

AzM2 | Arizo

Arizona's Statewide Achievement Assessment for English Language Arts and Mathematics

# Mathematics Item Specifications

GRADE 7

Arizona Department of Education with American Institutes for Research - 2019

# Table of Contents

Introduction	4
Item Development Process	5
Test Construction Guidelines	6
Blueprint	6
Depth of Knowledge (DOK)	6
Calculators	6
Item Formats	7
Arizona Math Standards Grade 7	10
Grade 7 Item Specifications	13
Expressions and Equations	13
7.EE.A.1	13
7.EE.A.2	14
7.EE.B.3	15
7.EE.B.4, 7.EE.B.4a, and 7.EE.B.4b	16
Geometry & Statistics and Probability	
7.G.A.1	
7.G.A.2	
7.G.A.3	20
7.G.B.4	21
7.G.B.5	22
7.G.B.6	23
7.SP.A.1	25
7.SP.A.2	26
7.SP.B.3	27
7.SP.B.4	29
7.SP.C.5	
7.SP.C.6	
7.SP.C.7, 7.SP.C.7a, and 7.SP.C.7b	
The Number System	
7.NS.A.1, 7.NS.A.1a, 7.NS.A.1b, 7.NS.A.1c, and 7.NS.A.1d	34
7.NS.A.2, 7.NS.A.2a, 7.NS.A.2b, 7.NS.A.2c, and 7.NS.A.2d	
7.NS.A.3	

F	Ratio and Proportional Relationships	. 39
	7.RP.A.1	. 39
	7.RP.A.2, 7.RP.A.2a, 7.RP.A.2b, 7.RP.A.2c, and 7.RP.A.2d	.40
	7.RP.A.3	.42

## Introduction

The Arizona Statewide Achievement Assessment for English Language Arts and Mathematics (AzM2) is Arizona's statewide achievement test. AzM2 assesses the Arizona English Language Arts Standards and Arizona Mathematics Standards adopted by the Arizona State Board of Education in December 2016. AzM2 will inform students, teachers, and parents about preparedness for college and careers upon graduating from high school. AzM2 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 AzM2 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. AzM2 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 *AzM2 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 AzM2 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. AzM2 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 AzM2, 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

AzM2 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 AzM2.



Sample tests are available online for the math portion of AzM2. For more information view the Guide to the Sample Tests at <u>www.AzM2portal.org</u>.

## Test Construction Guidelines

The construction of the AzM2 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 AzM2 Blueprint provides an overview of the distribution of items on the AzM2 according to the standards. The standards for Math Practices are embedded within all AzM2 items. Further, the AzM2 blueprint outlines the Depth of Knowledge distribution of items.

## Blueprint

Grade 7 AzM2 Blueprint 2016 Standards			
Reporting Category Min. Max.			
Ratios & Proportions	19%	23%	
The Number System	19%	23%	
Expressions & Equations	23%	27%	
Geometry and Statistics & Probability	27%	35%	
Geometry	15%	19%	
Statistics and Probability	12%	16%	

## 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.

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

For more information on DOK go to <u>www.azed.gov/AzM2</u>.

## Calculators

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

## Item Formats

The AzM2 Assessments are composed of item formats that include traditional multiplechoice response items and technology-enhanced response items (TEI). TEIs are computerdelivered 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 AzM2:

- 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 AzM2 Training Tests at <u>www.AzM2portal.org</u>.

Item Format	Description
Editing Task (ET)	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.
Editing Task Choice (ETC)	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		
Equation Editor (EQ)	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.		
Graphic Response Item Display (GRID)	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.		
Hot Text (HT)	<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.		
	<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.		
Matching Item (MI)	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.		
Multi-Select (MS)	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.		
Open Response	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.		

Item Format	Description
Table Item (TI)	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)			
7.RP.A Analyze proportional	7.RP.A.1	Compute unit rates associated with ratios involving both simple and complex fractions, including ratios of quantities measured in like or different units.		
Analyze proportional relationships and use them to solve mathematical problems and problems in real-world context.	7.RP.A.2	<ul> <li>Recognize and represent proportional relationships between quantities.</li> <li>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).</li> <li>b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.</li> <li>c. Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn.</li> <li>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.</li> </ul>		
	7.RP.A.3	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)			
7.NS.A Apply and extend previous understanding of operations with fractions to add, subtract, multiply, and divide rational numbers except division by zero.	7.NS.A.1	<ul> <li>Add and subtract integers and other rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.</li> <li>a. Describe situations in which opposite quantities combine to make 0.</li> <li>b. Understand <i>p</i> + <i>q</i> as the number located a distance  <i>q</i>  from <i>p</i>, in the positive or negative direction depending on whether <i>q</i> 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>c. Understand subtraction of rational numbers as adding the additive inverse, <i>p</i> - <i>q</i> = <i>p</i> + (-<i>q</i>). 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>d. Apply properties of operations as strategies to add and subtract rational numbers.</li> </ul>		

