Ohio Mathematics - Extended Learning Standards

Grade 7

Ratio and Proportional Relationships

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

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 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. 7.RP.1

Complexity a

a Given a model or pictures of a ratio, build the unit rate (e.g., given 12 pieces of candy for $3, find the unit rate). 7.RP.1.A

Complexity b

b Given a model of a unit rate, build equivalent ratios (e.g., every 4 pieces of candy cost $1. Using candy and play $1 bills, build equivalent ratios.). 7.RP.1.B

Complexity c

c Given models of equivalent ratios, identify the unit rate. Using candy and play $1 bills, the student is shown 6 candies for $2, 9 candies for $3, and 3 candies for $1. Identify the unit rate. 7.RP.1.C

Learning Progression

- Count physical objects up to 10. 7.RP.1.LP.A
- Sort a collection of two types of objects using a given criteria (bananas and oranges). 7.RP.1.LP.B
- Count the number of objects in a given group (bananas and oranges). 7.RP.1.LP.C
- Identify differences in two types of objects. 7.RP.1.LP.D
- Identify the value of dollars. 7.RP.1.LP.E
- Know the symbol for dollars ($). 7.RP.1.LP.F
- Know that unit rate means per (for) every 1. 7.RP.1.LP.G
- Engagement Statements (demonstration of engaged in the topic) 7.RP.1.LP.H
- Interact with physical objects. 7.RP.1.LP.I
- Interact with dollar bills. 7.RP.1.LP.J

2 Recognize and represent proportional relationships between quantities. a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. 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. 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 in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate. 7.RP.2

Complexity a

a1 Given a graph of a proportion, find an ordered pair on the line. 7.RP.2.A1

a2 Using models, determine whether two quantities represent a proportion. 7.RP.2.A2

Complexity b

b1 Given three ordered pairs that represents a proportional relationship, plot them on a coordinate grid and connect the line. 7.RP.2.B1

b2 Find a missing value in a ratio table. Students may use manipulatives to find the answer. 7.RP.2.B2

Complexity c

c1 Identify if a graph represents a proportional relationship. 7.RP.2.C1

c2 Build a proportion with objects such as blocks and record the information in a table. 7.RP.2.C2

Learning Progression

- Identify points on a horizontal number line (scale limited to whole numbers 1-10). 7.RP.2.LP.A
- Identify points on a vertical number line (scale limited to whole numbers 1-10). 7.RP.2.LP.B
- Understand a coordinate grid is formed by a vertical and horizontal number line. 7.RP.2.LP.C
- Recognize the horizontal number line as the x-axis. 7.RP.2.LP.D
- Recognize the vertical number line as the y-axis. 7.RP.2.LP.E
- Recognize the intersection of the x-axis and y-axis as the origin. 7.RP.2.LP.F
- Identify a line. 7.RP.2.LP.G
- Identify the point (0,0) on a graph. 7.RP.2.LP.H
- Represent a numeral with physical objects. 7.RP.2.LP.I
- Recognize and compare differences between two sets of objects. 7.RP.2.LP.J
- Represent two sets of different objects. 7.RP.2.LP.K
- Count physical objects up to 100 by ones and tens. 7.RP.2.LP.L
- Count the number of objects in a given group (bananas and oranges). 7.RP.2.LP.M
- Demonstrate understanding of the word “equal”. 7.RP.2.LP.N
- Understand that a table is made up of columns and rows. 7.RP.2.LP.O
- Engagement Statements (demonstration of engaged in the topic) 7.RP.2.LP.P
- Interact with physical objects. 7.RP.2.LP.Q

- Interact with two different sets of physical objects. 7.RP.2.LP.R
- Interact with a graph or table. 7.RP.2.LP.S

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. 7.RP.3

Complexity a

a Find the percent of a number in realworld problem involving tax or gratuity. 7.RP.3.A

