



PISCATAWAY TOWNSHIP SCHOOLS

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Math 7

Content Area: Mathematics

Grade Span: 7

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COURSE OVERVIEW

Description

Math 7 centers on understanding and applying proportional relationships. Students start by studying scale drawings in Unit 1, which sets up the introduction of proportional relationships in Unit 2. In Unit 3, students apply proportional relationships to understand the circumference and area of circles. Unit 4 invites students to use proportional relationships to solve problems involving fractional quantities and percent change. In Unit 5, students extend what they learned in Math 6 to add, subtract, multiply, and divide positive and negative numbers, which leads into work on expressions, equations, and inequalities in Unit 6. The year ends with geometry, probability, and statistics as students study angles, triangles, and prisms in Unit 7 and probability and sampling in Unit 8.

Students will investigate the Math 7 curriculum through a lens of the 8 Standards of Mathematical Practice.

Goals

Geometry:

- Draw, construct and describe geometrical figures and describe the relationships between them.
- Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

Ratios and Proportionality:

- Find and use unit rates.
- Identify and represent proportional relationships.
- Use graphs to represent and analyze proportional relationships

Proportions and Percentages:

- Solve problems involving percent change.
- Solve markup and markdown problems.
- Use percentages to find sales tax, tip, total cost, and simple interest.

The Number System:

- Identify and classify sets of rational numbers.
- Add, subtract, multiply, and divide integers
- Add, subtract, multiply, and divide rational numbers
- Use the properties of numbers as strategies to add, subtract, multiply, and divide rational numbers

Expressions and Equations:

- Add, subtract, factor, and multiply algebraic expressions.
- Write two-step equations.
- Solve two-step equations.
- Graph the solution to inequalities.
- Write two-step inequalities.
- Solve two-step inequalities.

Probabilities and Statistics:

- Investigate chances of a random event occurring and develop, use, and evaluate probability models.
- Use random sampling to draw inferences and predictions about a population
- Draw comparative inferences about two or more populations.

Mathematical Practices:

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.

- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning

Scope and Sequence

Unit	Topic	Length
Unit 1	Scale Drawing	15-19
Unit 2	Introducing Proportional Relationships	20-23
Unit 3	Measuring Circles	15-18
Unit 4	Proportional Relationships and Percentages	21-24
Unit 5	Operations with Positive and Negative Numbers	23-27
Unit 6	Expressions, Equations, and Inequalities	23-26
Unit 7	Angles, Triangles, and Prisms	19-22
Unit 8	Probability and Statistics	21-24

Resources

Core Text:

Suggested Resources:

UNIT 1: Scale Drawing

Summary and Rationale

In this unit, students examine and create scaled copies of figures, as well as explore scale drawings of real-life objects. In this unit, scaled copies have the same orientation as the original figure. Students explore objects that are and are not scaled copies of one another. They describe how scaling affects lengths, angles, and areas in scaled copies, and use scale factors to create and compare scaled copies. In Grade 8, students will extend their knowledge of scaled copies to similar figures when they study translations, rotations, reflections, and dilations. Students use what they know about scaled copies to create and analyze scale drawings of real-life objects.

Recommended Pacing

15-19 days

State Standards

Standard 7.G Geometry

CPI #	Cumulative Progress Indicator (CPI)
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1	Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale
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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.
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Instructional Focus

Unit Enduring Understandings

- Describe how scaling affects lengths, angles, and areas in scaled copies.
- Use scale factors to create and compare scaled copies.
- Represent distances in the real world using scales and scale drawings.

Unit Essential Questions

- How can you use scale drawing to solve problems?

Objectives

Students will know:

- Scale is a ratio between two sets of measurements, usually written as two numbers separated by a colon, which can also be written as a fraction.
- Scale drawing is proportional to a life size drawing of the same object.
- Scale drawing problems can be solved using proportions to find equivalent ratios.

Students will be able to:

- Use scale drawings to solve problems.

