
Pike County School District Standards Mastery Document

7th Grade Mathematics
Revised 2019



Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Mathematics

The Standards Mastery Document is designed for educators by educators as a resource and tool to help educators increase their depth of understanding of the Common Core Standards. This document will enable teachers to plan College & Career Ready curriculum and classroom instruction that promotes inquiry and higher levels of cognitive demand.

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education.

8 Mathematical Practices (MP):

MP 1. Make sense of problems and persevere in solving them.

MP 2. Reason abstractly and quantitatively.

MP 3. Construct viable arguments and critique the reasoning of others.

MP 4. Model with mathematics.

MP 5. Use appropriate tools strategically.

MP 6. Attend to precision.

MP 7. Look for and make use of structure.

MP 8. Look for and express regularity in repeated reasoning.

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Math Standards
Table of Contents

Grade 7 Overview	-----	4
Reference Tables	-----	6
Ratio and Proportional Relationships (7.RP)	-----	10
The Number System (7.NS)		17
Expressions and Equations (7.EE)	-----	25
Geometry (7.G)	-----	30
Statistics and Probability (7.SP)	-----	36

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Mathematics

Grade 7 Overview

Ratio and Proportional Relationships (RP)

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

The Number System (NS)

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

Expressions and Equations (EE)

- Use properties of operations to generate equivalent expressions.
- Solve real-life mathematical problems using numerical and algebraic expressions and equations.

Geometry (G)

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

Statistics and Probability (SP)

- Use random sampling to draw inferences about a population.
- Draw informal comparative inferences about two populations.
- Investigate chance processes and develop, use and evaluate probability models.

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Math Standards

Grade 7 Overview

In grade 7, instructional time should focus on three critical areas:

1. In the Ratios and Proportional Relationships domain, students will:

- extend their understanding of ratios and develop understanding of proportionality to solve single- and multi-step problems;
- use their understanding of ratios and proportionality to solve a wide variety of percent problems, including those involving discounts, interest, taxes, tips and percent increase or decrease;
- solve problems about scale drawings by relating corresponding lengths between the objects or by using the fact that relationships of lengths within an object are preserved in similar objects;
- graph proportional relationships and understand the unit rate informally as a measure of the steepness of the related line, called the slope;
- distinguish proportional relationships from other relationships.

2. In the Number System and the Expressions, Equations and Inequalities domains, students will:

- develop a unified understanding of number, recognizing fractions, decimals (that have a finite or a repeating decimal representation) and percents as different representations of rational numbers;
- extend addition, subtraction, multiplication, and division to all rational numbers, maintaining the properties of operations and the relationships between addition and subtraction and multiplication and division—by applying these properties and by viewing negative numbers in terms of everyday contexts;
- explain and interpret the rules for adding, subtracting, multiplying, and dividing with negative numbers;
- use the arithmetic of rational numbers as they formulate expressions and equations in one variable and use these equations to solve problems.

3. In the Geometry domain, students will:

- continue their work with area from grade 6, solving problems involving the area and circumference of a circle and surface area of three-dimensional objects;
- reason about relationships among two-dimensional figures using scale drawings and informal geometric constructions and they gain familiarity with the relationships between angles formed by intersecting lines;
- work with three-dimensional figures, relating them to two-dimensional figures by examining cross sections;
- solve real-world and mathematical problems involving area, surface area and volume of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

4. In the Statistics and Probability domain, students will:

- Build on their previous work with single data distributions to compare two data distributions and address questions about differences between populations;
- Begin informal work with random sampling to generate data sets and learn about the importance of representative samples for drawing inferences.

Pike County School District
Standards Mastery Document - Revised 2019

7th Grade Mathematics

Table 1

Common Addition and Subtraction Situations¹

	Result Unknown	Change Unknown	Start Unknown
Add To	Two bunnies sat on the grass. Three more bunnies hopped there. How many bunnies are on the grass now? $2 + 3 = ?$	Two bunnies were sitting on the grass. Some more bunnies hopped there. Then there were five bunnies. How many bunnies hopped over to the first two? $2 + ? = 5$	Some bunnies were sitting on the grass. Three more bunnies hopped there. Then there were five bunnies. How many bunnies were on the grass before? $? + 3 = 5$
Take From	Five apples were on the table. I ate two apples. How many apples are on the table now? $5 - 2 = ?$	Five apples were on the table. I ate some apples. Then there were three apples. How many apples did I eat? $5 - ? = 3$	Some apples were on the table. I ate two apples. Then there were three apples. How many apples were on the table before? $? - 2 = 3$
	Total Unknown	Addend Unknown	Both Addends Unknown ³
Put Together/ Take Apart²	Three red apples and two green apples are on the table. How many apples are on the table? $3 + 2 = ?$	Five apples are on the table. Three are red and the rest are green. How many apples are green? $3 + ? = 5, 5 - 3 = ?$	Grandma has five flowers. How many can she put in her red vase and how many in her blue vase? $5 = 0 + 5, 5 = 5 + 0$ $5 = 1 + 4, 5 = 4 + 1$ $5 = 2 + 3, 5 = 3 + 2$
	Difference Unknown	Bigger Unknown	Smaller Unknown
Compare	(“How many more?” version): Lucy has two apples. Julie has five apples. How many more apples does Lucy have than Julie? (“How many fewer?” version): Lucy has two apples. Julie has five apples. How many fewer apples does Lucy have than Julie? $2 + ? = 5, 5 - 2 = ?$	(Version with “more”): Julie has three more apples than Lucy. Lucy has two apples. How many apples does Julie have? (Version with “fewer”): Lucy has three fewer apples than Julie. Lucy has two apples. How many apples does Julie have? $2 + 3 = ?, 3 + 2 = ?$	(Version with “more”): Julie has three more apples than Lucy. Julie has five apples. How many apples does Lucy have? (Version with “fewer”): Lucy has three fewer apples than Julie. Julie has five apples. How many apples does Lucy have? $5 - 3 = ?, ? + 3 = 5$

Blue shading indicates the four Kindergarten problem subtypes. Students in grades 1 and 2 work with all subtypes and variants (blue and green). Yellow indicates problems that are the difficult four problem subtypes students in grade 1 work with but do not need to master until grade 2.