7.NS.A (cont.)		Multiply and divide integers and other rational numbers.
		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 context.
	7.NS.A.2	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 $-(p/q) = (-p)/q = p/(-q)$ . Interpret quotients of rational numbers by describing real-world context.
		c. Apply properties of operations as strategies to multiply and divide rational numbers.
		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.
	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 $d \neq 0$ .
		Expressions and Equations (EE)
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. For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."
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. 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.
		Use variables to represent quantities in mathematical problems and problems in real-world context, and construct simple equations and inequalities to solve problems.
	7.EE.B.4	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.
		b. Solve word problems leading to inequalities of the form $px+q > r$ or $px+q < r$ , where $p$ , $q$ , and $r$ are rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.

	Geometry (G)			
7.G.A Draw, construct, and	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.		
describe geometrical figures, and describe the relationships between them.	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	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.		
problems and problems in real-world context involving angle measure, area, surface area, and volume.	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.		
Statistics and Probability (SP)				
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. For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.		
7.SP.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. For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.		

7.SP.B (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. For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.
7.SP.C       Understand that the probability of a chance event is a number between 0 and the event occurring. Larger numbers indicate greater likelihood. A probability a probability around 1/2 indicates an event that is neither unlikely nor likely, ar 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. 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. 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	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. 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. 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?

# Grade 7 Item Specifications

## Expressions and Equations

7.EE.A.1			
Content Standards	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.		
Explanations	Apply and extend previous understanding of operations with fractions to add, subtract, multiply, and divide rational numbers except division by zero.		
Content Limits	Using negative numbers and multiple operations should be emphasized to distinguish from 6.EE.3 Linear expressions 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)		
Context	Context is allowed.		
Sample Task Demands		Common Item Formats	
Students will be required to perform operations to construct equivalent expressions.		<ul><li>Equation Response</li><li>Multiple Choice Response</li><li>Multi-Select Reponse</li></ul>	

Minimally Proficient	Partially Proficient
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.
Proficient	Highly Proficient
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

Content Standards	Rewrite an expression in different forms and understand the relationship between the different forms and their meanings in a problem context. For example, $a + 0.05a = 1.05a$ means that "increase by 5%" is the same as "multiply by 1.05."	
Explanations	Use properties of operations to generate equivalent expressions.	
Content Limits	Rational numbers Linear expressions with an unknown	
Context	Context is required.	
Sample Tas	sk Demands	Common Item Formats
Students will be required to a context, identify an equiv a feature of that context.	given an expression within alent expression that shows	Equation Response
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.		<ul> <li>Multi-Select Reponse</li> <li>Proposition Response</li> </ul>

Minimally Proficient	Partially Proficient
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. For example, $a + 0.05a = 1.05a$ means that "increase by 5%" is the same as "multiply by 1.05."
Proficient	Highly Proficient

#### 7.EE.B.3

Content Standards	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. 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.	
Explanations	Estimation strategies for calculations with fractions and decimals extend from students' work with whole number operations.	
Content Limits	Rational numbers No variables Items involving estimation t respond with the exact answ	o assess reasonableness should not allow the student to ver.
Context	Context is allowed.	
Sample Task Demands		
Sample Tas	sk Demands	Common Item Formats
Sample Tas Students will be required to the information needed is g	sk Demands solve a problem where only jiven.	Common Item Formats
Sample Tas Students will be required to the information needed is g Students will be required reasonable based on estima	sk Demands solve a problem where only given. to choose which value is ation.	Common Item Formats     Equation Response     Multiple Choice Response

Minimally Proficient	Partially Proficient
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.
Proficient	Highly Proficient
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. 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.	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