Complexity b

b Find the percent of a number. 7.RP.3.B

Complexity c

c Find 10%, 20%, and 30% of a number given a model of 100 units. 7.RP.3.C

Learning Progression

- Count physical objects up to 100 by ones and tens. 7.RP.3.LP.A
- Represent a number of objects up to 100 on a hundred grid. 7.RP.3.LP.B
- Use a physical representation to skip count by 10s. 7.RP.3.LP.C
- Recognize the percent symbol. 7.RP.3.LP.D
- Identify the percent symbol on a calculator. 7.RP.3.LP.E
- Demonstrate finding a percent on a calculator. 7.RP.3.LP.F
- Know that percent is out of 100. 7.RP.3.LP.G
- Engagement Statements (demonstration of engaged in the topic) 7.RP.3.LP.H
- Interact with a calculator. 7.RP.3.LP.I
- Interact with a model. 7.RP.3.LP.J

The Number System

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

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. a. Describe situations in which opposite quantities combine to make 0. For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged. b. Understand p + q as the number located a distance |q| from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts. c. Understand subtraction of rational numbers as adding the additive inverse, p − q = p + (−q). Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts. d. Apply properties of operations as strategies to add and subtract rational numbers. 7.NS.1

Complexity a

a Add and subtract integers. 7.NS.1.A

Complexity b

b1 Recognize that the absolute value of an integer is how far it is from 0 on the number line (e.g., plot a number and its opposite on a number line and recognize that they are equidistant from zero). 7.NS.1.B1

b2 Add and subtract whole numbers using models. 7.NS.1.B2

Complexity c

c1 Recognize that addition means move to the right and subtraction means move to the left on a number line. 7.NS.1.C1

c2 Add whole numbers using models. 7.NS.1.C2

Learning Progression

- Know what a number line is. 7.NS.1.LP.A
- Know the order of the numbers from 0 to 10. 7.NS.1.LP.B
- Identify a whole number on a number line marked with whole numbers up to 10. 7.NS.1.LP.C
- Identify 0 on a number line. 7.NS.1.LP.D
- Identify the symbols (+) and (-). 7.NS.1.LP.E
- Engagement Statements (demonstration of engaged in the topic) 7.NS.1.LP.F
- Interact with a model. 7.NS.1.LP.G

2 **Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide 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 contexts. b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with nonzero 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. c. Apply properties of operations as strategies to multiply and divide rational numbers. 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.** 7.NS.2

Complexity a

a Multiply and divide integers using models. 7.NS.2.A

Complexity b

b Multiply and divide whole numbers using models. 7.NS.2.B

Complexity c

c Multiply whole numbers using models. 7.NS.2.C

Learning Progression

- Create and count multiple groups of using objects. 7.NS.2.LP.A
- Repeatedly add groups using physical objects. 7.NS.2.LP.B
- Understand the numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones). 7.NS.2.LP.C
- Know the symbols for multiplication (×) and equals (=). 7.NS.2.LP.D
- Relate a picture or objects to a number sentence. 7.NS.2.LP.E
- Recognize and identify the (x) and (=) keys on a calculator 7.NS.2.LP.F
- Engagement Statements (demonstration of engaged in the topic) 7.NS.2.LP.G
- Interact with a calculator. 7.NS.2.LP.H
- Interact with a model. 7.NS.2.LP.I
- Interact with physical objects or other representations of multiplication. 7.NS.2.LP.J

3 **Solve real-world and mathematical problems involving the four operations with rational numbers. Computations with rational numbers extend the rules for manipulating fractions to complex fractions.** 7.NS.3

Complexity a

a Multiply fractions when solving real-world and mathematical problems using models. 7.NS.3.A

Complexity b

b Add and subtract fractions with same/unlike denominator when solving real-world and mathematical problems using models. 7.NS.3.B

Complexity c

c Add fractions with same denominator when solving real-world and mathematical problems using models. 7.NS.3.C