¹ Adapted from Box 2-4 of National Research Council (2009, op. cit., pp. 32, 33).

² These *take apart* situations can be used to show all the decompositions of a given number. The associated equations, which have the total on the left of the equal sign, help children understand that the = sign does not always mean *makes or results in* but always does mean *is the same number as*.

³ Either addend can be unknown, so there are three variations of these problem situations. Both Addends Unknown is a productive extension of this basic situation especially for small numbers less than or equal to 10.

⁴ For the Bigger Unknown or Smaller Unknown situations, one version directs the correct operation (the version using *more* for the bigger unknown and using *less* for the smaller unknown). The other versions are more difficult.

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Math Standards

Table 2
Common Multiplication and Division Situations¹

	Unknown Product	Group Size Unknown	Number of Groups Unknown
	$3 \times 6 = ?$	$3 \times ? = 18$ and $18 \div 3 = ?$	$? \times 6 = 18$ and $18 \div 6 = ?$
Equal Groups	<p>There are 3 bags with 6 plums in each bag. How many plums are there in all?</p> <p>Measurement example: you need 3 lengths of string, each 6 inches long. How much string will you need all together?</p>	<p>If 18 plums are shared equally into 3 bags, then how many plums will be in each bag?</p> <p>Measurement example: you have 18 inches of string which you will cut into 3 equal pieces. How long will each piece of string be?</p>	<p>If 18 plums are to be packed 6 to a bag, then how many bags are needed?</p> <p>Measurement example: you have 18 inches of string which you will cut into pieces that are 6 inches long. How many pieces of string will you have?</p>
Arrays² Area³	<p>There are three rows of apples with 6 apples in each row. How many apples are there?</p> <p>Area example: what is the area of a 3 cm by 6 cm triangle?</p>	<p>If 18 apples are arranged into 3 equal rows, how many apples will be in each row?</p> <p>Area example: a rectangle has area of 18 square centimeters. If one side is 3 cm long, how long is a side next to it?</p>	<p>If 18 apples are arranged into equal rows of 6 apples, how many rows will there be?</p> <p>Area example: a rectangle has area of 18 square centimeters. If one side is 6 cm long, how long is the side next to it?</p>
Compare	<p>A blue hat costs \$6. A red hat costs 3 times as much as the blue hat. How much does the red hat cost?</p> <p>Measurement example: a rubber band is 6 cm long. How long will the rubber band be when it is stretched to be 3 times as long?</p>	<p>A red hat costs \$18 and that is 3 times as much as a blue hat costs. How much does a blue hat cost?</p> <p>Measurement example: a rubber band is stretched to be 18 cm long and is 3 times as long as it was at first. How long was the rubber band at first?</p>	<p>A red hat costs \$18 and a blue hat costs \$6. How many times as much does the red hat cost as the blue?</p> <p>Measurement example: a rubber band was 6 cm long at first. Now it is stretched to be 18 cm long. How many times as long is the rubber band now as it was at first?</p>
General	$a \times b = ?$	$a \times ? = p$ and $p \div a = ?$	$? \times b = p$ and $p \div b = ?$

¹ The first examples in each cell are examples of discrete things. These are easier for students and should be given before the measurement examples.

² The language in the array examples shows the easiest form of array problems. A harder form is to use the terms rows and columns: the apples in the grocery window are in 3 rows and 6 columns. How many apples are in there? Both forms are valuable.

³ Area involves arrays of squares that have been pushed together so that there are no gaps or overlaps, so array problems include these especially important measurement situations.

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Mathematics

Table 3
Properties of Operations

The variables a , b and c stand for arbitrary numbers in a given number system.
The properties of operations apply to the rational number system, the real number system and the complex number system.

Associative property of addition	$(a + b) + c = a + (b + c)$
Commutative property of addition	$a + b = b + a$
Additive identity property of 0	$a + 0 = 0 + a = a$
Existence of additive inverses	For every a there exists $-a$ so that $a + (-a) = (-a) + a = 0$
Associative property of multiplication	$(a \times b) \times c = a \times (b \times c)$
Commutative property of multiplication	$a \times b = b \times a$
Multiplicative identity property of 1	$a \times 1 = 1 \times a = a$
Existence of multiplicative inverses	For every $a \neq 0$ there exists $1/a$ so that $a \times 1/a = 1/a \times a = 1$
Distributive property of multiplication over addition	$a \times (b + c) = a \times b + a \times c$

Table 4
Properties of Equality

The variables a , b and c stand for arbitrary numbers in the rational, real or complex number systems.

Reflexive property of equality	$a = a$
Symmetric property of equality	If $a = b$, then $b = a$
Transitive property of equality	If $a = b$ and $b = c$, then $a = c$
Addition property of equality	If $a = b$, then $a + c = b + c$
Subtraction property of equality	If $a = b$, then $a - c = b - c$
Multiplication property of equality	If $a = b$, then $a \times c = b \times c$
Division property of equality	If $a = b$ and $c \neq 0$, then $a \div c = b \div c$
Substitution property of equality	If $a = b$, then b may be substituted for a in any expression containing a .

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Math Standards
Table 5
Properties of Inequality

The variables a , b and c stand for arbitrary numbers in the rational or real number systems.