Content Standards	<ul> <li>7.EE.B.4 Use variables to problems in real-world corresolve problems.</li> <li>7.EE.B.4a Solve word prob + q) = r, where p, q, and r forms fluently. Compare an the sequence of the operational the sequence of the operational the sequence of the operational solve word prob q &lt; r, where p, q, and r are read on the property in the context of the sequence of the context of the sequence of th</li></ul>	represent quantities in mathematical problems and text, and construct simple equations and inequalities to lems leading to equations of the form $px + q = r$ and $p(x are specific rational numbers. Solve equations of thesealgebraic solution to an arithmetic solution, identifyingions used in each approach.lems leading to inequalities of the form px + q > r or px + aational numbers. Graph the solution set of the inequalityext of the problem.$
Explanations	Solve mathematical problem and algebraic expressions a	ms and problems in real-world context using numerical nd equations.
Content Limits	Rational numbers	
Context	Context is allowed.	
Sample Tas	sk Demands	Common Item Formats
Students will be required inequality for an unknown v	l to solve an equation or value, without context. (a, b)	
Students will be required inequality that models the solution. (a, b)	to create an equation or situation, and then find the	
Students will be required to construct an algebraic equation or inequality that models a word problem. (a, b)		<ul> <li>Equation Response</li> <li>Graphic Response</li> <li>Multiple Choice Response</li> <li>Multi-Select Response</li> </ul>
Students will be required to graph the solution set of an inequality. (b)		
Students will be required to interpret the solution set of an inequality in the context of the problem. (b)		

Minimally Proficient	Partially Proficient
Use variables to represent quantities in mathematical problems and problems in real-world context, and construct simple equations and inequalities to solve problems.	Use variables to represent quantities in mathematical problems and problems in real-world context, and construct simple equations and inequalities to solve problems.
<ul> <li>a. Solve word problems leading to equations of the form px + q = r and p(x + q) = r, where p, q, and r are integers.</li> <li>b. Solve word problems leading to inequalities of the form px + q &gt; r or px + q &lt; r, where p, q, and r are</li> </ul>	a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$ , where $p$ , $q$ , and $r$ 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.
integers.	b. Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$ , where $p$ , $q$ , and $r$ are rational numbers. Graph the solution set of the inequality.
Proficient	Highly Proficient
Use variables to represent quantities in mathematical	Lies veriables to represent quantities in methometical
problems and problems in real-world context, and construct simple equations and inequalities to solve problems.	problems and problems in real-world context, and construct simple equations and inequalities to solve problems.
problems and problems in real-world context, and construct simple equations and inequalities to solve problems. 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.	problems and problems in real-world context, and construct simple equations and inequalities to solve problems. a. Solve real-world 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, explaining the sequence of the operations used in each approach.

## Geometry & Statistics and Probability

7.G.A.1		
Content Standards	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.	
Explanations	Draw, construct and describe geometrical figures and describe the relationships between them.	
Content Limits	Two-dimensional polygons Keep any conversions within one system (e.g., inches to feet is okay but inches to meters is not okay).	
Context	Context is allowed.	
Sample Tas	sk Demands	Common Item Formats
Students will be required to measure of area/perimeter factor.	o find the length of a side or r given a shape and a scale	
Students will be required to find the scale factor given two figures where one is a scale drawing of the other.		<ul> <li>Equation Response</li> <li>Graphic Response</li> </ul>
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.		

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

Content Standards	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.		
Explanations	Conditions may involve points, line segments, angles, parallelism, congruence, angles, and perpendicularity.		
Content Limits	Limit to two-dimensional polygons Include questions about the sum of two side lengths of a triangle is greater than the third side length. Given conditions should not focus on similarity or congruence or that sum of angles in a triangle is 180 degrees. Be aware of the scoring capabilities for the graphic response tool when designing these items. To distinguish from previous grades, conditions should include factors outside of parallel/perpendicular lines and angle measure, such as symmetry and side length.		
Context	Context is allowed.		
Sample Tas	sk Demands	Common Item Formats	
Students will be required to draw a figure based on given conditions.		<ul> <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.			