Resources

Core Text:

<https://www.desmos.com/curriculum>

Suggested Resources: IXL, Delta Math, Quizizz, Gimkit, EdPuzzle, GeoGebra

UNIT 2: Introducing Proportional Relationships

Summary and Rationale

In this unit, students learn what a proportional relationship is, how it is represented, and what types of contexts can be modeled by proportional relationships. Students recognize proportional relationships represented in tables and calculate constants of proportionality using tables. This builds on students' work with equivalent ratios in Grade 6. Students use what they know about the constant of proportionality to write and interpret equations describing proportional relationships. Students explore graphs of proportional relationships and use graphs to determine constants of proportionality. This work supports students with the study of slope in Grade 8. Students use all of the representations of proportional relationships to solve real-world and mathematical problems.

Recommended Pacing

20-23 days

State Standards

Standard 7.RP Ratios and Proportional Relationships

CPI #	Cumulative Progress Indicator (CPI)
2	Recognize and represent proportional relationships between quantities
2a	Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.
2b	Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
2c	Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p , the relationship between the total cost and the number of items can be expressed as $t = pn$. d. Explain what a point (x, y) on the graph of a proportional relationship means i
2d	Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points $(0, 0)$ and $(1, r)$ where r is the unit rate.

Instructional Focus

Unit Enduring Understandings

- Reasoning with ratios involves attending to and coordinating two quantities.
- Ratios can be meaningfully reinterpreted as quotients.
- A proportion is a relationship of equality between two ratios. In a proportion, the ratio of two quantities remains constant as the corresponding values of the quantities change.
- Proportional reasoning is complex and involves understanding that -
 - Equivalent ratios can be created by iterating and/or partitioning a composed unit;
 - If one quantity in a ratio is multiplied or divided by a particular factor, then the other quantity must be multiplied or divided by the same factor to maintain the proportional relationship; and must be multiplied or divided by a particular factor, then the other quantity must be multiplied or divided by the same factor to maintain the proportional relationship; and
 - the two types of ratios - composed units and multiplicative comparison - are related.
- A rate is a set of infinitely many equivalent ratios.

Unit Essential Questions

- How do you find and use unit rates?
- How can you identify and represent proportional relationships?
- How can you use graphs to represent and analyze proportional relationships?

Objectives

Students will know:

- Ratios, rates, and unit rates.
- Constant rate of change.
- Constant of proportionality.
- The graphs of proportional relationships.
- Identify whether a table, equation, and graph is proportional
- Compare the constant of proportionality in a table, equation, and graph is proportional

Students will be able to:

- Recognize proportional relationships represented in tables.
- Find the constant of proportionality using tables.
- Write equations describing proportional relationships.
- Recognize proportional relationships represented in equations.
- Find the constant of proportionality using equations.
- Recognize proportional relationships represented in graphs.
- Find the constant of proportionality using graphs.
- Use proportional relationships to solve real-world and mathematical problems.

Resources

Core Text:

<https://www.desmos.com/curriculum>

Suggested Resources:

deltamath.com
edulastic.com
quizizz.com
gimkit.com
edpuzzle.com
khanacademy.com
ixl.com
thatquiz.org

UNIT 3: Measuring Circles

Summary and Rationale	
<p>In this unit, students explore the relationships between the radius, diameter, circumference, and area of a circle. Students also practice writing and using equations to calculate missing measurements, which they will revisit in Units 4 and 6. Students recognize that the relationships between radius, diameter, and circumference of a circle are proportional and use those relationships to calculate missing measurements. Students recognize that the relationships between the radius and area of a circle is not proportional. They explain and use the formula for the area of a circle to solve problems. Students will use this work to determine the volume of cylinders, cones, and spheres in Grade 8.</p>	
Recommended Pacing	
15-18 days	
State Standards	
Standard 7.RP Ratios and Proportional Relationships	
CPI #	Cumulative Progress Indicator (CPI)
2a	Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.
Standard 7.G Geometry	
CPI #	Cumulative Progress Indicator (CPI)
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.
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.
Instructional Focus	
Unit Enduring Understandings	
<ul style="list-style-type: none"> • Measurements can be found using indirect methods. • Use the relationships between radius, diameter, and circumference to calculate missing measurements. • Explain and use the formula for the area of a circle to solve problems. 	
Unit Essential Questions	
<ul style="list-style-type: none"> • How can you find and use the circumference and area of a circle? 	
Objectives	
<p>Students will know:</p> <ul style="list-style-type: none"> • Parts of a circle. • common approximations for pi as 3.14 and $\frac{22}{7}$. • The relationship between the radius and diameter of a circle. • The relationship between the circumference and area of a circle. • The formulas for circumference and area of a circle. <p>Students will be able to:</p> <ul style="list-style-type: none"> • Find and use the circumference of a circle. 	