Exactly one of the following is true: $a < b$, $a = b$, $a > b$
If $a > b$ and $b > c$ then $a > c$
If $a > b$, then $b < a$
If $a > b$, then $-a < -b$
If $a > b$, then $a \pm c > b \pm c$
If $a > b$ and $c > 0$, then $a \times c > b \times c$
If $a > b$ and $c < 0$, then $a \times c < b \times c$
If $a > b$ and $c > 0$, then $a \div c > b \div c$
If $a > b$ and $c < 0$, then $a \div c < b \div c$

Table 6
Fluency Standards across All Grade Levels

Grade	Coding	Fluency Standards
K	KY.K.OA.5	Fluently add and subtract within 5.
1	KY.1.OA.6	Fluently add and subtract within 10.
2	KY.2.OA.2 KY.2.NBT.5	Fluently add and subtract within 20. Fluently add and subtract within 100.
3	KY.3.OA.7 KY.3.NBT.2	Fluently multiply and divide within 100. Fluently add and subtract within 1000.
4	KY.4.NBT.	Fluently add and subtract multi-digit whole numbers using an algorithm.
5	KY.5.NBT.5	Fluently multiply multi-digit whole numbers (not to exceed four-digit by two-digit multiplication) using an algorithm.
6	KY.6.NS.2 KY.6.NS.3 KY.6.EE.2	Fluently divide multi-digit numbers using an algorithm. Fluently add, subtract, multiply and divide multi-digit decimals using an algorithm for each operation. Write, read and evaluate expressions in which letters stand for numbers.

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Mathematics

Ratio and Proportional Relationships (7.RP)

Standard: 7.RP.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 miles per hour, equivalently 2 miles per hour.

Enduring Skills:

- MP 2: Reason abstractly and quantitatively
- MP 6: Attend to precision.

<p>Know: <i>What content does the student need to know to demonstrate this standard?</i></p> <p>Write ratios and use them to compare quantities.</p> <p>What is a proportional relationship?</p> <p>How can you use them to solve real-world and mathematical problems.</p>	<p>Do: <i>What skill must the student demonstrate?</i></p> <p>Find unit rates and unit costs using proportional reasoning.</p> <p>Compute unit rates associated with ratios of fractions in like or different units.</p>	<p>Mastery: <i>How does the student demonstrate the learning of the standard?</i></p> <p>Students will correctly compute unit rates associated with ratios of fractions in like or different units.</p>
--	---	--

KY.6.RP.2 Coherence KY.6.RP.3 → KY.7.RP.1

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Math Standards

Standard: 7.RP.2.a 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.

Enduring Skills:

MP 1: Make sense of problems and persevere in solving them.

MP 2: Reason abstractly and quantitatively.

MP 3: Construct viable arguments and critique the reasoning of others.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
Know that a proportion is a statement of equality between two ratios.	<p>Analyze two ratios to determine if they are proportional to one another with a variety of strategies. (e.g. using tables, graphs, pictures, etc.)</p> <p>Test whether ratios form a proportion by using equivalent ratios and cross products.</p>	Students will correctly analyze two ratios to determine if they are proportional to one another with a variety of strategies. (e.g. using tables, graphs, pictures, etc.)

KY.8.F.2 KY.8.F.4 Coherence KY.6.RP.3a →KY.7.RP.2b →KY.8.EE.6

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Mathematics

Standard: 7.RP.2.b Recognize and represent proportional relationships between quantities.

- b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.

Enduring Skills:

MP 1: Make sense of problems and persevere in solving them.

MP 2: Reason abstractly and quantitatively.

MP 3: Construct viable arguments and critique the reasoning of others.

<p>Know: <i>What content does the student need to know to demonstrate this standard?</i></p> <p>Define constant of proportionality as a unit rate.</p>	<p>Do: <i>What skill must the student demonstrate?</i></p> <p>Analyze tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships to identify the constant of proportionality.</p>	<p>Mastery: <i>How does the student demonstrate the learning of the standard?</i></p> <p>Students will correctly analyze tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships to identify the constant of proportionality.</p> <p>Students will understand the unit rate in a table or graph is equivalent to the constant of proportionality in an equation or verbal description.</p>
---	--	--

KY.8.F.2 KY.8.F.4 Coherence KY.6.RP.3a →KY.7.RP.2b →KY.8.EE.6

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Math Standards

Standard: 7.RP.2.c Recognize and represent proportional relationships between quantities.

- 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 $t = pn$.

Enduring Skills:

MP 1: Make sense of problems and persevere in solving them.

MP 2: Reason abstractly and quantitatively.

MP 3: Construct viable arguments and critique the reasoning of others.

<p>Know: <i>What content does the student need to know to demonstrate this standard?</i></p> <p>Recognize what $(0, 0)$ represents on the graph of a proportional relationship.</p>	<p>Do: <i>What skill must the student demonstrate?</i></p> <p>Represent proportional relationships by writing equations.</p>	<p>Mastery: <i>How does the student demonstrate the learning of the standard?</i></p> <p>Students will correctly represent proportional relationships by writing equations.</p>
---	---	--

Coherence [KY.7.RP.2c](#) → [KY.8.EE.5](#)

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Mathematics

Standard: 7.RP.2.d Recognize and represent proportional relationships between quantities.

- 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.

Enduring Skills:

MP 1: Make sense of problems and persevere in solving them.

MP 2: Reason abstractly and quantitatively.

MP 3: Construct viable arguments and critique the reasoning of others.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
<p>Recognize what $(1, r)$ on a graph represents, where r is the unit rate.</p>	<p>Explain what the points on a graph of a proportional relationship means in terms of a specific situation.</p>	<p>Students will correctly describe points (x, y) in terms of the labels of the x and y-axes.</p> <p>Students must understand that in a proportional relationship $(0, 0)$ is a valid point and $(1, r)$ represents the unit rate and the constant of proportionality for the relationship between the quantities.</p>

Coherence KY.7.RP.2d → KY.8.F.5

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Math Standards

Standard: 7.RP.3a Use percents to solve mathematical and real-world problems.

- a. Find a percent of a quantity as a rate per 100; solve percents involving finding the whole, a part, and a percent, given two of these. For example, 30% of a quantity means 30/100 times the quantity.

Enduring Skills:

MP 5: Use appropriate tools strategically.

MP 6: Attend to precision.