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

#### 7.G.A.3

Content Standards	Describe the two-dime dimensional figures.	nsional figures that result from slicing three-
Explanations	Draw, construct, and describe geometrical figures, and describe the relationships between them.	
Content Limits	Limited to right prisms and pyramids up to ones with a hexagonal base. Spheres, cones and cylinders are allowed. Diagonals are limited to slices which will result in shapes that have been described in previous grade level standards.	
Context	Context is allowed.	
Sample Tas	k Demands	Common Item Formats
Students will be required to cross section with its (possi	o match a two-dimensional ble) 3-D figure(s).	Cranhie Response
Students will be required the figure that represents the c	to draw a two-dimensional ross section of a 3-D figure.	<ul> <li>Graphic Response</li> <li>Multiple Choice Response</li> <li>Matching Item Response</li> <li>Multi-Select Response</li> </ul>

Minimally Proficient	Partially Proficient
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.
Proficient	Highly Proficient
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

Content Standards	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.	
Explanations	Solve mathematical problems and problems in real-world context involving angle measure, area, surface area, and volume.	
Content Limits	Circles and semi-circles.	
Context	Context is allowed.	
Sample Ta	ask Demands Common Item Formats	
Students will be required to find the area of a circle given diameter or radius. Students will be required to find the radius or diameter		
of a circle given the circum	rerence.	
Students will be required to find circumference given the radius or diameter.		Equation Response
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.		

Minimally Proficient	Partially Proficient
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.
Proficient	Highly Proficient
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

Content Standards	Use facts about supplemer multi-step problems to writ figure.	ntary, complementary, vertical, and adjacent angles in e and solve simple equations for an unknown angle in a
Explanations	Angle relationships that can be explored include but are not limited to: same-side (consecutive) interior and same-side (consecutive) exterior angles are supplementary.	
Content Limits	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.	
Context	Context is allowed.	
Sample Tas	sk Demands	Common Item Formats
Students will be required to find the unknown measure of a supplementary, complementary, vertical, or adjacent angle.		Equation Response
Students will be required to create an expression that can be used to find an unknown angle measurement.		

Minimally Proficient	Partially Proficient
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.
Proficient	Highly Proficient
Use facts about supplementary, complementary, vertical, and adjacent angles in multi-step problems to write and solve simple equations for an unknown	Use facts about supplementary, complementary, vertical, and adjacent angles in multi-step problems to

#### 7.G.B.6

Content Standards	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.		
Explanations	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.		
Content Limits	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.		
Context	Context is allowed.		
Sample Tas	sk Demands	Common Item Formats	
Students will be required to area of an object.	o find the volume or surface		
Students will be required to area, surface area, or volun	o find dimensions when the ne is given.		
Students will be required to given the surface area. (Are 100 square units)	o find the volume of a cube ea of each face is limited to	<ul> <li>Equation Response</li> <li>Table Response</li> </ul>	
Students will be required object composed of two ob	to find the volume of an jects.		

Performance Level Descriptors	
Minimally Proficient	Partially Proficient
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.
Proficient	Highly Proficient
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

Content Standards	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.	
Explanations	Use random sampling to draw inferences about a population.	
Content Limits	Use random sampling to draw inferences about a population.	
Context	Context is required.	
Sample Tas	sk Demands	Common Item Formats
Students will be required to identify a valid sample (random, representative, and proportional to population).		<ul> <li>EBSR Response</li> <li>Multiple Choice Response</li> </ul>
Students will be required t method.	o justify a chosen sampling	Multi-Select Response

Minimally Proficient	Partially Proficient
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.
Proficient	Highly Proficient
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	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

#### 7.SP.A.2

Content Standards	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.	
Explanations	Use random sampling to draw inferences about a population.	
Content Limits	Rational numbers Given dot plots should have an approximately normal distribution	
Context	Context is required.	
Sample Tas	sk Demands	Common Item Formats
Students will be required to population based on a set of the set	to draw inferences about a of random samples.	Equation Response     Craphic Response
Students will be required among a set of random san	to explore the variation nples.	Multiple Choice Response

Minimally Proficient	Partially Proficient
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.
Proficient	Highly Proficient
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

Content Standards	Informally assess the degree with similar variabilities, expressing it as a multiple o of players on the basketbalk on the soccer team, about to team; on a dot plot, the so noticeable.	ee of visual overlap of two numerical data distributions measuring the difference between the centers by of a measure of variability. For example, the mean height team is 10 cm greater than the mean height of players twice the variability (mean absolute deviation) on either separation between the two distributions of heights is
Explanations	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. Measures of center include mean, median, and mode. The measures of variability include range, mean absolute deviation, and interquartile range.	
Content Limits	Data displays should be dot plots or box plots with approximately normal distributions	
Context	Context is allowed.	
Sample Tas	sk Demands	Common Item Formats
Students will be required to that represent data distrib shows the most visual over	o given sets of data displays outions, select the set that lap.	Equation Response
Students will be required with different centers be compute the difference in c absolute deviation and info overlap.	to given two data displays out the same variability, enters in terms of the mean ormally assess the degree of	<ul> <li>Graphic Response</li> <li>Multiple Choice Response</li> <li>Multi-Select Response</li> </ul>