- Find the area of a circle.

Resources

Core Text: <https://www.desmos.com/curriculum>

Suggested Resources: IXL, Delta Math, Quizizz, Gimkit, EdPuzzle, GeoGebra

UNIT 4: Proportional Relationships and Percentages

Summary and Rationale	
<p>In this unit, students apply what they have learned in Unit 2 about proportional relationships to solve problems involving fractional quantities and percent change. Students use tape diagrams, tables, and double number lines to represent proportional relationships involving fractional quantities and percentages. Students also practice writing and using equations of proportional relationships involving percent change. This prepares students to explore exponential functions involving percent change in high school. Students interpret and solve problems about real-world situations involving proportional relationships and percent change.</p>	
Recommended Pacing	
21-24 days	
State Standards	
Standard 7.RP Ratios and Proportional Relationships	
CPI #	Cumulative Progress Indicator (CPI)
1	Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks $\frac{1}{2}$ mile in each $\frac{1}{4}$ hour, compute the unit rate as the complex fraction $\frac{1/2}{1/4}$ miles per hour, equivalently 2 miles per hour.
2	Recognize and represent proportional relationships between quantities.
3	Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error
Standard 7.EE Expressions and Equations	
CPI #	Cumulative Progress Indicator (CPI)
2	Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. For example, $a + 0.05a = 1.05a$ means that “increase by 5%” is the same as “multiply by 1.05.”
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.
Instructional Focus	
Unit Enduring Understandings	
<ul style="list-style-type: none"> • Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. For example, $a + 0.05a = 1.05a$ means that “increase by 5%” is the same as “multiply by 1.05.” 	
Unit Essential Questions	
<ul style="list-style-type: none"> • How can you represent the expression $a + 0.05a$ by a single variable? What does that mean in a real-world problem? 	
Objectives	
<p>Students will know:</p> <ul style="list-style-type: none"> • Find the part, whole and percentage by using models and proportions • Find percent increase and decrease • Compare relationships that involve fractional quantities Students represent situations involving percent increase or decrease using equations and make connections between different ways to write that equation. • The meaning of percent decrease and percent increase. 	

- Taxes, tips, simple interest and markups are related as they will increase the initial value.
- Discounts and markdowns are related as they will decrease the initial value.
- The meaning of principal as the original amount of money deposited or borrowed and simple interest as a fixed percent of the principal.

Students will be able to:

- Determine missing measurements in proportional relationships involving fractional quantities or percentages.
- Represent proportional relationships using tape diagrams, tables, double number lines, and equations.
- Interpret and solve problems about real-world situations involving proportional relationships and percent change.

Resources

Core Text:

<https://www.desmos.com/curriculum>

Suggested Resources:

deltamath.com

edulastic.com

quizizz.com

gimkit.com

edpuzzle.com

khanacademy.com

ixl.com

thatquiz.org

Unit 5: Operations with Positive and Negative Numbers

Summary and Rationale	
<p>In this unit, students extend what they learned in Grade 6 to add, subtract, multiply, and divide positive and negative numbers. Students use a variety of strategies and mental models to add and subtract negative numbers. Students extend what they learned in Section 1 to make sense of multiplying and dividing positive and negative numbers. Sections 1 and 2 prepare students to solve equations with positive and negative numbers in Unit 6. Students apply what they have learned to understand issues in society.</p>	
Recommended Pacing	
23-27 days	
State Standards	
Standard 7.NS	
CPI #	Cumulative Progress Indicator (CPI)
1	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.
1a	Describe situations in which opposite quantities combine to make 0. <i>For example, in the first round of a game, Maria scored 20 points. In the second round of the same game, she lost 20 points. What is her score at the end of the second round?</i>
1b	Understand $p + q$ as the number located a distance $ q $ from p , in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.
1c	Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.
1d	Apply properties of operations as strategies to add and subtract rational numbers
2	Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.
2a	Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.
2b	Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real world contexts.
2c	Apply properties of operations as strategies to multiply and divide rational numbers.
2d	Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats
3	Solve real-world and mathematical problems involving the four operations with rational numbers.
Instructional Focus	
Unit Enduring Understandings	
<ul style="list-style-type: none"> Students will understand that the numbers with various properties are subsets within the Real Number System. 	