<p>Know: <i>What content does the student need to know to demonstrate this standard?</i></p> <p>Recognize a “percent” as “part of 100”.</p>	<p>Do: <i>What skill must the student demonstrate?</i></p> <p>Solve problems involving finding the whole, a part, and a percent, given two of these.</p>	<p>Mastery: <i>How does the student demonstrate the learning of the standard?</i></p> <p>Students will correctly apply proportional relationships to solve problems involving finding the percent, a part, and the whole.</p> <p>Students will also correctly use equations to solve percent problems.</p>
--	---	---

Coherence KY.6.RP.3c → KY.7.RP.3

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Mathematics

Standard: 7.RP.3.b Use percents to solve mathematical and real-world problems.

- b. Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, percent, percent error.

Enduring Skills:

MP 5: Use appropriate tools strategically.

MP 6: Attend to precision.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
Recognize situations in which percentage proportional relationships apply.	Apply proportional reasoning to solve multistep ratio and percent problems, e.g., simple interest, tax, markups, markdowns, gratuities, commissions, fees, percent increase and decrease, percent error, etc.	Students will correctly apply proportional reasoning to solve multistep ratio and percent problems, e.g., simple interest, tax, markups, markdowns, gratuities, commissions, fees, percent increase and decrease, percent error, etc.

Coherence KY.6.RP.3c → KY.7.RP.3

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Math Standards

The Number System (7.NS)

Standard: 7.NS.1.a 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.

Enduring Skills:

MP 2: Reason abstractly and quantitatively.

MP 4: Model with mathematics.

MP 7: Look for and make use of structure.

<p>Know: <i>What content does the student need to know to demonstrate this standard?</i></p> <p>Describe situations in which opposite quantities combine to make 0.</p> <p>Represent and explain how a number and its opposite have a sum of 0 and are additive inverses.</p>	<p>Do: <i>What skill must the student demonstrate?</i></p> <p>Add and subtract integers and rational numbers.</p> <p>Represent addition and subtraction problems of rational numbers with a horizontal or vertical number line.</p>	<p>Mastery: <i>How does the student demonstrate the learning of the standard?</i></p> <p>Students will correctly apply properties of operations as strategies to add and subtract rational inverse numbers.</p>
--	--	--

KY.6.NS.5 KY.6.NS.6 Coherence KY.6.NS.7 → KY.7.NS.1

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Mathematics

Standard: 7.NS.1.b 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.

- 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.

Enduring Skills:

MP 2: Reason abstractly and quantitatively.

MP 4: Model with mathematics.

MP 7: Look for and make use of structure.

<p>Know: <i>What content does the student need to know to demonstrate this standard?</i></p> <p>Demonstrate and explain how adding two numbers, $p + q$, if q is positive, the sum of p and q will be q spaces to the right of p on the number line.</p> <p>Demonstrate and explain how adding two numbers, $p + q$, if q is negative, the sum of p and q will be q spaces to the left of p on the number line.</p>	<p>Do: <i>What skill must the student demonstrate?</i></p> <p>Interpret sums of rational numbers by describing real-world contexts.</p> <p>Explain and justify why the sum of $p + q$ is located a distance of q in the positive or negative direction from p on a number line.</p>	<p>Mastery: <i>How does the student demonstrate the learning of the standard?</i></p> <p>Students will correctly explain and justify why the sum of $p + q$ is located a distance of q in the positive or negative direction from p on a number line.</p> <p>Students will understand that the sum of opposites is zero due to the fact that opposites have equivalent absolute values.</p>
--	---	--

KY.6.NS.5 KY.6.NS.6 Coherence KY.6.NS.7 → KY.7.NS.1

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Math Standards

Standard: 7.NS.1.c 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.

- 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.

Enduring Skills:

MP 2: Reason abstractly and quantitatively.

MP 4: Model with mathematics.

MP 7: Look for and make use of structure.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
Identify subtraction of rational numbers as adding the additive inverse property to subtract rational numbers, $p - q = p + (-q)$.	<p>Represent the distance between two rational numbers on a number line is the absolute value of their difference and apply this principle in real-world contexts.</p> <p>Apply the principle of subtracting rational numbers in real world contexts.</p> <p>Apply properties of operations as strategies to add and subtract rational numbers.</p>	<p>Students will correctly represent the distance between two rational numbers on a number line is the absolute value of their difference and apply this principle in real-world contexts.</p> <p>Students will correctly apply the principle of subtracting rational numbers in real world contexts. Apply properties of operations as strategies to add and subtract rational numbers.</p>

KY.6.NS.5 KY.6.NS.6 Coherence KY.6.NS.7 → KY.7.NS.1

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Mathematics

Standard: 7.NS.1.d 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.

- d. Apply properties of operations as strategies to add and subtract rational numbers. Properties are listed in the Common Core State Standards Glossary, Table 3, Properties of Operations.

Enduring Skills:

- MP 2: Reason abstractly and quantitatively.
- MP 4: Model with mathematics.
- MP 7: Look for and make use of structure.**

<p>Know: <i>What content does the student need to know to demonstrate this standard?</i></p> <p>Identifies properties of addition and subtraction when adding and subtracting rational numbers.</p>	<p>Do: <i>What skill must the student demonstrate?</i></p> <p>Apply properties of operations as strategies to add and subtract rational numbers.</p>	<p>Mastery: <i>How does the student demonstrate the learning of the standard?</i></p> <p>Students will correctly apply properties of operations as strategies to add and subtract rational numbers.</p>
--	---	--

KY.6.NS.5 KY.6.NS.6 Coherence KY.6.NS.7 → KY.7.NS.1

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Math Standards

Standard: 7.NS.2a 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. **Example: $4(-3)$ could be four days of golfing three under par and therefore, having an overall score of -12 .**

Enduring Skills:

MP 2: Reason abstractly and quantitatively.

MP 7: Look for and make use of structure.

MP 8: Look for and express regularity in repeated reasoning.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
Recognize that the process for multiplying fractions can be used to multiply rational numbers including integers.	Apply the properties of operations, particularly distributive property, to multiply rational numbers.	Students will correctly apply the properties of operations, particularly distributive property, to multiply rational numbers.
Know and describe the rules when multiplying signed numbers.	Interpret the products of rational numbers by describing real-world contexts.	Interpret the products of rational numbers by describing real-world contexts.