Learning Progression

- Identify a unit fraction (1/4 or ½) as part of a whole when shown as a physical and/or visual representation. 7.NS.3.LP.A
- Identify the symbols (+) and (=). 7.NS.3.LP.B
- Recognize that in a fraction the top number is the numerator and the bottom number is the denominator. 7.NS.3.LP.C
- Identify the same sized whole partitioned into 2, 3, 4, 5, 6, 8, and 10 equal shares. 7.NS.3.LP.D
- Recognize the value of a whole fractional shaded part. 7.NS.3.LP.E
- Identify ½ , 1/3 , ¼ , etc. when given a fraction model. 7.NS.3.LP.F
- Write a number sentence representing a whole partitioned into 2, 3, 4, 5, 6, 8, or 10 equal shares (4/4 = ¼ + ¼ + ¼ + ¼). 7.NS.3.LP.G
- Count by unit fractions up to a whole. (½ , 1/3 , ¼ , etc.) 7.NS.3.LP.H
- Use fraction models to combine equal sized shares with like denominators. 7.NS.3.LP.I
- Engagement Statements (demonstration of engaged in the topic) 7.NS.3.LP.J
- Interact with fraction models. 7.NS.3.LP.K

Expressions and Equations

Use properties of operations to generate equivalent expressions.

1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. 7.EE.1

Complexity a

a Apply the order of operations to problems using whole numbers. Limit the number of terms to 4. 7.EE.1.A

Complexity b

b Apply the first step of the order of operations to create an equivalent expression. Limit the number of terms to 3. 7.EE.1.B

Complexity c

c Identify the first step to complete the order of operations (e.g., 2(3 + 5) x 10 + 2, what is the first step? Add 3 + 5.) Limit the number of terms to 3. 7.EE.1.C

Learning Progression

- Identify a number sentence. 7.EE.1.LP.A
- Recognize the symbols for addition (+), subtraction, (–), multiplication (×), division (÷), and equals (=). 7.EE.1.LP.B
- Read and interpret a traditional one-step number sentence (2 × 3 =). 7.EE.1.LP.C
- Relate a picture or objects to a number sentence. 7.EE.1.LP.D
- Know that a symbol can represent a missing value. 7.EE.1.LP.E
- Know the symbols () 7.EE.1.LP.F
- Know parentheses are evaluated first within an expression. 7.EE.1.LP.G
- Demonstrate understanding when there can be more than one step to solve a problem. 7.EE.1.LP.H
- Engagement Statements (demonstration of engaged in the topic) 7.EE.1.LP.I
- Interact with linear models or physical objects or drawings representing addition, subtraction, multiplication, or division. 7.EE.1.LP.J

2 In a problem context, understand that rewriting an expression in an equivalent form can reveal and explain properties of the quantities represented by the expression and can reveal how those quantities are related. For example, a discount of 15% (represented by p − 0.15p) is equivalent to (1 − 0.15)p, which is equivalent to 0.85p or finding 85% of the original price. 7.EE.2

Complexity a

a Create an equivalent expression by giving one missing term (limit to addition, subtraction, and multiplication, using whole numbers) (e.g., 6 x 4 = 8 x ?). 7.EE.2.A

Complexity b

b Create an equivalent expression by giving one missing term (limit to addition and subtraction using whole numbers) (e.g., 7 + 1 = 6 + ?). 7.EE.2.B

Complexity c

c Identify equivalent expressions (limit to addition using whole numbers) (e.g., 5 + 2 = 6 + 1). 7.EE.2.C

Learning Progression

- Demonstrate understanding of the word “equal”. 7.EE.2.LP.A
- Recognize the symbols for addition (+). 7.EE.2.LP.B
- Relate a picture or objects to a number sentence. 7.EE.2.LP.C
- Know that more than one number can be to the right of an (=) symbol. 7.EE.2.LP.D
- Know that there is more than one way to represent a number. 7.EE.2.LP.E
- Decompose a number in more than one combination. 7.EE.2.LP.F
- Engagement Statements (demonstration of engaged in the topic) 7.EE.2.LP.G
- Interact with physical objects or drawings representing addition. 7.EE.2.LP.H

