>-(p/q) = (-p)/q = p/(-q)</math>. Interpret quotients of rational numbers by describing real-world context.</p> <p>c. Apply properties of operations as strategies to multiply and divide rational numbers in a real-world context.</p> <p>d. Convert a rational number to decimal form using long division; know that the decimal form of a rational number terminates in 0's or eventually repeats.</p>

7.NS.A.3

<b>Content Standards</b>	Solve mathematical problems and problems in real-world context involving the four operations with rational numbers. Computations with rational numbers extend the rules for manipulating fractions to complex fractions where $a/b \div c/d$ when $a, b, c,$ and $d$ are all integers and $b, c,$ and $d \neq 0$ .
<b>Explanations</b>	Apply and extend previous understanding of operations with fractions to add, subtract, multiply, and divide rational numbers except division by zero.
<b>Content Limits</b>	Rational numbers Complex fractions can be used, but should contain fractions with single-digit numerators and denominators
<b>Context</b>	Context is allowed.
<b>Sample Task Demands</b>	
Students will be required to solve simple problems involving rational numbers given a scenario.	<ul style="list-style-type: none"> <li>• Equation Response</li> <li>• Table Response</li> </ul>
Students will be required to solve complex problems involving rational numbers given a scenario.	

**Performance Level Descriptors**

<b>Minimally Proficient</b>	<b>Partially Proficient</b>
Identify the solution of mathematical problems four operations with rational numbers.	Identify the solution of mathematical problems and problems in real-world context involving the four operations with rational numbers. Computations with rational numbers extend the rules for manipulating fractions to complex fractions where $a/b \div c/d$ when $a, b, c,$ and $d$ are all integers and $b, c,$ and $d \neq 0$ .
<b>Proficient</b>	<b>Highly Proficient</b>
Solve mathematical problems and problems in real-world context involving the four operations with rational numbers. Computations with rational numbers extend the rules for manipulating fractions to complex fractions where $a/b \div c/d$ when $a, b, c,$ and $d$ are all integers and $b, c,$ and $d \neq 0$ .	Solve mathematical problems and problems in real-world context involving the four operations with rational numbers and interpret the solution. Computations with rational numbers extend the rules for manipulating fractions to complex fractions where $a/b \div c/d$ when $a, b, c,$ and $d$ are all integers and $b, c,$ and $d \neq 0$ .

## Ratio and Proportional Relationships

### 7.RP.A.1

<b>Content Standards</b>	Compute unit rates associated with ratios involving both simple and complex fractions, including ratios of quantities measured in like or different units.	
<b>Explanations</b>	Analyze proportional relationships and use them to solve mathematical problems and problems in real-world context.	
<b>Content Limits</b>	<p>Rational numbers - some items may include one rational number and one whole number (other than 1), but the bulk of items from this standard should involve ratios expressed as fractions, including complex fractions</p> <p>Ratios can be expressed as fractions, with “:”, or with words</p> <p>Units can be the same or different across the two quantities</p>	
<b>Context</b>	Context is allowed.	
<b>Sample Task Demands</b>		<b>Common Item Formats</b>
Students will be required to find a unit rate for a given ratio from information within a situational context, table or mathematical problem.		<ul style="list-style-type: none"> <li>• Equation response</li> <li>• Graphic Response</li> <li>• Multiple Choice Response</li> <li>• Multi-Select Response</li> <li>• Table Response</li> </ul>

### Performance Level Descriptors

<b>Minimally Proficient</b>	<b>Partially Proficient</b>
Identify unit rates associated with ratios involving simple fractions, including ratios of quantities measured in like units.	Compute unit rates associated with ratios involving simple fractions, including ratios of quantities measured in like units.
<b>Proficient</b>	<b>Highly Proficient</b>
Compute unit rates associated with ratios involving both simple and complex fractions, including ratios of quantities measured in like or different units.	Interpret unit rates associated with ratios involving both simple and complex fractions, including ratios of quantities measured in like or different units.