Coherence [KY.6.NS.1](#) → [KY.7.NS.2](#) → [KY.8.NS.1](#)

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Mathematics

Standard: 7.NS.2b Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

- 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.

Enduring Skills:

MP 2: Reason abstractly and quantitatively.

MP 7: Look for and make use of structure.

MP 8: Look for and express regularity in repeated reasoning.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
Know what a rational number is.	Interpret the quotient of rational numbers by describing real-world contexts.	Students will correctly interpret the quotient of rational numbers by describing real-world contexts.
Know what a quotient is.	Explain why integers can be divided except when the divisor is 0.	Students will correctly explain why integers can be divided except when the divisor is 0.
Know integer rules for dividing numbers.	Describe why the quotient is always a rational number.	Students will correctly describe why the quotient is always a rational number.
	Know and describe the rules when dividing signed numbers, integers.	Students will correctly know and describe the rules when dividing signed numbers, integers.
	Recognize that $-(p/q) = -p/q = p/-q$.	Students will correctly recognize that $-(p/q) = -p/q = p/-q$.

Coherence [KY.6.NS.1](#) → [KY.7.NS.2](#) → [KY.8.NS.1](#)

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Math Standards

Standard: 7.NS.2c Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

- c. Apply properties of operations as strategies to multiply and divide rational numbers.

Enduring Skills:

MP 2: Reason abstractly and quantitatively.

MP 7: Look for and make use of structure.

MP 8: Look for and express regularity in repeated reasoning.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
<p>Know what a rational number is.</p> <p>Understand properties of operations.</p>	<p>Identify how properties of operations can be used to multiply and divide rational numbers (such as distributive property, multiplicative inverse property, multiplicative identity, commutative property for multiplication, associative property for multiplication, etc.)</p> <p>Multiply and divide rational numbers.</p>	<p>Students will correctly identify how properties of operations can be used to multiply and divide rational numbers (such as distributive property, multiplicative inverse property, multiplicative identity, commutative property for multiplication, associative property for multiplication, etc.)</p> <p>Students will apply properties of operations as strategies to multiply and divide rational numbers in real-world situations.</p>

Coherence [KY.6.NS.1](#) → [KY.7.NS.2](#) → [KY.8.NS.1](#)

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Mathematics

Standard: 7.NS.3 Solve real-world and mathematical problems involving the four operations with rational numbers.

Enduring Skills:

MP 1: Make sense of problems and persevere in solving them.

MP 2: Reason abstractly and quantitatively.

MP 5: Use appropriate tools strategically.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
<p>Know the four operations.</p> <p>Know what rational numbers are.</p> <p>Know how to add, subtract, multiply, and divide rational numbers.</p>	<p>Add rational numbers.</p> <p>Subtract rational numbers.</p> <p>Multiply rational numbers.</p> <p>Divide rational numbers.</p>	<p>Solve real-world mathematical problem by adding, subtracting, multiplying, and dividing rational numbers, including complex fractions.</p>

Coherence [KY.6.NS.3](#) → [KY.7.NS.3](#)

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Math Standards

Expressions and Equations (7.EE)

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

Enduring Skills:

MP 2: Reason abstractly and quantitatively.

MP 3: Construct viable arguments and critique the reasoning of others.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
Know the order of operations. Know the commutative, associative, distributive properties.	Combine like terms with rational coefficients. Simplify algebraic expressions using properties of operations. Factor and expand linear expressions with rational coefficients using the distributive property.	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

Coherence [KY.6.EE.3](#) → [KY.7.EE.1](#) → [KY.8.EE.7](#)

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Mathematics

Standard: 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. For example, $a + 0.05a = 1.05a$ means that “increase by 5%” is the same as “multiply by 1.05.”

Enduring Skills:

MP 7: Look for and make use of structure.

MP 8: Look for and express regularity in repeated reasoning.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
Know what equivalent expressions are.	Write and evaluate algebraic expressions. Write equivalent expressions with fractions, decimals, percents, and integers. Use properties of operations to generate equivalent expressions.	Rewrite an expression in an equivalent form in order to provide insight about how quantities are related in a problem context

Coherence [KY.6.EE.4](#) → [KY.7.EE.2](#) → [KY.8.EE.8c](#)

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Math Standards

Standard: 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.

Enduring Skills:

MP 1: Make sense of the problems and persevere in solving them.

MP 4: Model with mathematics.

MP 6: Attend to precision.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
Know what rational numbers are.	Convert between fractions, decimals, and percents.	<p>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.</p> <p>Apply properties of operations to calculate with numbers in any form.</p> <p>Assess the reasonableness of answers using mental computation and estimation strategies.</p>

Coherence KY.7.NS.3 → KY.8.EE.4

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Mathematics

Standard: 7.EE.4a 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.

Graph the solution set of the equality and interpret it in the context of the problem.

Enduring Skills:

MP 2: Reason abstractly and quantitatively.

MP 4: Model with mathematics.

Know – <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
<p>Know what equations are.</p> <p>Know what operation is occurring with the variable.</p>	<p>Solve equations by adding, subtracting, multiplying, and dividing using inverse operations.</p> <p>Solve equations of the form $px + q = r$ and $p(x + q) = r$ using the distributive property.</p>	<p>Use variables and construct equations to represent quantities of the form $px + q = r$ and $p(x + q) = r$ from real-world and mathematical problems.</p> <p>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.</p> <p style="color: red;">Interpret word problems in the form of the initial value as a one-time occurrence within the problem and the coefficient as the recurring event within the problem.</p>

Coherence [KY.6.EE.7](#) → [KY.7.EE.4](#) → [KY.8.EE.7](#)

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Math Standards

Standard: 7.EE.4b 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.

- b. Solve word problems leading to inequalities of the form $px + q > r$, $px + q < r$, $px + q \geq r$, $px + q \leq r$; 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.

