

ALPHA BORO PUBLIC SCHOOL

CONTENT AREA: Mathematics

GRADE: 7

UNIT #: 1

UNIT NAME: The Number System

#	STUDENT LEARNING OBJECTIVES	CORRESPONDING CCSS
1	Describe and model, on a horizontal and vertical number line, real-world situations in which rational numbers are combined.	7.NS.1
2	Apply the additive inverse property to subtraction problems and develop the argument that the distance between two points is the absolute value of the difference between their coordinates.	7.NS.1
3	Explain why a divisor cannot be zero and why division of integers results in a rational number.	7.NS.2
4	Model the multiplication and division of signed numbers using real-world contexts, such as taking multiple steps backwards.	7.NS.2
5	Convert a rational number to a decimal using long division and explain in oral or written language why the decimal is either a terminating or repeating decimal.	7.NS.2
6	Apply properties of operations as strategies to add, subtract, multiply, and divide rational numbers.	7.NS.2 7.NS.3
7	Solve mathematical and real-world problems involving addition, subtraction, multiplication, and division of rational numbers.	7.NS.3

Major Content Supporting Content (Identified by PARCC Model Content Frameworks).

Bold type indicates grade level fluency requirements. (Identified by PARCC Model Content Frameworks).

Selected Opportunities for Connection to Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.

ALPHA BORO PUBLIC SCHOOL

CONTENT AREA: Mathematics

GRADE: 7

UNIT #: 1

UNIT NAME: The Number System

- SLO #3 Present oral and written arguments.
- 4. Model with mathematics.**
SLOs #1 and #4 Apply the mathematics to describe situations that arise from their environments.
5. Use appropriate tools strategically.
6. Attend to precision.
- 7. Look for and make use of structure.**
SLO #6 Discern a structure then perform calculations appropriate for the structure.
8. Look for and express regularity in repeated reasoning.

All of the content presented at this grade level has connections to the standards for mathematical practices.

Bold type identifies possible starting points for connections to the SLOs in this unit.

Code #	Common Core State Standards
Z NS.1	<p>Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.</p> <ol style="list-style-type: none"> Describe situations in which opposite quantities combine to make 0. <i>For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.</i> Understand $p + q$ as the number located a distance q from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts. Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts. Apply properties of operations as strategies to add and subtract rational numbers.
Z NS.2	<p>Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.</p> <ol style="list-style-type: none"> 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 $(-1)(-1) = 1$

ALPHA BORO PUBLIC SCHOOL

CONTENT AREA: Mathematics

GRADE: 7

UNIT #: 1

UNIT NAME: The Number System

7.NS.3	<p>and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.</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 p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts.</p> <p>c. Apply properties of operations as strategies to multiply and divide rational numbers.</p> <p>d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.</p> <p>Solve real-world and mathematical problems involving the four operations with rational numbers.</p>
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Major Content Supporting Content

Additional Content (Identified by PARCC Model Content Frameworks).

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ALPHA BORO PUBLIC SCHOOL

CONTENT AREA: Mathematics

GRADE: 7

UNIT #: 2

UNIT NAME: Expressions and Equations

#	STUDENT LEARNING OBJECTIVES	CORRESPONDING CCSS
1	Apply the properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients (including additive and multiplicative inverse, distributive, commutative, and associative properties).	7.EE.1 7.EE.2
2	Use equivalent expressions to demonstrate the relationship between quantities and determine simpler solutions to a problem, such as $a + 0.05a = 1.05a$ means that "increase by 5%" is the same as "multiply by 1.05."	7.EE.2
3	Solve multi-step real life and mathematical problems with rational numbers in any form (fractions, decimals, percents) by applying properties of operations and converting rational numbers between forms as needed, and then assess the reasonableness of results using mental computation and estimation strategies.	7.EE.3
4	Use variables to represent quantities in a real-world or mathematical problem by constructing simple equations and inequalities to represent problems. <i>Equations of the form $px + q = r$ and $p(x + q) = r$ and inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers.</i>	7.EE.4
5	Fluently solve equations and inequalities and graph the solution set of the inequality; interpret the solutions in the context of the problem.	7.EE.4

Major Content Supporting Content

(Identified by PARCC Model Content Frameworks).