7.RP.A.2, 7.RP.A.2a, 7.RP.A.2b, 7.RP.A.2c, and 7.RP.A.2d

<b>Content Standards</b>	<p><b>7.RP.A.2</b> Recognize and represent proportional relationships between quantities.</p> <p><b>7.RP.A.2a</b> 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).</p> <p><b>7.RP.A.2b</b> Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.</p> <p><b>7.RP.A.2c</b> Represent proportional relationships by equations. <i>For example, if total cost <math>t</math> is proportional to the number <math>n</math> of items purchased at a constant price <math>p</math>, the relationship between the total cost and the number of items can be expressed as <math>t = pn</math>.</i></p> <p><b>7.RP.A.2d</b> Explain what a point <math>(x, y)</math> on the graph of a proportional relationship means in terms of the situation, with special attention to the points <math>(0, 0)</math> and <math>(1, r)</math> where <math>r</math> is the unit rate.</p>	
<b>Explanations</b>	Graphing proportional relationships represented in a table helps students recognize that the graph is a line through the origin $(0,0)$ with a constant of proportionality equal to the slope of the line.	
<b>Content Limits</b>	<p>Rational numbers</p> <p>Ratios can be expressed as fractions, with “:”, or with words</p> <p>Units can be the same or different across the two quantities</p> <p>Items should not require creating a graph of a proportional relationship (this is 8.EE.5), only interpreting given graphs</p>	
<b>Context</b>	Context is allowed.	
<b>Sample Task Demands</b>		<b>Common Item Formats</b>
Students will be required to recognize a proportional relationship within a representation (description, graph, table, etc). (a)		<ul style="list-style-type: none"> <li>• Equation response</li> <li>• Multiple Choice Response</li> <li>• Multi-Select Response</li> <li>• Simulator Response</li> </ul>
Students will be required to identify the unit rate in a proportional relationship, given a description, graph with $(1, r)$ plotted, equation, or table of equivalent ratios. (b)		
Students will be required to identify equivalent proportional relationship across representations. (c or d)		
Students will be required to solve real-world problems involving a proportional relationship, given an equation or graph. (c or d)		
Students will be required to create an equation to represent a proportional relationship; in some cases, also apply the equation to the situation. (c)		
Students will be required to explain the points $(0,0)$ and $(1,r)$ and their significance in a graph of a proportional relationship, where $r$ is the unit rate. (d)		



### Performance Level Descriptors

Minimally Proficient	Partially Proficient
<p>Recognize and represent proportional relationships between quantities.</p> <p>a. Identify two quantities in a proportional relationship.</p> <p>b. Identify the constant of proportionality (unit rate) in tables or graphs.</p> <p>c. Identify equations to represent proportional relationships.</p> <p>d. Identify a point <math>(x, y)</math> on the graph of a proportional relationship.</p>	<p>Recognize and represent proportional relationships between quantities.</p> <p>a. Decide whether two quantities are in a proportional relationship.</p> <p>b. Identify the constant of proportionality (unit rate) in tables, graphs, equation.</p> <p>c. Represent proportional relationships by equations.</p> <p>d. Identify what a point <math>(x, y)</math> on the graph of a proportional relationship means in terms of the situation, with special attention to the points <math>(0, 0)</math> and <math>(1, r)</math> where <math>r</math> is the unit rate.</p>
Proficient	Highly Proficient
<p>Recognize and represent proportional relationships between quantities.</p> <p>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).</p> <p>b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.</p> <p>c. Represent proportional relationships by equations. For example, if total cost <math>t</math> is proportional to the number <math>n</math> of items purchased at a constant price <math>p</math>, the relationship between the total cost and the number of items can be expressed as <math>t = pn</math>.</p> <p>d. Explain what a point <math>(x, y)</math> on the graph of a proportional relationship means in terms of the situation, with special attention to the points <math>(0, 0)</math> and <math>(1, r)</math> where <math>r</math> is the unit rate.</p>	<p>Recognize and represent proportional relationships between quantities.</p> <p>a. Explain 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).</p> <p>b. Interpret the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.</p> <p>c. Represent proportional relationships by equations. For example, if total cost <math>t</math> is proportional to the number <math>n</math> of items purchased at a constant price <math>p</math>, the relationship between the total cost and the number of items can be expressed as <math>t = pn</math>.</p> <p>d. Explain what a point <math>(x, y)</math> on the graph of a proportional relationship means in terms of the situation, with special attention to the points <math>(0, 0)</math> and <math>(1, r)</math> where <math>r</math> is the unit rate.</p>

## 7.RP.A.3

<b>Content Standards</b>	Use proportional relationships to solve multi-step ratio and percent problems (e.g., simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).
<b>Explanations</b>	Students should be able to explain or show their work using a representation (numbers, words, pictures, physical objects, or equations) and verify that their answer is reasonable. Models help students to identify the parts of the problem and how the values are related. For percent increase and decrease, students identify the starting value, determine the difference, and compare the difference in the two values to the starting value.
<b>Content Limits</b>	Limit to rational numbers Units can be the same or different across the two quantities
<b>Context</b>	Context is allowed.
<b>Sample Task Demands</b>	
Students will be required to calculate the solution for percent and ratio problems.	<ul style="list-style-type: none"> <li>• Equation response</li> <li>• Graphic Response</li> <li>• Multiple Choice Response</li> </ul>
Students will be required to create an expression that can be used to find a specified percent or percentage increase/decrease of a given whole.	
Students will be required to use percent increase or decrease to find two quantities given their relationship in a real world context.	
Students will be required to interpret a proportional pattern from percent increase/decrease problems as a graph or as an equation.	
<b>Common Item Formats</b>	

## Performance Level Descriptors

<b>Minimally Proficient</b>	<b>Partially Proficient</b>
Use proportional relationships to solve one-step ratio and percent mathematical problems (e.g., simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).	Use proportional relationships to solve one-step ratio and percent problems (e.g., simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).
<b>Proficient</b>	<b>Highly Proficient</b>
Use proportional relationships to solve multi-step ratio and percent problems (e.g., simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).	Interpret proportional relationships when solving multi-step ratio and percent problems (e.g., simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).