Enduring Skills:

MP 2: Reason abstractly and quantitatively.

MP 4: Model with mathematics.

Know – <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
<p>Know what inequalities are.</p> <p>Know how to graph a solution set.</p>	<p>Graph and write algebraic inequalities.</p> <p>Solve inequalities in the form $px + q > r$ or $px + q < r$ using inverse operations.</p> <p>Graph the solution set of the inequality of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers.</p>	<p>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.</p> <p>Interpret word problems that have one or more solutions that satisfy the conditions of the problem.</p>

Coherence [KY.6.EE.8](#) → [KY.7.EE.4](#)

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Mathematics

Geometry (7.G)

Standard: 7.G.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.

Enduring Skills:

MP 1: Make sense of problems and persevere in solving them.

MP 2: Reason abstractly and quantitatively.

MP 5: Use appropriate tools strategically.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
<p>Draw, construct, and describe geometrical figures and describe the relationships between them.</p>	<p>Identify corresponding sides of scaled geometric figures.</p> <p>Convert values from one given measurement to another based on a given scale factor.</p> <p>Compute lengths and areas from scale drawings using strategies such as proportions.</p> <p>Use ratios and proportions to create scale drawing.</p> <p>Solve problems involving scale drawings of geometric figures. <i>For example, 1 inch on a scale drawing equals how many feet in real life based on the scale factor given.)</i></p>	<p>Reproduce a given drawing based on a scale factor.</p>

Coherence KY.6.G.1→KY.7.G.1→KY.8.EE.6

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Math Standards

Standard: 7.G.2 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.

Enduring Skills:

MP 6: Attend to precision.

MP 7: Look for and make use of structure.

<p>Know: <i>What content does the student need to know to demonstrate this standard?</i></p>	<p>Do: <i>What skill must the student demonstrate?</i></p>	<p>Mastery: <i>How does the student demonstrate the learning of the standard?</i></p>
<p>Know how to plot points on a coordinate grid.</p> <p>Know how to measure and draw specific angles.</p> <p>Know which conditions create unique triangles, more than one triangle, or no triangle.</p>	<p>Construct triangles with given angle measures and side lengths and determine when the given conditions do not meet the conditions of a triangle.</p>	<p>Analyze given conditions and convert them to geometric shapes.</p>

Coherence KY.7.G.2→KY.8.G.1

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Mathematics

Standard: 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.

Enduring Skills:

MP 5: Use appropriate tools strategically.

MP 6: Attend to precision.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
<p>Know the difference between a two-dimensional and three dimensional figure.</p> <p>Classify and draw two-dimensional figures.</p> <p>Classify three-dimensional figures.</p>	<p>Define slicing as the cross section of a 3D figure.</p> <p>Identify the two-dimensional figures that result from slicing a three-dimensional figure such as a right rectangular prism or pyramid. (Cross sections may be taken from horizontal, vertical and oblique angles.)</p>	<p>Analyze three-dimensional shapes and describe the two dimensional figures created from the cross sections.</p>

Coherence KY.7.G.2→KY.8.G.1

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Math Standards

Standard: 7.G.4 Use formulas for area and circumference of circles and their relationships.

- a. Apply the formulas for the area and circumference of a circle to solve real-world and mathematical problems.
- b. Explore and understand the relationship between the radius, diameter, circumference and area of a circle.

Enduring Skills:

- MP 1: Make sense of problems and persevere in solving them.
- MP 2: Reason abstractly and quantitatively.
- MP 8: Look for and express regularity in repeated reasoning.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
<p>Know the parts of a circle including radius, diameter, area, circumference, center, and chord.</p>	<p>Calculate area of a circle given radius or diameter.</p>	<p>Apply circle formulas to solve mathematical and real-world problems.</p>
<p>Identify pi and know the significance of the ratio.</p>	<p>Find circumference of a circle given radius or diameter.</p>	<p>Justify why pi can be derived from the circumference and diameter of a circle.</p>
<p>Know the circle formulas: $C = d \pi$ $C = 2r \pi$ $A = \pi r^2$</p>	<p>Find radius or diameter given circumference.</p>	<p>Justify the circle formulas and how they relate to π.</p>
	<p>Given the circumference of a circle, find its area.</p>	<p><i>Note: Calculating the radius or diameter of a circle given its area is not expected, as finding the square root of a number is reserved for 8th grade.</i></p>

Coherence KY.7.G.4 → KY.8.G.9

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Mathematics

Standard: 7.G.5 Apply properties of supplementary, complementary, vertical and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

Enduring Skills:

- MP 3: Construct viable arguments and critique the reasoning of others.
- MP 6: Attend to precision.
- MP 7: Look for and make use of structure.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
<p>Know types of angles: complementary, supplementary, vertical, and adjacent.</p> <p>Know what complements and supplements of angles are and how to calculate them.</p>	<p>Identify and recognize types of angles: supplementary, complementary, vertical, adjacent.</p> <p>Determine complements and supplements of a given angle.</p> <p>Write and solve equations to find unknown angle measures.</p>	<p>Find missing angles based on the relationships between the various types of angles.</p> <p>Calculate unknown angle measures by writing and solving equations based on relationships between angles.</p>

KY.8.G.1 Coherence KY.4.MD.7 →KY.7.G.5 →KY.8.G.5

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Math Standards

Standard: 7.G.6 Solve problems involving area of two-dimensional objects and surface area and volume of three-dimensional objects.

- a. Solve real-world and mathematical problems involving area of two-dimensional objects composed of triangles, quadrilaterals and other polygons.
- b. Solve real-world and mathematical problems involving volume and surface area, using nets as needed, of three-dimensional objects including cubes, pyramids and right prisms.