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

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 ¾ 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 on the exact computation. 7.EE.3

Complexity a

a Solve one-step real-life and mathematical problems (limit to fractions) (e.g., the recipe for 12 cupcakes asks for 2/3 cup of sugar. How many cups of sugar is needed if the recipe is doubled?). 7.EE.3.A

Complexity b

b Solve one-step real-life and mathematical problems (limit to decimals) (e.g., Sue spends $2.35 on a notebook and $1.60 on a ruler. How much does Sue spend in all?). 7.EE.3.B

Complexity c

c Solve one-step real-life and mathematical problems (limit to whole numbers) (e.g., Jim spends $3 on a pen and $2 on a pencil. How much does Jim spend in all?). 7.EE.3.C

Learning Progression

- Identify a number sentence. 7.EE.3.LP.A
- Recognize the symbols for addition (+), subtraction, (–), multiplication (×), division (÷), and equals (=) and identify the keys on a calculator. 7.EE.3.LP.B
- Read and interpret a traditional one-step number sentence in a context (2 × 3 =). 7.EE.3.LP.C
- Relate a picture or objects to a number sentence. 7.EE.3.LP.D
- Know that a symbol can represent a missing value. 7.EE.3.LP.E
- Engagement Statements (demonstration of engaged in the topic) 7.EE.3.LP.F
- Interact with linear models or physical objects or drawings representing addition, subtraction, multiplication, or division. 7.EE.3.LP.G
- Interact with a calculator. 7.EE.3.LP.H

4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. a. Solve word problems leading to equations of the form px + q = r and p(x + q) = r, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution,

identifying the sequence of the operations used in each approach. For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width? 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. 7.EE.4

Complexity a

a Use variables to show and solve a real-world or mathematical problem (limit to two-step problems involving whole numbers and one variable) (e.g., Mary pays a $5 flat rate plus a $2 hourly rate for each hour, x, for parking. Mary has $15. Which equation should Mary use to calculate the total number of hours she can park? 2x + 5 = 15, 5x + 2 = 15, 2 + 5 + x = 15, or 15 + 5 + 2 = x). 7.EE.4.A

Complexity b

b Use variables to solve a real-world or mathematical problem (limit to twostep problems and one variable) (e.g., Mary pays a $5 flat rate plus a $2 hourly rate for each hour, x, for parking. Mary has $15 is represented by 2x + 5 = 15; solve for x.). 7.EE.4.B

Complexity c

c Use variables to show a real-world or mathematical problem (limit to one-step problems involving whole numbers and one variable) (e.g., Mary has $15. She buys a bag of apples for $4. Which equation shows how much money, x, Mary has left? Key: x = 15 - 4). 7.EE.4.C

Learning Progression

- Know that a letter or a symbol can represent a missing value. 7.EE.4.LP.A
- Recognize a numerical expression with and without variables. 7.EE.4.LP.B
- Identify a number sentence. 7.EE.4.LP.C
- Recognize the symbols for addition (+), subtraction, (–), multiplication (×), division (÷), and equals (=) and identify the keys on a calculator. 7.EE.4.LP.D
- Read and interpret a traditional one-step number sentence in a context (2 × 3 =). 7.EE.4.LP.E
- Relate a picture or objects to a number sentence. 7.EE.4.LP.F
- Engagement Statements (demonstration of engaged in the topic) 7.EE.4.LP.G
- Interact with linear models or physical objects or drawings representing addition, subtraction, multiplication, or division. 7.EE.4.LP.H
- Interact with a calculator. 7.EE.4.LP.I

Geometry

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

1 Solve problems involving similar figures with right triangles, other triangles, and special quadrilaterals. a. Compute actual lengths and areas from a scale drawing and reproduce a scale drawing at a different scale. b. Represent proportional relationships within and between similar figures. 7.G.1

