Kentucky Academic Standards for Mathematics: Grade 3 Overview

Operations/Algebraic Thinking (OA)	Number and Operations in Base Ten (NBT)	Number and Operations Fractions (NF)	Measurement and Data (MD)	Geometry (G)
• Represent and solve problems involving multiplication and division. • Understand properties of multiplication and the relationship between multiplication and division. • Multiply and divide within 100. • Solve problems involving the four operations and identify and explain patterns in arithmetic.	• Use place value understanding and properties of operations to perform multi-digit arithmetic. Note: A range of algorithms may be used.	• Develop understanding of fractions as numbers. Note: grade 3 expectations in this domain are limited to fractions with denominators 2, 3, 4, 6, 8.	• Solve problems involving measurement and estimation of intervals of time, liquid volumes and masses of objects. • Understand and apply the statistics process. • Geometric measurement: understand concepts of area and relate area to multiplication and to addition. • Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.	• Reason with shapes and their attributes.

In grade 3, instructional time should focus on four critical areas:

1. In the Operations and Algebraic Thinking domain, students will:

- develop an understanding of the meanings of multiplication and division of whole numbers through activities and problems involving equal-sized groups, arrays and area models; multiplication is finding an unknown product and division is finding an unknown factor in these situations. For equal-sized group situations, division can require finding the unknown number of groups or the unknown group size;
- use properties of operations to calculate products of whole numbers, using increasingly sophisticated strategies based on these properties to solve multiplication and division problems involving single-digit factors; and
- compare a variety of solution strategies to learn the relationship between multiplication and division.

2. In the Number Sense and Operations—Fractions domain, students will:

- develop an understanding of fractions, beginning with unit fractions;
- view fractions in general as being built out of unit fractions and use fractions along with visual fraction models to represent parts of a whole;
- understand that the size of a fractional part is relative to the size of the whole. Use fractions to represent numbers equal to, less than and greater than one; and
- solve problems that involve comparing fractions by using visual fraction models and strategies based on noticing equal numerators or denominators.

3. In the Measurement and Data domain, students will:

- recognize area as an attribute of two-dimensional regions;
- measure the area of a shape by finding the total number of same-size units of area required to cover the shape without gaps or overlaps, a square with sides of unit length being the standard unit for measuring area; and
- understand that rectangular arrays can be decomposed into identical rows or into identical columns. By decomposing rectangles into rectangular arrays of squares, students connect area to multiplication and justify using multiplication to determine the area of a rectangle.

4. In the Geometry domain, students will:

- compare and classify shapes by their sides and angles; and
- relate their fraction work to geometry by expressing the area of part of a shape as a unit fraction of the whole.

Note: Multiplication, division and fractions are the most important developments in grade 3.

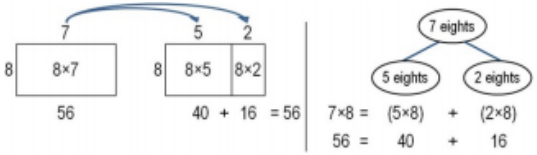
Operations and Algebraic Thinking	
Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools 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.

Cluster: Represent and solve problems involving multiplication and division.

Standards	Clarifications
KY.3.OA.1 Interpret and demonstrate products of whole numbers. **MP.2**, **MP.5**	Students use models for multiplication situations. For example, students interpret 5 x 7 as the total number of objects in 5 groups of 7 objects each. Coherence KY.2.OA.4→KY.3.OA.1→KY.4.OA.1
KY.3.OA.2 Interpret and demonstrate whole-number quotients of whole numbers, where objects are partitioned into equal shares. **MP.2**, **MP.5**	Students use models for division situations. For example, students interpret 56 ÷ 8 as the number of 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 object each. Coherence KY.3.OA.1→KY.3.OA.2→KY.5.NF.3
KY.3.OA.3 Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays and measurement quantities, by using drawings and equations with a symbol for the unknown number to represent the problem. **MP.1**, **MP.4**	Students flexibly model or represent multiplication and division situations or context problems (involving products and quotients up to 100). Note: Drawings need not show detail, but accurately represent the quantities involved in the task. **See Table 2 in Appendix A.** Coherence KY.3.OA.3→KY.4.OA.2
KY.3.OA.4 Determine the unknown whole number in a multiplication or division equation relating three whole numbers. **MP.6**, **MP.7**	Students determine the unknown number that makes the equation true in each of the equations 8 x ? = 48, 5 = □ ÷ 3, 6 x 6 = ?. Coherence KY.3.OA.4→KY.4.MD.3