- Students will understand that the techniques of algebra are tools to model and analyze real-world situations.
- Students will understand that there are a variety of strategies and combinations of techniques to choose from to solve a problem.

Unit Essential Questions

- How do you add integers with the same sign?
- How do you add integers with different signs?
- How do you subtract integers?
- How do you solve multi step problems involving addition and subtraction of integers?
- How do you multiply integers?
- How do you divide integers?
- How can you convert a rational number to a decimal?
- How can you add rational numbers?
- How do you subtract rational numbers?
- How do you decide whether to model a real-world situation with addition or subtraction?
- How do you multiply rational numbers?
- How do you divide rational numbers?
- How can you justify your steps when solving mathematical and real-world problems?
- How do you use different forms of rational numbers and strategically choose tools to solve problems?

Objectives

Students will know:

- Absolute value.
- The meaning of additive inverse.
- The closure property.
- The properties of addition.
- The properties of multiplication.
- Sets and subsets of rational numbers.
- The order of operations.
- Rational number, repeating decimals, terminating decimals.
- The steps of multiplying rational numbers.
- The steps of dividing rational numbers.
- Complex fractions.

Students will be able to:

- To add integers with the same sign.
- Add integers with different signs.
- Subtract integers.
- Solve multistep problems involving addition and subtraction of integers.
- Multiply integers.
- Divide integers.
- Use integer operations to solve real-world problems.
- Convert rational numbers to decimals.
- Add rational numbers.
- Subtract rational numbers.
- Multiply rational numbers.
- To divide rational numbers.

- Convert fractions and decimals to compare.
- Use different forms of rational numbers and strategically choose tools to solve problems.

Resources

Core Text:

<https://www.desmos.com/curriculum>

Suggested Resources:

deltamath.com

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edpuzzle.com

khanacademy.com

ixl.com

thatquiz.org

Unit 6: Expressions, Equations, and Inequalities

Summary and Rationale	
<p>In this unit, students extend what they learned in Grade 6 about solving one-step equations to solve equations of the form $px+q=r$ and $p(x+q)=r$, and equations that include expanding, factoring, or adding terms. Students also solve inequalities and graph their solutions on a number line. Students use tape diagrams to represent equations and situations in context and to determine unknown values. This builds on students' work with tape diagrams in Grade 7, Unit 4 and with determining unknown values in equations in Grade 7, Unit 5. Students learn how to solve equations of the form $px+q=r$ and $p(x+q)=r$ in and out of context. They also rewrite expressions using fewer terms by adding, expanding, and factoring, which can help make complex equations look more familiar before solving. This section builds on work from Grade 6 with solving one-step equations, which will support students when solving equations with variables on both sides in Grade 8. Students use what they have learned about solving equations to solve inequalities that represent situations in and out of context. They also create graphs that represent solutions to inequalities, including those with \leq or \geq. Students' work in this section will support them in making sense of inequalities in the coordinate plane in high school.</p>	
Recommended Pacing	
23-26 days	
State Standards	
Standard 7.EE Expressions and Equations	
CPI #	Cumulative Progress Indicator (CPI)
1	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
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. <i>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.</i>
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
4a	Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. <i>For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?</i>
4b	Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p , q , and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. <i>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.</i>
Instructional Focus	
Unit Enduring Understandings	
<ul style="list-style-type: none"> • Simplifying expressions shows a problem in a different but equivalent way. • There are many representations of an algebraic model. 	

- Students will understand that incorporating a combination of techniques of computation may be necessary to solve problems.
- Students will understand that mathematical statements can be justified in oral, symbolic, and written forms.
- Students will understand that the techniques of algebra are tools to model and analyze real-world situations.
- Use tape diagrams to represent equations and situations in context and to determine unknown values.

Unit Essential Questions

- How do you add, subtract, factor, and multiply algebraic expressions?
- Do properties and procedures change among different mathematical systems?
- When is simplifying expressions helpful and when is it harmful?
- Are different forms necessary?
- What is the most effective way to solve a problem? What is the best answer?
- How do you write a two-step equation?
- How do you write and solve one-step inequalities?
- How do you write a two-step inequality?
- How do you solve a two-step inequality?