Complexity a

a Solve problems involving scaled drawings of figures (e.g., if a triangle is drawn on a grid, what will be the length of one of the sides if the triangle is increased by a factor of 2?). 7.G.1.A

Complexity b

b Identify similar geometric figures on a grid (e.g., which shape is twice the size of another shape?). 7.G.1.B

Complexity c

c Identify same size/same shape polygons drawn on a grid (e.g., square, rectangles, quadrilaterals, isosceles triangles, right triangles, scalene triangles, and obtuse triangles). 7.G.1.C

Learning Progression

- ** Note** Congruent should be referred to as same size same shape or equal in measure. 7.G.1.LP.A
- A simple grid should be used in place of a coordinate plane. 7.G.1.LP.B
- Understand grids are formed by vertical and horizontal lines. 7.G.1.LP.C
- Recognize 2D shapes regardless of orientation. 7.G.1.LP.D
- Recognize there are different types of triangles and quadrilaterals. 7.G.1.LP.E

f. Identify the same sized angles. 7.G.1.LP.F

- Count squares on a grid. 7.G.1.LP.G
- Understand that the squares are used to measure the size of the shape. 7.G.1.LP.H
- Recognize by measuring or counting side lengths that are the same. 7.G.1.LP.I
- Count the number of sides in a shape. 7.G.1.LP.J
- Differentiate between 3 sided and 4 sided shapes. 7.G.1.LP.K
- Engagement Statements (demonstration of engaged in the topic) 7.G.1.LP.L
- Interact with grid. 7.G.1.LP.M
- Interact with 2D shapes. 7.G.1.LP.N

2 Draw (freehand, with ruler and protractor, and with technology) geometric figures with given conditions. a. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more

than one triangle, or no triangle. b. Focus on constructing quadrilaterals with given conditions, noticing types and properties of resulting quadrilaterals and whether it is possible to construct different quadrilaterals using the same conditions. 7.G.2

Complexity a

a Analyze special quadrilaterals and triangles a. by the measure of the angles (acute, obtuse, and right). by the measures of their side lengths (isosceles, equilateral, and scalene triangles; parallelogram, rhombus, and trapezoid). 7.G.2.A

Complexity b

b Identify and recognize special quadrilaterals or triangles by using parallel and perpendicular sides. 7.G.2.B

Complexity c

c Identify the type of angles in a triangle and the angles in a special quadrilateral. 7.G.2.C

Learning Progression

- Understand that 90 degrees (right angle) is marked by a square. 7.G.2.LP.A
- Recognize that a right angle forms a square corner, an acute angle is smaller than a square corner, and an obtuse angle is larger than a square corner. 7.G.2.LP.B
- Recognize that a right angle is 90 degrees, acute angle is less than 90 degrees, and an obtuse angle is more than 90 degrees. 7.G.2.LP.C
- Recognize that a triangle has 3 angles and a quadrilateral has 4 angles. 7.G.2.LP.D
- Engagement Statements (demonstration of engaged in the topic) 7.G.2.LP.E
- Interact with shapes in their environment. 7.G.2.LP.F

3 Describe the twodimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids. 7.G.3

Complexity a

a Using models, identify two-dimensional shapes that result from slicing a three-dimensional figure (limit to prisms and horizontal and vertical cuts). 7.G.3.A

Complexity b

b Identify the shape of twodimensional faces of three dimensional figures (limit to rectangular prisms and cubes). 7.G.3.B

Complexity c

c Identify, by naming, two- and threedimensional figures (manipulatives can be used). 7.G.3.C

Learning Progression

- Recognize the differences between 2D and 3D shapes. 7.G.3.LP.A

- Identify shapes as two-dimensional (lying in a plane, flat) or three-dimensional (solid). 7.G.3.LP.B
- Name shapes regardless of their orientations or overall size. 7.G.3.LP.C
- Engagement Statements (demonstration of engaged in the topic) 7.G.3.LP.D
- Interact with two- and three-dimensional objects in their environment. 7.G.3.LP.E