Minimally Proficient	Partially Proficient
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.
Proficient	Highly Proficient
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

Content Standards	Use measures of center and samples to draw informal example, decide whether th generally longer than the w	I measures of variability for numerical data from random comparative inferences about two populations. For e words in a chapter of a seventh-grade science book are ords in a chapter of a fourth-grade science book.
Explanations	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. Measures of center include mean, median, and mode. The measures of variability include range, mean absolute deviation, and interquartile range.	
Content Limits	Data displays should be dot plots or box plots with approximately normal distributions	
Context	Context is allowed.	
Sample Tas	sk Demands Common Item Formats	
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> <li>Equation Response</li> <li>Graphic Response</li> <li>Multiple Choice Response</li> <li>Multi-Select Response</li> </ul>

Minimally Proficient	Partially Proficient
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.
Proficient	Highly Proficient
Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.	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

Content Standards	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.	
Explanations	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.	
Content Limits	Rational numbers Probabilities should not be given as percentages	
Context	Context is allowed.	
Sample Tas	sk Demands	Common Item Formats
Students will be required to chance event occurring.	o identify the likelihood of a	Equation Response
Students will be required to given a likelihood of an event occurring, identify a possible probability.		<ul> <li>Multiple Choice Response</li> <li>Matching Item Response</li> <li>Multi-Select Response</li> </ul>
Students will be required t being more or less likely.	to compare probabilities as	

Minimally Proficient	Partially Proficient
Identify that 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.	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 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 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

Content Standards	Approximate the probability. For example, a 3 or 6 would be rolled times.	pility of a chance event by collecting data on the roduces it and observing its long-run relative the approximate relative frequency given the when rolling a number cube 600 times, predict that I roughly 200 times, but probably not exactly 200
Explanations	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.	
Content Limits	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	
Context	Context is allowed.	
Sample Tas	sk Demands Common Item Formats	
Students will be required to probability of a chance ev data (empirical/experiment	o approximate/estimate the ent by observing collected cal probability).	Equation Response
Students will be required to predict the approximate relative frequency given the theoretical probability.		

Minimally Proficient	Partially Proficient
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.
Proficient	Highly Proficient
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	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.	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

Content Standards	<ul> <li>7.SP.C.7 Develop a proba Compare probabilities from good, explain possible source</li> <li>7.SP.C.7a Develop a unifor outcomes, and use the mod student is selected at rand selected and the probability</li> <li>7.SP.C.7b Develop a proba frequencies in data gener approximate probability the paper cup will land open-en- to be equally likely based or</li> </ul>	bility model and use it to find probabilities of events. a model to observed frequencies. If the agreement is not ces of the discrepancy. Improbability model by assigning equal probability to all lel to determine probabilities of events. For example, if a lom from a class, find the probability that Jane will be that a girl will be selected. ability model (which may not be uniform) by observing rated from a chance process. For example, find the at a spinning penny will land heads up or that a tossed of down. Do the outcomes for the spinning penny appear in the observed frequencies?
Explanations	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.	
Content Limits	Rational numbers	
Context	Context is required.	
Sample Tas	sk Demands	Common Item Formats
Students will be required to find the probability of contained in the model. (a,	o, given a probability model, a combination of events b)	
Students will be required to clearly uniform (a), or probability model.	to, given a situation that is given data (b), create a	<ul><li>Equation Response</li><li>Table Response</li></ul>
Students will be required to clearly uniform (a), or probability model and fo combination of events cont	to, given a situation that is given data (b), create a ind the probability of a rained in the model.	