Additional Content

(Identified by PARCC Model Content Frameworks).

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ALPHA BORO PUBLIC SCHOOL

CONTENT AREA: Mathematics

GRADE: 7

UNIT #: 2

UNIT NAME: Expressions and Equations

Selected Opportunities for Connection to Mathematical Practices

1. **Make sense of problems and persevere in solving them.**
SLO 4 Compare arithmetic and algebraic solutions to the same real-world problems.
 2. **Reason abstractly and quantitatively.**
SLO 2 Find simpler but equivalent expressions
 3. Construct viable arguments and critique the reasoning of others.
 4. Model with mathematics.
 5. Use appropriate tools strategically.
 6. Attend to precision.
 7. **Look for and make use of structure.**
SLO 1 Examine the formation of rational expressions then perform appropriate arithmetic operations.
 8. Look for and express regularity in repeated reasoning.
- All of the content presented at this grade level has connections to the standards for mathematical practices.*

Bold type identifies possible starting points for connections to the SLOs in this unit.

Common Core State Standards	
Code #	
7.EE.1	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
7.EE.2	Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. <i>For example, $a + 0.05a = 1.05a$ means that "increase by 5%" is the same as "multiply by 1.05."</i>
7.EE.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making \$25 an hour gets a 10% raise, she will make an additional $1/10$ of her salary an hour, or \$2.50, for a new salary of \$27.50. If you want to place a towel bar $9\ 3/4$ inches long in the center of a door that is 27 $1/2$ inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check

ALPHA BORO PUBLIC SCHOOL

CONTENT AREA: Mathematics

GRADE: 7

UNIT #: 2

UNIT NAME: Expressions and Equations

	<p>on the exact computation.</p> <p>Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.</p> <p>a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?</p> <p>b. Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. For example: As a salesperson, you are paid \$50 per week plus \$3 per sale. This week you want your pay to be at least \$100. Write an inequality for the number of sales you need to make, and describe the solutions.</p>
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7.EE.A

Major Content Supporting Content (Identified by PARCC Model Content Frameworks).
Additional Content (Identified by PARCC Model Content Frameworks).

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ALPHA BORO PUBLIC SCHOOL

CONTENT AREA: Mathematics **GRADE:** 7 **UNIT #:** 3 **UNIT NAME:** Ratios and Proportions

#	STUDENT LEARNING OBJECTIVES	CORRESPONDING CCSS
1	Calculate and interpret unit rates of various quantities involving ratios of fractions that contain like and different units using real world examples such as speed and unit price. <i>For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction $\frac{1/2}{1/4}$ miles per hour, equivalently 2 miles per hour.</i>	7.RP.1
2	Determine if a proportional relationship exists between two quantities e.g. by testing for equivalent ratios in a table or graph on the coordinate plane and observing whether the graph is a straight line through the origin.	7.RP.2
3	Identify the constant of proportionality (unit rate) from tables, graphs, equations, diagrams, and verbal descriptions.	7.RP.2
4	Write equations to model proportional relationships in real world problems. <i>For example, if a recipe that serves 6 people calls for $2\frac{1}{2}$ cups of sugar. How much sugar is needed if you are serving only 2 people?</i>	7.RP.2
5	Represent real world problems with proportions on a graph and describe how the graph can be used to explain the values of any point (x, y) on the graph including the points (0, 0) and (1, r), recognizing that r is the unit rate.	7.RP.2
6	Solve multi-step ratio and percent problems using proportional relationships, including scale drawings of geometric figures, simple interest, tax, markups and markdowns, gratuities and commissions, and fees.	7.RP.3 7.G.1
7	Use freehand, mechanical (i.e. ruler, protractor) and technological tools to draw geometric shapes with given conditions (e.g. scale factor), focusing on constructing triangles.	7.G.2

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ALPHA BORO PUBLIC SCHOOL

CONTENT AREA: Mathematics

GRADE: 7

UNIT #: 3

UNIT NAME: Ratios and Proportions

Selected Opportunities for Connection to Mathematical Practices

1. **Make sense of problems and persevere in solving them.**
SLO 6 Use proportional relationships in real world context.
2. **Reason abstractly and quantitatively.**
SLO 7 Notice geometric conditions that determine a unique triangle.
3. Construct viable arguments and critique the reasoning of others.
4. **Model with mathematics.**
SLO 6 Represent proportional relationships symbolically.
5. **Use appropriate tools strategically.**
SLO 7 Use technology when available.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

All of the content presented at this grade level has connections to the standards for mathematical practices.