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

4 Work with circles. a. Explore and understand the relationships among the circumference, diameter, area, and radius of a circle. b. Know and use the formulas for the area and circumference of a circle and use them to solve real-world and mathematical problems. 7.G.4

Complexity a

a1 Apply the formula for finding the area of a circle when given the radius. 7.G.4.A1

a2 Measure diameters and circumference of various circles to show the relationship is close to 3.14. 7.G.4.A2

Complexity b

b Identify the attributes of a circle (radius, diameter, circumference, and center). 7.G.4.B

Complexity c

c Identify circles in the environment. 7.G.4.C

Learning Progression

- Understand that circles are round. 7.G.4.LP.A
- Understand that circles have no angles. 7.G.4.LP.B
- Understand that circles have no sides. 7.G.4.LP.C
- Engagement Statements (demonstration of engaged in the topic) 7.G.4.LP.D
- Interact with circles in their environment. 7.G.4.LP.E

5 Use facts about supplementary, complementary, vertical, and adjacent angles in a multistep problem to write and solve simple equations for an unknown angle in a figure. 7.G.5

Complexity a

a Identify unknown angles and solve problems when using facts about adjacent and vertical angles using visual models. 7.G.5.A

Complexity b

b Classify angles as supplementary, complementary, vertical, or adjacent using visual models. 7.G.5.B

Complexity c

c Sort angles by type using visual models (right, acute, obtuse, straight). 7.G.5.C

Learning Progression

- Understand that 90 degrees (right angle) is marked by a square. 7.G.5.LP.A
- Recognize that a right angle forms a square corner, an acute angle is smaller than a square corner, and an obtuse angle is larger than a square

corner. 7.G.5.LP.B

- Recognize that a right angle is 90 degrees, acute angle is less than 90 degrees, and an obtuse angle is more than 90 degrees. 7.G.5.LP.C
- Recognize that a straight angle makes a straight line and is 180 degrees. 7.G.5.LP.D
- Engagement Statements (demonstration of engaged in the topic) 7.G.5.LP.E
- Interact with angles in the environment. 7.G.5.LP.F

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. 7.G.6

Complexity a

a2 Solve real-world problems involving finding the volume of a right prism or cube. Use whole number edge lengths. 7.G.6.A2

a1 Solve real-world problems involving surface area of a prism, cube, and pyramid. Use whole number edge lengths. 7.G.6.A1

Complexity b

b1 Solve realworld problems involving the area of figures involving rectangles and right triangles (manipulatives can be used). 7.G.6.B

Complexity c

c1 Solve realworld problems involving perimeter (manipulatives can be used). 7.G.6.C

Learning Progression

- Identify surfaces where a perimeter can be measured. 7.G.6.LP.A
- Lay inch squares up to 20 around a flat surface. 7.G.6.LP.B
- Count inch squares up to 20 all the way around a flat surface. 7.G.6.LP.C
- Measure length and width with units and record the measurement. 7.G.6.LP.D
- Perimeter is found by adding the measures of all the sides. 7.G.6.LP.E
- Recognize the symbols for addition (+) and equals (=) and identify the keys on a calculator. 7.G.6.LP.F
- Engagement Statements (demonstration of engaged in the topic) 7.G.6.LP.G
- Interact with flat two-dimensional surfaces. 7.G.6.LP.H
- Interact with a calculator. 7.G.6.LP.I

Statistics and Probability

Use sampling to draw conclusions about a population.