Performance Level Descriptors		
Minimally Proficient	Partially Proficient	
Develop a probability model and use it to find	Develop a probability model and use it to find	
probabilities of events. Compare probabilities from a	probabilities of events. Compare probabilities from a	
model to observed frequencies. If the agreement is	model to observed frequencies. If the agreement is	
not good, explain possible sources of the discrepancy.	not good, explain possible sources of the discrepancy.	
a. Identify a uniform probability model that assigns	a. Use a uniform probability model that assigns equal	
equal probability to all outcomes to determine	probability to all outcomes to determine probabilities	
probabilities of events.	of events.	
b. Identify a probability model (which may not be	b. Use a probability model (which may not be uniform)	
uniform) that observes frequencies in data generated	that observes frequencies in data generated from a	
from a chance process.	chance process.	
Proficient	Highly Proficient	
Develop a probability model and use it to find	Develop a probability model and use it to find	
probabilities of events. Compare probabilities from a	probabilities of events. Compare probabilities from a	
model to observed frequencies. If the agreement is	model to observed frequencies. If the agreement is	
not good, explain possible sources of the discrepancy.	not good, explain possible sources of the discrepancy.	
a. Develop a uniform probability model by assigning	a. Develop and explain a uniform probability model by	
equal probability to all outcomes, and use the model	assigning equal probability to all outcomes, and use	
to determine probabilities of events. For example, if a	the model to determine probabilities of events. For	
student is selected at random from a class, find the	example, if a student is selected at random from a	
probability that Jane will be selected and the	class, find the probability that Jane will be selected	
probability that a girl will be selected.	and the probability that a girl will be selected.	
b. Develop a probability model (which may not be	b. Develop and explain a probability model (which may	
uniform) by observing frequencies in data generated	not be uniform) by observing frequencies in data	
from a chance process. For example, find the	generated from a chance process. For example, find	
approximate probability that a spinning penny will	the approximate probability that a spinning penny will	
land heads up or that a tossed paper cup will land	land heads up or that a tossed paper cup will land	
open-end down. Do the outcomes for the spinning	open-end down. Do the outcomes for the spinning	
penny appear to be equally likely based on the	penny appear to be equally likely based on the	
observed frequencies?	observed frequencies?	

## 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>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.	
	7.NS.A.1a Describe situation	ons in which opposite quantities combine to make 0.
Content Standards	<b>7.NS.A.1b</b> Understand <i>p</i> + positive or negative direction that a number and its opp sums of rational numbers b	q as the number located a distance $ q $ from $p$ , in the on depending on whether $q$ is positive or negative. Show osite have a sum of 0 (are additive inverses). Interpret y describing real-world context.
	btraction of rational numbers as adding the additive ow that the distance between two rational numbers on lute value of their difference, and apply this principle in	
	<b>7.NS.A.1d</b> Apply propertie numbers.	s of operations as strategies to add and subtract rational
Explanations	Visual representations may be helpful as students begin this work; they become less necessary as students become more fluent with the operations.	
	Rational numbers: use integers, fractions, and decimals	
Content		
Limits		
	Limit fractions to halves, fourths, and eighths.	
Context	Context is allowed.	
Sample Tas	k Demands	Common Item Formats
Students will be required	to calculate the sum of a	
Students will be required	))	
botwoon two points on a pi	in calculate the distance	
Students will be required to identify the location of a		
noint that is a specified distance from another point on		
a number line. (b or c)		Equation Response
Students will be required to find the sum or difference		<ul> <li>Graphic Response</li> <li>Multiple Choice Response</li> </ul>
of two rational numbers. (d)		
Students will be required to	model each step of a	<ul> <li>IVIUITI-Select Response</li> </ul>
multi-part addition/subtrac	tion 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	l numbers. (b or c)	

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

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

	<b>7.NS.A.2</b> Multiply and divide integers and other rational numbers.		
Content Standards	<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 $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world context. <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 <i>p</i> and <i>q</i> are integers, then $-(p/q) = (-p)/q = p/(-q)$ . Interpret quotients of rational numbers by describing real-world context.		
	<b>7.NS.A.2d</b> Convert a rational number to decimal form using long division; know th the decimal form of a rational number terminates in 0's or eventually repeats.		
Explanations	Multiplication and division of integers is an extension of multiplication and division of whole numbers.		
Content Limits	Rational numbers 7.NS.2a and 2b require the incorporation of a negative value		
Context	Context is allowed.		
Sample Ta	sk Demands	Common Item Formats	
Students will be required to a decimal.	o convert a rational number		
Students will be required to determine a product or quotient given an expression or real-world situation.		<ul> <li>Equation Response</li> <li>Graphic Response</li> <li>Multiple Choice Response</li> <li>Multi-Select Response</li> </ul>	
Students will be required to identify properties of values given a number line or calculation, using variables rather than actual numbers.			