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Code #	Common Core State Standards
7.RP.1	<p>Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. <i>For example, if a person walks $1/2$ mile in each $1/4$ hour, compute the unit rate as the complex fraction $1/2/1/4$ miles per hour, equivalently 2 miles per hour.</i></p> <p>Recognize and represent proportional relationships between quantities.</p> <ol style="list-style-type: none"> 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. b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. c. Represent proportional relationships by equations. <i>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 $t = pn$.</i>
7.RP.2	

ALPHA BORO PUBLIC SCHOOL

CONTENT AREA: Mathematics	GRADE: 7	UNIT #: 3	UNIT NAME: Ratios and Proportions
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	<p>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.</p>
7.RP.3	<p>Use proportional relationships to solve multistep ratio and percent problems. <i>Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.</i></p>
7.G.1	<p>Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.</p>
7.G.2	<p>Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.</p>

Major Content Supporting Content (Identified by PARCC Model Content Frameworks).

Additional Content (Identified by PARCC Model Content Frameworks).

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ALPHA BORO PUBLIC SCHOOL

CONTENT AREA: Mathematics

GRADE: 7

UNIT #: 4

UNIT NAME: Statistics and Probability

#	STUDENT LEARNING OBJECTIVES	CORRESPONDING CCSS
1	Solve multi-step ratio and percent problems using proportional relationships (<i>simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error</i>).	7.RP.3
2	Distinguish between valid and invalid samples from a population by determining if the sample is representative of the subgroups within the population (<i>e.g. if the class had 50% girls and the sample had 25% girls, then the number of girls was not representative of the whole population</i>).	7.RP.3, 7.SP.1
3	Use random sampling to produce a representative sample, develop valid inferences about a population with an unknown characteristic of interest, and compare the variation in estimates using multiple samples of the same and different size.	7.SP.1 7.SP.2
4	Visually and numerically compare the means and variations of two distinct populations (such as the mean height of different sports teams) to draw informal comparative inferences about measures of center and variability using graphical representations and statistical calculations.	7.SP.3 7.SP.4
5	Interpret and express the likelihood of a chance event as a number between 0 and 1, relating that the probability of an unlikely event happening is near 0, a likely event is near 1, and 1/2 is neither likely nor unlikely.	7.SP.5
6	Conduct experimental probability events that are both uniform (<i>rolling a number cube multiple times</i>) and non-uniform (<i>tossing a paper cup to see if it lands up or down</i>) to collect and analyze data to make predictions for the approximate relative frequency of chance events.	7.RP.3, 7.SP.6
7	Develop uniform and non-uniform theoretical probability models by listing the probabilities of all possible outcomes in an event, for instance, the probability of the number cube landing on each number being 1/6. Then, conduct an experiment of the event using frequencies to determine the probabilities of each outcome and use the results to explain possible sources of discrepancies in theoretical and experimental probabilities.	7.SP.7


ALPHA BORO PUBLIC SCHOOL

CONTENT AREA: Mathematics

GRADE: 7

UNIT #: 4

UNIT NAME: Statistics and Probability

8	Design a simulation of a compound probability event and determine the sample space using organized lists, tables, and tree diagrams, calculate the fractional probabilities for each outcome in the sample space, and conduct the simulation using the data collected to determine the frequencies of the outcomes in the sample space.	
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Selected Opportunities for Connection to Mathematical Practices