Objectives

Students will know:

- The parts of an algebraic expression and equation.
- The solution to one and two step equations.
- Inverse operations.
- Inequality symbols.
- The solution to inequalities.

Students will be able to:

- Add, subtract, factor, and multiply algebraic expressions.
- Use one-step equations with rational coefficients to solve problems to solve problems.
- Write two-step equations.
- Model two step equations.
- Check the solution to an equation.
- Solve two-step equations.
- Write and solve one-step inequalities.
- Test the solution to inequalities.
- Graph the solution to inequalities.
- Write two-step inequalities.
- Solve two-step inequalities.

Resources

Core Text: <https://www.desmos.com/curriculum>

Suggested Resources: IXL, Delta Math, Quizizz, Gimkit, EdPuzzle, GeoGebra

Unit 7: Angles, Triangles, and Prisms

Summary and Rationale	
<p>In this unit, students solve real-life and mathematical problems involving angle measures, volume, and surface area. Students also explore whether it is possible to draw no triangles, one triangle, or more than one triangle given three measures of sides or angles. Students use facts about complementary, supplementary, and vertical angles to determine unknown angle measures. They also build on their work from Unit 6 to write and solve equations for unknown angles in a diagram. This work supports students in using transformations to discover the relationship between angles in a triangle in Grade 8. Students build and draw triangles given three measures of side lengths or angles, and then determine whether it is possible to draw one unique triangle, more than one triangle, or no triangle with these measurements. This work supports students in understanding congruence in Grade 8 and criteria for triangle congruence in high school. Students solve problems involving the volume and surface area of right prisms. They also describe, compare, and contrast cross sections of prisms and pyramids. This work supports students in calculating the volumes of cylinders, cones, and spheres in Grade 8.</p>	
Recommended Pacing	
19-22 days	
State Standards	
Standard 7.EE Expressions and Equations	
CPI #	Cumulative Progress Indicator (CPI)
2	Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. For example, $a + 0.05a = 1.05a$ means that “increase by 5%” is the same as “multiply by 1.05.”
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.
Standard 7.G Geometry	
CPI #	Cumulative Progress Indicator (CPI)
2	Draw (with technology, with ruler and protractor, as well as freehand) 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.
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.
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.
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.
Instructional Focus	
Unit Enduring Understandings	
<ul style="list-style-type: none"> • Mathematical statements can be justified in oral, symbolic and written form. • Measurements can be found using indirect methods. • The interrelation among shapes leads to describing relationships and vice-versa. 	
Unit Essential Questions	

- What is the best way to measure?
- What is the best way to communicate mathematically?
- How does geometry help build structures?
- How can you use proportions to solve real-world geometry problems?
- How can you draw shapes that satisfy given conditions?
- How can you identify cross sections of three dimensional figures?
- How can you use angle relationships to solve problems?
- How can you find the area of compound figures?
- How can you find the surface area and volume of solids made out of prisms?

Objectives

Students will know:

- Rulers, protractors, and compasses are tools that can be used to draw geometric figures.
- Characteristics of adjacent, complementary, congruent, supplementary, vertical angles.
- Unknown angles in a diagram can be found by writing and solving equations using angle relationships
- When only the angle measures are given, a unique triangle is not determined.
- Two angle measures and the included side determine a unique triangle.
- The sum of the two shorter sides of a triangle must be greater than the third side.
- Find the area of rectangle, triangle, trapezoid and parallelogram
- A three-dimensional figure can have many cross sections.
- The shape of a cross section depends on the angle and the placement of the slice.
- The relationship of a pyramid is $\frac{1}{3}$ of a prism with the same base and height.
- To use a formula chart or research formulas necessary to find the area, circumference, surface area or volume of given figures.

Students will be able to:

- Draw shapes that satisfy given conditions.
- Identify cross sections of three-dimensional figures.
- Use angle relationships to solve problems.
- Find the area of composite figures.
- Find the surface area of a figure made up of cubes and prisms.
- Find the volume of figures made of cubes and prisms.