Attending to the Standards for Mathematical Practice

Students recognize the numbers and symbols in an equation such as 5 x 8 = 40 are related to a context using groups or arrays (**MP.2**). For example, a student analyzes this equation and tells a story about walking 8 blocks round-trip to and from school each day, connecting to the equation by saying: 5 days x 8 blocks each day is 40 total blocks walked. To represent the problem, they show 5 jumps of 8 on an open number line or show five 8-unit long Cuisenaire Rods (**MP.5**). When reading story situations, students seek to make sense of the story and its quantities (**MP.1**). They do not just lift numbers out or use keywords. To help make sense of the problem, students decide to write an equation or use a number line. In other words they 'mathematize' the situation (**MP.4**). In missing value problems, students attend to what value is unknown and what operation is represented (**MP. 6**) and use this information to determine what value will result in both sides of the equations being equal (**MP.7**).

Operations and Algebraic Thinking	
Standards for Mathematical Practice	
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.
Cluster: Understand properties of multiplication and the relationship between multiplication and division.	
Standards	**Clarifications**
KY.3.OA.5 Apply properties of operations as strategies to multiply and divide. **MP.3**, **MP.4**	Students need not use formal terms for these properties. If 6 x 4 is known, then 4 x 6 = 24 is also known (Commutative property of multiplication). 3 x 5 x 2 can be found by 3 x 5 = 15, then 15 x 2 = 30, or by 5 x 2 = 10, then 3 x 10 = 30 (Associative property of multiplication). Knowing that 8 x 5 = 40 and 8 x 2 = 16, one can find 8 x 7 as 8 x (5+2) = (8 x 5) + (8 x 2) = 40 + 16 = 56 (Distributive property).  KY.4.NBT.5 Coherence KY.3.OA.5→KY.4.NBT.6
KY.3.OA.6 Understand division as an unknown-factor problem. **MP.2**	Find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8. Coherence KY.3.OA.6→KY.4.NBT.6
Attending to the Standards for Mathematical Practice	
Students use strategies beyond skip counting to solve multiplication problems. They decide how to use known facts to solve facts like 6 x 9. Students use strategies like Adding a Group, thinking 5 groups of 9 (45) plus one more group (54) and Subtracting a Group, thinking 9 x 6 and reasoning 10 groups of 6 (60) minus one group of 6 (54) (**MP.7**). Students explain their selected reasoning strategy and listen and critique other students' strategies, considering which strategies make sense and are efficient (**MP.3**). Students think about 84 ÷ 4 as, "How many sets of 4 can be made from 84 items?" or "How many in a group, if there 84 items and 4 groups?" and use this relationship to solve the problem (**MP.2**).	

The identified mathematical practices, coherence connections and clarifications are possible suggestions; however, they are not the only pathways.

Operations and Algebraic Thinking	
Standards for Mathematical Practice	
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.
Cluster: Multiply and divide within 100.	
Standards	**Clarifications**
KY.3.OA.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division or properties of operations. **MP.2**, **MP.8**	Students determine multiplication and division strategies efficiently, accurately, flexibly and appropriately. Being fluent means students choose flexibly among methods and strategies to solve contextual and mathematical problems, they understand and explain their approaches and they produce accurate answers efficiently. Knowing 8 x 5 = 40, one knows 40 ÷ 5 = 8. Note: Reaching fluency is an ongoing process that will take much of the year. Coherence KY.3.OA.7→KY.4.OA.4
Attending to the Standards for Mathematical Practice	
By studying patterns and relationships in multiplication facts, students develop fluency for multiplication facts (**MP.8**). For example, students notice 4 x 6 is equivalent to 2 x 2 x 6 (doubling strategy). They know 9 facts can be found by thinking of the other factor x 10 and subtracting one group. For example, recognizing 9 x 8 is equivalent to 10 x 8 – 8. For each fact, the student thinks, “What reasoning strategy can I use that is more efficient than skip counting?” (**MP.2**).	