- 1. Make sense of problems and persevere in solving them.**
SLO 1 Use problems that have several givens or must be decomposed before solving.
- 2. Reason abstractly and quantitatively.**
SLO 2 Present an argument and provide supporting justification
- 3. Construct viable arguments and critique the reasoning of others.**
- 4. Model with mathematics.**
SLO 5 Determine probability experimentally.
- 5. Use appropriate tools strategically.**
- 6. Attend to precision.**
- 7. Look for and make use of structure.**
- 8. Look for and express regularity in repeated reasoning.**

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ALPHA BORO PUBLIC SCHOOL

CONTENT AREA: Mathematics

GRADE: 7

UNIT #: 4

UNIT NAME: Statistics and Probability

Code #	Common Core State Standards
7.RP.3	Use proportional relationships to solve multistep ratio and percent problems. <i>Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.</i>
7.SP.1	Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.
7.SP.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.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.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.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.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.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

ALPHA BORO PUBLIC SCHOOL

CONTENT AREA: Mathematics

GRADE: 7

UNIT #: 4

UNIT NAME: Statistics and Probability

	<p>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. 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 style="text-align: center;">7.SP.8</p>	<p>Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.</p> <p>a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.</p> <p>b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event.</p> <p>c. Design and use a simulation to generate frequencies for compound events. <i>For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?</i></p>

Major Content Supporting Content

(Identified by PARCC Model Content Frameworks).

Additional Content (Identified by PARCC Model Content Frameworks).

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ALPHA BORO PUBLIC SCHOOL

CONTENT AREA: Mathematics

GRADE: 7

UNIT #: 5

UNIT NAME: Geometry

#	STUDENT LEARNING OBJECTIVES	CORRESPONDING CCSS
1	Use variables to represent quantities in a real-world or mathematical problem; write and fluently solve simple equations and inequalities, interpret the solutions in the context of the problem and graph the solution set on a number line. [Please note this unit addresses standard 7.EE.4 again to assess fluency.]	7.EE.4
2	Use tools strategically to solve multi-step real-world and mathematical problems involving positive and negative rational numbers in any form (converting between forms as needed) and determine the reasonableness of the answers. [Please note this unit addresses standard 7.EE.3 again to assess fluency.]	7.EE.3
3	Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.	7.G.6 7.EE.3 7.EE.4
4	Write and solve simple algebraic equations involving supplementary, complementary, vertical, and adjacent angles for multi-step problems and finding the unknown measure of an angle in a figure.	7.G.5
5	Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.	7.G.4
6	Describe, using drawings or written descriptions, the 2-dimensional figures that result when 3-dimensional figures (right rectangular prisms and pyramids) are sliced from multiple angles given both concrete models and a written description of the 3-dimensional figure.	7.G.3

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ALPHA BORO PUBLIC SCHOOL

CONTENT AREA: Mathematics

GRADE: 7

UNIT #: 5

UNIT NAME: Geometry

Selected Opportunities for Connection to Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
SLO 4 Represent problems involving geometric concepts algebraically.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
SLO 3 Use geometric models of 3-D objects.
5. Use appropriate tools strategically.
SLO 2 Represent problems involving real-world circumstances using the number line.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.
SLO 5 Apply the correct formula when solving problems .

All of the content presented at this grade level has connections to the standards for mathematical practices.

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Code #	Common Core State Standards
7.EE.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making \$25 an hour gets a 10% raise, she will make an additional $\frac{1}{10}$ of her salary an hour, or \$2.50, for a new salary of \$27.50. If you want to place a towel bar $9\frac{3}{4}$ inches long in the center of a door that is $27\frac{1}{2}$ inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.
7.EE.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the

ALPHA BORO PUBLIC SCHOOL

CONTENT AREA: Mathematics

GRADE: 7

UNIT #: 5

UNIT NAME: Geometry

	<p>sequence of the operations used in each approach. For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?</p> <p>b. Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. For example: As a salesperson, you are paid \$50 per week plus \$3 per sale. This week you want your pay to be at least \$100. Write an inequality for the number of sales you need to make, and describe the solutions.</p>
7.G.3	Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.
7.G.5	Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.
7.G.4	Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.
7.G.6	Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Major Content Supporting Content

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