Resources

Core Text:

<https://www.desmos.com/curriculum>

Suggested Resources:

IXL, DeltaMath, Khan Academy, EdPuzzle, Gimkit, Kahoot, Quizizz, GeoGebra

Unit 8: Probability and Statistics

Summary and Rationale

In the first section of the unit, students learn about probability as a way to describe the likelihood of unknown events and use simulations to estimate the probability of real-world situations. In the second section, students use samples to draw conclusions about and compare populations. Students determine the probability of unknown events and compare the results of repeated experiments and the expected probability. They also design and perform simulations to estimate the probability of multistep real-world situations. Students use measures of center and measures of variability from random samples to draw conclusions about and compare populations. Students also explain the purpose of sampling and which methods tend to produce representative samples. This builds on the work students did in Grade 6 analyzing data sets and distributions using mean, median, MAD, and IQR.

Recommended Pacing

21-24 days

State Standards

Standard 7.SP Statistics and Probability

CPI #	Cumulative Progress Indicator (CPI)
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.
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.
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>
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>
5	Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around $\frac{1}{2}$ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.
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	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.

7a	Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. <i>For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.</i>
7b	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>
8	Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.
8a	Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.
8b	Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event.
8c	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>

Instructional Focus

Unit Enduring Understandings

- Mathematics provides tools to weigh and analyze outcomes.
- Representing and analyzing data assists in making informed decisions.
- You can solve real-world problems involving large populations by modeling them with smaller random samples and then analyzing the samples.
- Probability is a way of predicting outcomes, but it does not assure outcomes.

Unit Essential Questions

Probability:

- What is the best way to represent data?
- How does evaluating the probabilities of outcomes affect decisions?
- How can you describe the likelihood of an event?
- How do you find experimental probability of a simple event?
- How do you find experimental probability of compound events?
- How do you make predictions using experimental probability?
- Why does it make sense to express the chance of something happening using percentages?
- How can you find the theoretical probability of a simple event?
- How do you find the theoretical probability of a compound event?
- How do you make the predictions using theoretical probability?

Statistics:

- Why is data collected and analyzed?
- Is all data reliable?
- How do people use data to influence others?
- How can you use a random sample to gain information about a population?
- How can you generate and use random samples to represent a population?
- How and when do you compare data using dot plots?
- How and when do you compare data using box plots?

Objectives

Students will know:

- The chance of something happening can be expressed using words or numbers.
- An experiment is an activity involving a chance in which results are observed.
- A simulation is a model for an experiment which would be very difficult to actually perform.
- The probability of an event measures the likelihood that the event will occur.
- The sample space is a set of all possible outcomes for an event.
- The complement of an event is the set of all outcomes that are not included in the event.
- The probability of an event and probability of its complement add up to 1.
- Experimental probability is the ratio of the number of times something occurs to the total number of trials.
- Theoretical probability is a ratio of the number of ways an event can occur to the total number of possible outcomes.
- The probability of a simple event is the probability of a single event occurring.
- The probability of a compound event is the probability of more than one event happening together.
- Compound events can be independent or dependent.
- Recorded data can be used to make predictions.
- The difference between a population and a sample.
- Sampling methods, random samples, and biased samples.
- Measures of center: mean, median, mode, range.
- Measures of variability: mean absolute deviation (MAD), interquartile range (IQR), upper/lower quartiles
- Outliers and their effect on the measures of center and variability in a data set

Students will be able to:

- Find and use equivalent fractions, decimals and percentages to compare values
- Describe the likelihood of an event.
- Find the experimental probability of simple and compound events.
- Find the theoretical probability of simple and compound events.
- Use theoretical and experimental probability to make predictions.
- Determine sample space using tables, lists, tree diagrams, and the counting principle.
- Use technology simulations to estimate probabilities.
- Generate and use random samples to represent a population.
- Determine whether a sample is representative of a population.
- Use a sample to gain information and make inferences about a population.
- Use proportions to make inferences or predictions about a population.
- Create, interpret, and compare box plots and dot plots.
- Calculate the mean, median, mode, range, IQR, and MAD of a given data set.
- Use statistical measures to compare populations.

Resources**Core Text:**

<https://www.desmos.com/curriculum>

Suggested Resources:

IXL, DeltaMath, Khan Academy, EdPuzzle, Gimkit, Kahoot, Quizizz