1 Understand that statistics can be used to gain information about a population by examining a sample of the population. a. Differentiate between a sample and a population. b. Understand that conclusions and generalizations about a population are valid only if the sample is representative of that population. Develop an informal understanding of bias. 7.SP.1

Complexity a

a Differentiate between a sample and population. 7.SP.1.A

Complexity b

b Understand that a sample is only part of a population. 7.SP.1.B

Complexity c

c Recognize that everyone in an area (such as classroom) is a population. 7.SP.1.C

Learning Progression

- Population can consist of people, animals, or objects. 7.SP.1.LP.A
- Population would be represented by a number. 7.SP.1.LP.B
- Population will be defined. 7.SP.1.LP.C
- Engagement Statements (demonstration of engaged in the topic) 7.SP.1.LP.D
- Interact with items to be counted in a population. 7.SP.1.LP.E

Broaden understanding of statistical problem solving.

2 Broaden statistical reasoning by using the GAISE model: a. Formulate Questions: Recognize and formulate a statistical question as one that anticipates variability and can be answered with quantitative data. For example, “How do the heights of seventh graders compare to the heights of eighth graders?” (GAISE Model, step 1) b. Collect Data: Design and use a plan to collect appropriate data to answer a statistical question. (GAISE Model, step 2) c. Analyze Data: Select appropriate graphical methods and numerical measures to analyze data by displaying variability within a group, comparing individual to individual, and comparing individual to group. (GAISE Model, step 3) d. Interpret Results: Draw logical conclusions and make generalizations from the data based on the original question. (GAISE Model, step 4) 7.SP.2

Complexity a

a1 Formulate statistical questions that include simple comparisons. 7.SP.2.A1

a2 Collect data to answer statistical questions. 7.SP.2.A2

Complexity b

b Given two questions, identify which question is statistical (anticipates variability). For example, “How old am I?” is not a statistical question, but “How old are the students in my school?” is a statistical question because of the variability in students’ ages. (GAISE Model, step 1). 7.SP.2.B

Complexity c

c Identify the 4 steps of the GAISE model. 7.SP.2.C

Learning Progression

- Understand ordering. 7.SP.2.LP.A
- Engagement Statements (demonstration of engaged in the topic) 7.SP.2.LP.B
- Interact with a Gaise model for example cut apart and manipulate the 4 steps. 7.SP.2.LP.C

Summarize and describe distributions representing one population and draw informal comparisons between two populations.

3 Describe and analyze distributions. a. Summarize quantitative data sets in relation to their context by using mean absolute deviation (MAD), interpreting mean as a balance point. b. Informally assess the degree of visual overlap of two numerical data distributions with roughly equal 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 (line plot), the separation between the two distributions of heights is noticeable. 7.SP.3

Complexity a

a Answer simple questions given two data displays (e.g., which data set has more people?). 7.SP.3.A

Complexity b

b Find the mean and median of a data set. Limit to 7 data points. 7.SP.3.B

Complexity c

c Answer questions given a graph (e.g., given a histogram of student's heights, which range of heights did most students fall into?). 7.SP.3.C

Learning Progression

- Identify information on a graph which can include labels, scales, and data. 7.SP.3.LP.A
- Count data in a graph. 7.SP.3.LP.B
- Interpret data from a given graph. 7.SP.3.LP.C
- Recognize the symbols for addition (+), subtraction, (–), and equals (=) and identify the keys on a calculator. 7.SP.3.LP.D
- Solve "how many more" and "how many less" problems using information presented in the graphs. 7.SP.3.LP.E
- Recognize the symbols for addition (+), subtraction, (–), and equals (=) and identify the keys on a calculator. 7.SP.3.LP.F
- Identify what a key is on a graph. 7.SP.3.LP.G
- Read and interpret a key. 7.SP.3.LP.H
- Engagement Statements (demonstration of engaged in the topic) 7.SP.3.LP.I
- Interact with a graph. 7.SP.3.LP.J
- Interact with a calculator. 7.SP.3.LP.K

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.5

Complexity a

a Given an outcome in a real-life event or situation, such as a game, determine if an event is impossible, likely, unlikely, or certain. 7.SP.5.A

Complexity b

b Given an outcome in a real-life event or situation, such as a game, determine if an event is impossible, likely, or unlikely. 7.SP.5.B