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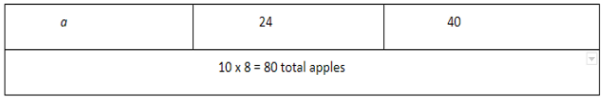
Operations and Algebraic Thinking	
Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools 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.
Cluster: Solve problems involving the four operations and identify and explain patterns in arithmetic.	
Standards	**Clarifications**
KY.3.OA.8 Use various strategies to solve two-step word problems using the four operations (involving only whole numbers with whole number answers). Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. **MP.1**, **MP.4**	Students solve problems using models, pictures, words and numbers. Students explain how they solved the problem using accurate mathematical vocabulary and why their answer makes sense. Note: Estimation skills include identifying when estimation is appropriate, determining method of estimation and verifying solutions or determining the reasonableness of situations using various estimation strategies. The skill of estimating within context allows students to further develop their number sense. Coherence KY.2.OA.1→KY.3.OA.8→ KY.4.OA.3
KY.3.OA.9 Identify arithmetic patterns (including patterns in the addition table or multiplication table) and explain them using properties of operations. **MP.3**, **MP.8**	Students observe 4 times a number is always even and explain why 4 times a number can be decomposed into two equal addends. Coherence KY.2.OA.3→KY.3.OA.9→ KY.4.OA.5
Attending to the Standards for Mathematical Practice	
Given a non-straightforward story situation about gathering apples and sharing them among 8 families, students decide on ways to make sense of the problem (**MP.1**). One student decides to use a bar diagram to make sense of the situation and then use the bar diagram to write equations and solve the problem (**MP.4**). *Maggie was picking apples from her three apple trees. She picked some from the first tree and realized she should count the rest of what she was picking. She picked 24 apples from the second tree and 40 apples from the third tree. She had enough apples to give 10 to each of eight families. How many apples did she pick from the first tree?*  $a + 24 + 40$ = total apples and 10 x 8 = total apples. There are 80 apples total. $a + 64 = 80$ $a = 16$	

Another student thinks of the situation differently and decides to figure out how many apples each family has from the known apples (**MP.1**). Other students use counters to model the problem and/or use trial and error. If their first approach doesn't work, students persevere by trying another strategy (**MP.1**). In each case, students check to see if the answer of 16 apples makes sense.

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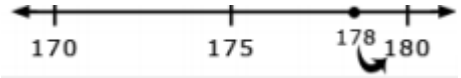
Numbers and Operations in Base Ten	
Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools 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.

Cluster: Use place value understanding and properties of operations to perform multi-digit arithmetic. Note: A range of algorithms may be used.

Standards	Clarifications
KY.3.NBT.1 Use place value understanding to round whole numbers to the nearest 10 or 100. **MP.7**	On a number line, students determine 178 rounded to nearest 10 is 180.  Coherence KY.2.NBT.1→KY.3.NBT.1→ KY.4.NBT.3
KY.3.NBT.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations and/or the relationship between addition and subtraction. **MP.2**, **MP.3**	Students determine addition and subtraction strategies efficiently, accurately, flexibly and appropriately. Being fluent means students are able to choose flexibly among methods and strategies to solve contextual and mathematical problems, they understand and are able to explain their approaches and they are able to produce accurate answers efficiently. Note: Reaching fluency is an ongoing process that will take much of the year. KY.2.NBT.5 Coherence KY.2.NBT.7→KY.3.NBT.2→ KY.4.NBT4
KY.3.NBT.3 Multiply one-digit whole numbers by multiples of 10 in the range of 10–90 using strategies based on place value and properties of operations. **MP.7**, **MP.8**	To solve 8 x 60, students interpret this as 8 groups of 6 tens, which is 480. KY.3.OA.5 Coherence KY.2.NBT.1→KY.3.NBT.3→ KY.4.NBT.5