Enduring Skills:

- MP 3: Construct viable arguments and critique the reasoning of others.
- MP 4: Model with mathematics.
- MP 5: Use appropriate tools strategically.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
Know the formulas for area and volume.	Find the area of parallelograms, triangles, trapezoids and other geometric figures.	Students will correctly solve real-world and math problems involving area, surface area and volume of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.
Understand that volume and surface area are two different quantities used to describe the same three-dimensional figure.	Classify and draw three-dimensional figures. Use nets of three-dimensional objects to conceptualize surface area.	
Identify three-dimensional figures from nets.	Calculate with appropriate units, using nets as a possible strategy for calculation as well as formulas for volume and surface area, where appropriate.	

KY.6.G.1 KY.6.G.2 Coherence KY.6.G.4 → KY.7.G.6 → KY.8.G.6

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Mathematics

Statistics and Probability (7.SP)

Standard: KY.7.SP.0 Create displays, including circle graphs (pie charts), scaled pictographs and bar graphs, to compare and analyze distributions of categorical data from both matching and different-sized samples. For example, students need to be asked, “Which data display fits this data set and why?” The circle graph focuses more on the relative values of the clustering of data, whereas the bar and pictographs add a dimension of quantity.

Enduring Skills:

- MP 2: Reason abstractly and quantitatively.
- MP 3: Construct viable arguments and critique the reasoning of others.
- MP 6: Attend to precision.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
<p>Knowledge of percents and rates.</p> <p>Know which data display fits a data set and why.</p> <p>Know how to create circle, scaled pictographs, and bar graphs.</p>	<p>Select an appropriate data display for data.</p> <p>Create circle, scaled pictographs, and bar graphs.</p>	<p>Compare and analyze distributions of categorical data from both matching and different-sized samples.</p>

KY.7.SP.0 KY.7.SP.2 Coherence KY.6.SP.O→KY.7.SP.4

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Math Standards

Standard: 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. **Recognize what makes a valid and non-valid sample of a population. Recognize the size of the sample holds importance to the accuracy of the sample.**

Enduring Skills:

MP 2: Reason abstractly and quantitatively.

MP 3: Construct viable arguments and critique the reasoning of others.

MP 7: Look for and make use of structure.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
<p>Know statistics terms such as population, sample, sample size, random sampling, generalizations, valid, biased and unbiased.</p> <p>Recognize sampling techniques such as convenience, random, systematic, and voluntary.</p> <p>Know that generalizations about a population from a sample are valid only if the sample is representative of that population.</p>	<p>Apply statistics to gain information about a population from a sample of the population.</p> <p>Identify a random sample and write survey questions.</p> <p>Generalize that random sampling tends to produce representative samples and support valid inferences.</p>	<p>Students will correctly apply statistics to gain information about a population from a sample of the population.</p> <p>Students will correctly generalize that random sampling tends to produce representative samples and support valid inferences.</p>

KY.6.SP.0 KY.6.SP.1 Coherence KY.6.SP.2→KY.7.SP.1→KY.HS.SP.9

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Mathematics

Standard: 7.SP.2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest.

- a. Generate multiple samples of categorical data of the same size to gauge the variation in estimates or predictions. For example, randomly sample 6th, 7th, and 8th graders about who their favorite superhero is to generate samples of data that are roughly the same size, looking specifically at patterns, if any.
- b. Generate multiple samples (or simulated samples) of numerical data 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.
- c. Gauge how far off an estimate or prediction might be related to a population character of interest.

Enduring Skills:

MP 2: Reason abstractly and quantitatively.

MP 3: Construct viable arguments and critique the reasoning of others.

MP 7: Look for and make use of structure.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
Define random sample. Identify an appropriate sample size.	Analyze & interpret 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 determine the variation in estimates or predictions by comparing and contrasting the samples.	Students will correctly analyze & interpret data from a random sample to draw inferences about a population with an unknown characteristic of interest. Students will correctly generate multiple samples (or simulated samples) of the same size to determine the variation in estimates or predictions by comparing and contrasting the samples. (Emphasis is on the sample size and how this affects the validity of the estimate or prediction).

Coherence KY.6.SP.0 → 7.SP.2 → KY.HS.SP.12

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Math Standards

Standard: 7.SP.3 Describe the degree of visual overlap (and separation) from the graphical representations of two numerical data distributions (box plots, dot plots) with similar variabilities with similar contexts (same variable), measuring the difference between the centers (medians or means) by expressing this difference as a multiple of a measure of variability (interquartile range when comparing medians or the mean absolute deviation when comparing means). 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.

Enduring Skills:

MP 1: Make sense of problems and persevere in solving them.

MP 5: Use appropriate tools strategically.

MP 7: Look for and make use of structure.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
Identify measures of central tendency (mean, median, and mode) in a data distribution.	Compare two numerical data distributions on a graph by visually comparing data displays, and assessing the degree of visual overlap.	Students will correctly compare two numerical data distributions on a graph by visually comparing data displays, and assessing the degree of visual overlap.
Identify measures of variability including upper quartile, lower quartile, upper extreme maximum, lower extreme minimum, range, interquartile range, and mean absolute deviation (i.e. box-and-whisker plots, line plot, dot plots, etc.).	Compare the differences in the measure of central tendency in two numerical data distributions by measuring the difference between the centers and expressing it as a multiple of a measure of variability.	Students will correctly compare the differences in the measure of central tendency in two numerical data distributions by measuring the difference between the centers and expressing it as a multiple of a measure of variability.

KY.6.SP.2 Coherence KY.6.NS.1→KY.7.SP.3→KY.HS.SP.13 KY.HS.SP.10

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Mathematics

Standard: 7.SP.4 Calculate and use measures of center (**mean and median**) and measures of variability (**interquartile range when comparing medians and mean absolute deviation when comparing means**) for numerical data from random samples to draw informal comparative inferences about two populations. For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.

Enduring Skills:

MP 2: Reason abstractly and quantitatively.

MP 5: Use appropriate tools strategically.

MP 7: Look for and make use of structure.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
Find measures of central tendency (mean, median, and mode) and measures of variability (range, interquartile range, mean absolute deviation , etc.).	Analyze and interpret data using measures of central tendency and variability. Draw informal comparative inferences about two populations from random samples.	Students will correctly analyze and interpret data using measures of central tendency and variability. Students will correctly draw informal comparative inferences about two populations from random samples.