Complexity c

c Given an outcome in a real-life event or situation, such as a game, determine if an event is possible or impossible. 7.SP.5.C

Learning Progression

- Understand the term possible is something that can happen. 7.SP.5.LP.A
- Understand the term impossible is something that cannot occur. 7.SP.5.LP.B
- Engagement Statements (demonstration of engaged in the topic) 7.SP.5.LP.C
- Engage with probability manipulatives. 7.SP.5.LP.D

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.6

Complexity a

a Approximate the probability of an event occurring as likely, unlikely, certain, or impossible based on possible outcomes using a model. 7.SP.6.A

Complexity b

b Find the experimental probability of an event occurring after collecting data using a model. 7.SP.6.B

Complexity c

c Collect data on the probability of an event (e.g. rolling dice, spinning a spinner, or drawing marbles). 7.SP.6.C

Learning Progression

- Identify the possible outcomes. 7.SP.6.LP.A
- Understand methods to collect data. 7.SP.6.LP.B
- Understand methods to record data. 7.SP.6.LP.C
- Engagement Statements (demonstration of engaged in the topic) 7.SP.6.LP.D
- Engage with probability manipulatives. 7.SP.6.LP.E

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? 7.SP.7

Complexity a

a Compare the probabilities of an event occurring (e.g., probability of landing on heads when flipping a coin; likelihood of landing on a certain area on a three section spinner). 7.SP.7.A

Complexity b

b Use a probability model/ graphic organizer to record data from a probability experiment (e.g., occurrence of heads or tails in a coin flip). 7.SP.7.B

Complexity c

c Make prediction of the probability of an event occurring (e.g., probability of landing on heads when flipping a coin) using models. 7.SP.7.C

Learning Progression

- Identify the possible outcomes. 7.SP.7.LP.A
- Understand methods to collect data. 7.SP.7.LP.B
- Understand methods to record data. 7.SP.7.LP.C
- Understand the term possible is something that can happen. 7.SP.7.LP.D
- Understand the term impossible is something that cannot occur. 7.SP.7.LP.E
- Count the number of times each outcome occurs. 7.SP.7.LP.F
- Recognize the outcome with the highest/lowest occurrence. 7.SP.7.LP.G
- Collect data from probability games and real world situations. 7.SP.7.LP.H
- Engagement Statements (demonstration of engaged in the topic) 7.SP.7.LP.I
- Interact with probability manipulatives. 7.SP.7.LP.J
- Interact with probability games. 7.SP.7.LP.K

8 Find probabilities of compound events using organized lists, tables, tree diagrams, and simulations. 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. 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 composes the event. c. Design and use a simulation to generate frequencies for compound events. For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood,

what is the probability that it will take at least four donors to find one with type A blood? 7.SP.8

Complexity a

a Find the number of outcomes of a compound events using a simple tree diagram, organized list, or table (see example below). 7.SP.8.A

Complexity b

b Complete a simple tree diagram, organized list, or table (see example blow). 7.SP.8.B

Complexity c

c Find the probability of a simple event (e.g., probability of landing on heads when flipping a coin). 7.SP.8.C

Learning Progression

- Identify the possible outcomes. 7.SP.8.LP.A
- Understand methods to collect data. 7.SP.8.LP.B
- Understand methods to record data. 7.SP.8.LP.C
- Understand the term possible is something that can happen. 7.SP.8.LP.D
- Understand the term impossible is something that cannot occur. 7.SP.8.LP.E
- Count the number of times each outcome occurs. 7.SP.8.LP.F
- Recognize the outcome with the highest/lowest occurrence. 7.SP.8.LP.G
- Collect data from probability games and real world situations. 7.SP.8.LP.H
- Engagement Statements (demonstration of engaged in the topic) 7.SP.8.LP.I
- Interact with probability manipulatives. 7.SP.8.LP.J
- Interact with probability games. 7.SP.8.LP.K