Attending to the Standards for Mathematical Practice

Students look at the numbers in a problem and consider which strategy they will use to solve the given problem (**MP.2**). For example, for the problem 405 - 381, a student notices these values are close to each other, so rather than take away 381, they find the difference. They count up to 400 (19) and add on 5 more to equal 24. For the problem 425 - 98, the student notices 98 is close to 100, so chooses to take away 100 and add 2 more back on to equal 327. Students share the strategy they used, why it works and why they chose it (**MP.3**).

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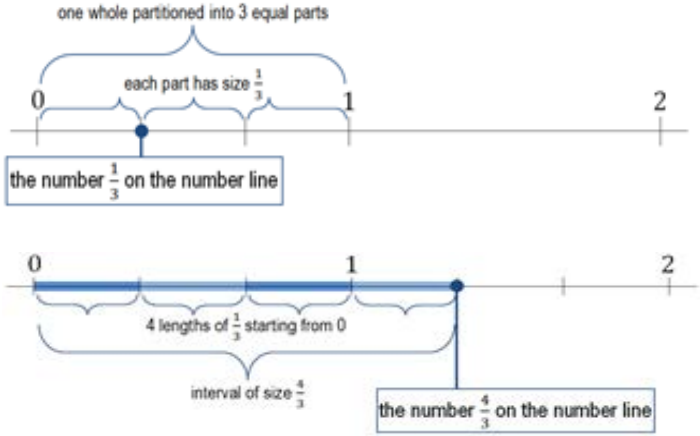
Numbers and Operations-Fractions

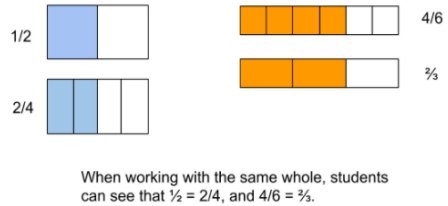
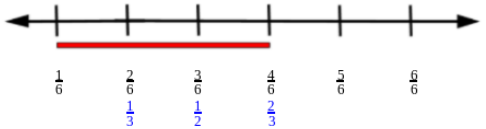
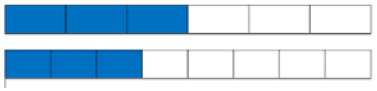
Note: grade 3 expectations in this domain are limited to fractions with denominators 2, 3, 4, 6 and 8.

Standards for Mathematical Practice

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.

Cluster: Develop understanding of fractions as numbers. Note: grade 3 expectations in this domain are limited to fractions with denominators 2, 3, 4, 6 and 8.

Standards	Clarifications
KY.3.NF.1 Understand a fraction $\frac{1}{b}$ as the quantity formed by 1 part when a whole is partitioned into *b* equal parts; understand a fraction $\frac{a}{b}$ as the quantity formed by *a* parts of size $\frac{1}{b}$. **MP.2, MP.7**	Students name parts of the whole using fractions and explain the fraction is made up of unit fractions. Students describe the numerator and the denominator using pictures, numbers and words. $\frac{4}{6} = \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6}$ Note: grade 3 expectations in this domain are limited to fractions with denominators 2, 3, 4, 6 and 8. Coherence KY.2.G.3→KY.3.NF.1→ KY.4.NF.3
KY.3.NF.2 Understand a fraction as a number on the number line; represent fractions on a number line. a. Represent a fraction $\frac{1}{b}$ (unit fraction) on a number line by defining the interval from 0 to 1 as the whole and partitioning it into *b* equal parts. • Recognize each part has size $\frac{1}{b}$. • a unit fraction, $\frac{1}{b}$ is located $\frac{1}{b}$ of a whole unit from 0 on the number line. b. Represent a non-unit fraction $\frac{a}{b}$ on a number line by marking off *a* lengths of $\frac{1}{b}$ (unit fractions) from 0. Recognize that the resulting interval has size $\frac{a}{b}$ and that its endpoint locates the non-unit fraction $\frac{a}{b}$ on the number line. **MP.4**	 Note: grade 3 expectations in this domain are limited to fractions with denominators 2, 3, 4, 6 and 8. Coherence KY.2.MD.6→KY.3.NF.2 →KY.4.NF.3