KY.HS.SP.10 Coherence KY.6.SP.2→KY.7.SP.4→KY.HS.SP.13

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Math Standards

Standard: 7.SP.5 Describe that the probability of a chance event is a number between 0 and 1, which tells how likely the event is, from impossible (0) to certain (1). 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.

Enduring Skills:

MP 5: Use appropriate tools strategically.

MP 6: Attend to precision.

MP 7: Look for and make use of structure.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
Know that probability is expressed as a number between 0 and 1.	Find the probability and the complement of an event.	Students will use descriptive language to describe numerical probabilities; impossible event, unlikely event, equally likely event, likely event, certain event. Students understand that all probabilities must fall between 0 and 1.
Know that a random event with a probability of $\frac{1}{2}$ is equally likely to happen.	Draw conclusions to determine that a greater likelihood occurs as the number of favorable outcomes approaches the total number of outcomes.	
Know that as probability moves closer to 1 it is increasingly likely to happen.		
Know that as probability moves closer to 0 it is decreasingly likely to happen.		

Coherence KY.7.SP.6 → KY.HS.SP.10

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Mathematics

Standard: 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. 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.

Enduring Skills:

MP 1: Make sense of problems and persevere in solving them.

MP 2: Reason abstractly and quantitatively.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
Determine relative frequency (experimental probability) is the number of times an outcome occurs divided by the total number of times the experiment is completed.	Find experimental probability and use simulations. Estimate the likelihood of an event. Test the estimate by trial and collect data. Observe that the accuracy of the estimate will increase with the frequency of repeated trials.	Students will correctly determine the relationship between experimental and theoretical probabilities by using the law of large numbers. Students will correctly predict the relative frequency (experimental probability) of an event based on the (theoretical) probability.

Coherence KY.7.SP.6 → KY.HS.SP.10

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Math Standards

Standard: 7.SP.7a 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.

Enduring Skills:

MP 4: Model with mathematics.

MP 7: Look for and make use of structure.

MP 8: Look for and express regularity in repeated reasoning.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
<p>Recognize uniform (equally likely) probability.</p> <p>Use models to determine the probability of events.</p>	<p>Develop a uniform probability model and use it to determine the probability of each outcome/event.</p>	<p>Students will correctly develop a uniform probability model and use it to determine the probability of each outcome/event.</p>

KY.7.RP.3 Coherence KY.7.SP.7 → KY.HS.SP.14

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Mathematics

Standard: 7.SP.7b 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 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?

Enduring Skills:

MP 4: Model with mathematics.

MP 7: Look for and make use of structure.

MP 8: Look for and express regularity in repeated reasoning.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
<p>Recognize probability models (which may not be uniform).</p> <p>Use models to determine the probability of events.</p>	<p>Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.</p> <p>Analyze a probability model and justify why it is uniform or explain the discrepancy if it is not.</p>	<p>Students will correctly analyze a probability model and justify why it is uniform or explain the discrepancy if it is not.</p>

KY.7.RP.3 Coherence KY.7.SP.7 → KY.HS.SP.14

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Math Standards

Standard: 7.SP.8a Find probabilities of compound events using organized lists, tables, tree diagrams, and simulations.

- a. **Explain** 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. **For example: if the probability of heads occurring on a coin is $\frac{1}{2}$, then the probability of three heads in a row is $\frac{1}{2} * \frac{1}{2} * \frac{1}{2} = \frac{1}{8}$.**

Enduring Skills:

MP 2: Reason abstractly and quantitatively.

MP 4: Model with mathematics.

MP 7: Look for and make use of structure.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
<p>Define and describe a compound event.</p> <p>Define independent and dependent events.</p>	<p>Find probabilities of compound events using organized lists, tables, tree diagrams, etc. and analyze the outcomes.</p>	<p>Students will correctly find probabilities of compound events using organized lists, tables, tree diagrams, etc. and analyze the outcomes.</p>

Coherence KY.7.SP.8 → KY.HS.SP.14

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Mathematics

Standard: 7.SP.8b Find probabilities of compound events described in everyday language using methods such as organized lists, tables, tree diagrams, and simulations.

- b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event (e.g. “rolling double sixes”), identify the outcomes in the sample space which compose the event.

Enduring Skills:

- MP 2: Reason abstractly and quantitatively.
- MP 4: Model with mathematics.
- MP 7: Look for and make use of structure.**

<p>Know: <i>What content does the student need to know to demonstrate this standard?</i></p> <p>Know that the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.</p> <p>Identify the outcomes in the sample space for an everyday event.</p>	<p>Do: <i>What skill must the student demonstrate?</i></p> <p>Choose the appropriate method such as organized lists, tables and tree diagrams to represent sample spaces for compound events.</p>	<p>Mastery: <i>How does the student demonstrate the learning of the standard?</i></p> <p>Students will correctly choose the appropriate method such as organized lists, tables and tree diagrams to represent sample spaces for compound events.</p> <p>Students will understand that the sample space becomes a probability model when a probability for each simple event is specified.</p>
---	--	---

Coherence KY.7.SP.8 → KY.HS.SP.14

t

Pike County School District
Standards Mastery Document - Revised 2019
7th Grade Math Standards

Standard: 7.SP.8c Find probabilities of compound events using organized lists, tables, tree diagrams, and simulations.

- 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 4 donors to find one with type A blood?

Enduring Skills:

MP 2: Reason abstractly and quantitatively.

MP 4: Model with mathematics.

MP 7: Look for and make use of structure.

Know: <i>What content does the student need to know to demonstrate this standard?</i>	Do: <i>What skill must the student demonstrate?</i>	Mastery: <i>How does the student demonstrate the learning of the standard?</i>
Define simulation.	Design and use a simulation to estimate the probability of compound events.	Students will correctly design and use a simulation to estimate the probability of compound events.

Coherence KY.7.SP.8 → KY.HS.SP.14