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

#### 7.NS.A.3

Content Standards	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 $d \neq 0$ .	
Explanations	Apply and extend previous understanding of operations with fractions to add, subtract, multiply, and divide rational numbers except division by zero.	
Content Limits	Rational numbers Complex fractions can be used, but should contain fractions with single-digit numerators and denominators	
Context	Context is allowed.	
Sample Tas	sk Demands	Common Item Formats
Students will be required to solve simple problems involving rational numbers given a scenario.		<ul> <li>Equation Response</li> <li>Table Response</li> </ul>
Students will be required to solve complex problems involving rational numbers given a scenario.		

Minimally Proficient	Partially Proficient
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 $d \neq 0$ .
Proficient	Highly Proficient
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		
Content Standards	Compute unit rates assoc fractions, including ratios of	iated with ratios involving both simple and complex f quantities measured in like or different units.
Explanations	Analyze proportional relation and problems in real-world	onships and use them to solve mathematical problems context.
Content Limits	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 Ratios can be expressed as fractions, with ":", or with words Units can be the same or different across the two quantities	
Context	Context is allowed.	
Sample Ta	sk Demands	Common Item Formats
Students will be required to ratio from information wi table or mathematical prob	o find a unit rate for a given ithin a situational context, lem.	<ul> <li>Equation response</li> <li>Graphic Response</li> <li>Multiple Choice Response</li> <li>Multi-Select Response</li> <li>Table Response</li> </ul>

Minimally Proficient	Partially Proficient
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.
Proficient	Highly Proficient
Compute unit rates associated with ratios involving both simple and complex fractions, including ratios of	Interpret unit rates associated with ratios involving

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

	7.RP.A.2 Recognize and re	present proportional relationships between quantities.
	<b>7.RP.A.2a</b> Decide whether testing for equivalent ratio observing whether the grap	two quantities are in a proportional relationship (e.g., by os in a table or graphing on a coordinate plane and h is a straight line through the origin).
Content Standards	<b>7.RP.A.2b</b> Identify the co equations, diagrams, and ve <b>7.RP.A.2c</b> Represent propo- cost t is proportional to the relationship between the to pn.	nstant of proportionality (unit rate) in tables, graphs, erbal descriptions of proportional relationships. ortional relationships by equations. For example, if total number n of items purchased at a constant price p, the stal cost and the number of items can be expressed as t =
	<b>7.RP.A.2d</b> Explain what a means in terms of the situa where <i>r</i> is the unit rate.	point $(x, y)$ on the graph of a proportional relationship tion, with special attention to the points (0, 0) and $(1, r)$
Explanations	Graphing proportional relat that the graph is a line thr equal to the slope of the lin	ionships represented in a table helps students recognize ough the origin (0,0) with a constant of proportionality e.
Content Limits	Rational numbers Ratios can be expressed as fractions, with ":", or with words Units can be the same or different across the two quantities Items should not require creating a graph of a proportional relationship (this is 8 EF 5) only interpreting given graphs	
Context	Context is allowed.	
Sample Tas	k Demands	Common Item Formats
Students will be required to relationship within a re- graph, table, etc). (a) Students will be required to reportional relationship	to recognize a proportional epresentation (description, o 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)		<ul> <li>Equation response</li> <li>Multiple Choice Response</li> <li>Multi-Select Response</li> <li>Simulator Response</li> </ul>
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)		

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

#### 7.RP.A.3

Content Standards	Use proportional relationsh simple interest, tax, marku percent increase and decre	nips to solve multi-step ratio and percent problems (e.g., ups and markdowns, gratuities and commissions, fees, ase, percent error).
Explanations	Students should be able to (numbers, words, pictures, answer is reasonable. Mode and how the values are rela identify the starting value, o the two values to the starting	explain or show their work using a representation physical objects, or equations) and verify that their els help students to identify the parts of the problem ated. For percent increase and decrease, students determine the difference, and compare the difference in ng value.
Content Limits	Limit to rational numbers Units can be the same or di	fferent across the two quantities
Context	Context is allowed.	
Sample Ta	sk Demands	Common Item Formats
Students will be required t percent and ratio problems	o calculate the solution for 5.	
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.		Equation recoonse
Students will be required to use percent increase or decrease to find two quantities given their relationship in a real world context.		<ul> <li>Graphic Response</li> <li>Multiple Choice Response</li> </ul>
Students will be required to interpret a proportional pattern from percent increase/decrease problems as a graph or as an equation.		

Minimally Proficient	Partially Proficient
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).
Proficient	Highly Proficient
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).