Standards	Clarifications
KY.3.NF.3 Explain equivalence of fractions in special cases and compare fractions by reasoning about their size. a. Understand two fractions as equivalent (equal) if they are the same size, or same point on a number line. b. Recognize and generate simple equivalent fractions. Explain why the fractions are equivalent through writing or drawing. c. Express whole numbers as fractions and recognize fractions that are equivalent to whole numbers. d. Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions. **MP.2**, **MP.3**	 When working with the same whole, students can see that ½ = 2/4, and 4/6 = ⅔.   $\frac{3}{6}$ is greater than $\frac{3}{8}$ or $\frac{3}{6} > \frac{3}{8}$ Note: grade 3 expectations in this domain are limited to fractions with denominators 2, 3, 4, 6 and 8. KY.4.NF.1 Coherence KY.3.NF.3→ KY.4.NF.5

Attending to the Standards for Mathematical Practice

Students use the number line to reason about the relative size of a fraction (**MP.4**). They locate $\frac{5}{6}$ on a number line by accurately partitioning the line into 6 equal-length segments. They explain that $\frac{5}{6}$ means five segments that are each one-sixth of a unit in length, for example counting, "One-sixth, two-sixths, three-sixths, four-sixths, five-sixths." (**MP.7**). As they partition the line in other ways, they recognize three-sixths is half of the distance to 1 whole, as is $\frac{2}{4}$, $\frac{1}{2}$, and $\frac{4}{8}$, and reason these fractions are equivalent (**MP.2**). Similarly, they can generate other illustrations or justifications to explain why two fractions are equivalent or not (**MP.3**).

The identified mathematical practices, coherence connections and clarifications are possible suggestions; however, they are not the only pathways.

Measurement and Data	
Standards for Mathematical Practice	
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.
Cluster: Solve problems involving measurement and estimation of intervals of time, liquid volumes and masses of objects.	
Standards	**Clarifications**
KY.3.MD.1 Tell and write time to the nearest minute and measure elapsed time intervals in minutes. Solve word problems involving addition and subtraction of time intervals within and across the hour in minutes. **MP.4, MP.6, MP.1, MP.4**	Students solve elapsed time problems using strategies and tools such as clock models and number lines (seeing a clock as a number line). Coherence KY.2.MD.7→KY.3.MD.1→ KY.4.MD.2
KY.3.MD.2 Measure and solve problems involving mass and liquid volume. a. Measure and estimate masses and liquid volumes of objects using standard units of grams (g), kilograms (kg) and liters (L). b. Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units. **MP.1, MP.6**	a. Students have multiple opportunities to weigh classroom objects and fill containers to help them develop a basic understanding of the size and weight of a liter, a gram and a kilogram. b. **See Table 2 in Appendix A.** Coherence KY.2.MD.5→KY.3.MD.2→KY.4.MD.1
Attending to the Standards for Mathematical Practice	
Students solve story situations using a model to support their reasoning (**MP.4**). For example, a student solves a task such as: you try to run for 15 minutes without stopping. When you look at the clock, the time is 2:52. What time will it say when you have reached 15 minutes? On an open number line, they show a jump from 2:52 to 3:00 as 8 minutes and then jump 7 minutes more to 3:07. Students estimate and then measure objects using standard units. For example, how many grams might balance with a selected item (**MP.6**)?	

Measurement and Data	
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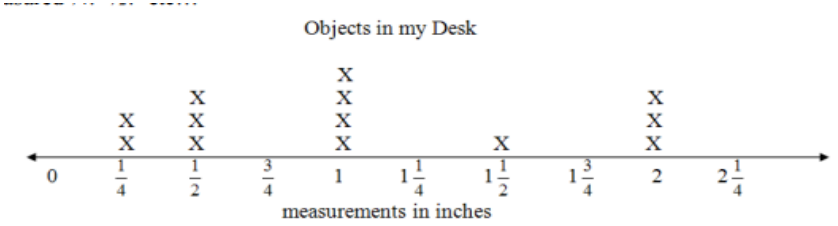
Cluster: Understand and apply the statistics process.	
Standards	**Clarifications**
KY.3.MD.3 Investigate questions involving categorical data. a. Identify a statistical question focused on categorical data and gather data; b. Create a scaled pictograph and a scaled bar graph to represent a data set (using technology or by hand); c. Make observations from the graph about the question posed, including "how many more" and "how many less" questions. **MP.3**, **MP.5**, **MP.6**	Students select a question of interest (how many pets does each classmate have), gather data and create a bar graph (each square in the bar graph might represent 2 pets). Coherence KY.2.MD.10→KY.3.MD.3
KY.3.MD.4 Investigate questions involving numerical data. a. Identify a statistical question focused on numerical data; b. Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. c. Show the data by making a dot plot where the horizontal scale is marked off in appropriate units – whole numbers, halves, or quarters. d. Make observations from the graph about the question posed, including questions about the shape of the data and compare responses. **MP.1**, **MP.3**, **MP.6**	Students measure objects in their desk to the nearest ½ or ¼ of an inch, display data collected on a dot plot and analyze the data.  Coherence KY.2.MD.9→KY.3.MD.4→KY.4.MD.4
Attending to the Standards for Mathematical Practice	
Students understand the purpose of creating a graph is to make sense of data related to a question (**MP.1**). They look at the data they have collected and decide on how to set up a graph to best communicate the data (**MP.6**). Students determine if the scale on a dot plot should be in whole numbers, halves or fourths, based on the data gathered. For example, if they measured the length of each person's pencil to the nearest fourth inch, the related dot plot would be created using fourths (**MP.6**).	

Measurement and Data	
Standards for Mathematical Practice	
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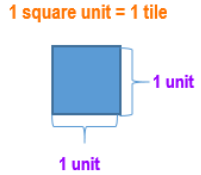
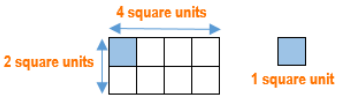
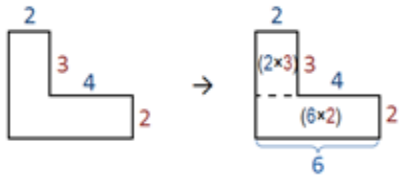
Cluster: Geometric measurement: understanding concepts of area and relate area to multiplication and to addition.	
Standards	**Clarifications**
KY.3.MD.5 Recognize area as an attribute of plane figures and understand concepts of area measurement. **MP.5**	A square with side length 1 unit, called "a unit square," is said to have "one square unit" of area and can be used to measure area.  A plane figure which can be covered without gaps or overlaps by *n* unit squares is said to have an area of *n* square units.  Coherence KY.3.MD.5→KY.5.MD.3
KY.3.MD.6 Measure areas by counting unit squares (square cm, square m, square in, square ft. and improvised units). **MP.5**, **MP.6**	Students use grid paper of varying square units to count the number of unit squares in a figure. Coherence KY.2.G.2→KY.3.MD.6→KY.5.MD.4
KY.3.MD.7 Relate area to the operations of multiplication and addition. a. Find the area of a rectangle with whole-number side lengths by tiling it and show the area is the same as would be found by multiplying the side lengths. b. Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real world and mathematical problems and represent whole-number products as rectangular areas in mathematical reasoning. c. Use tiling to show in a concrete case the area of a rectangle with whole-number side lengths *a* and *b* + *c* is the sum of *a* × *b*	d.  Coherence KY.3.MD.7→KY.4.MD.3→ KY.5.MD.5

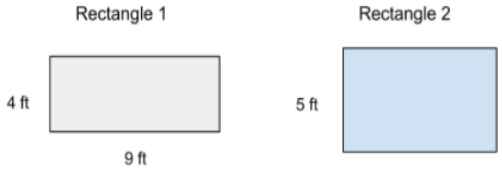
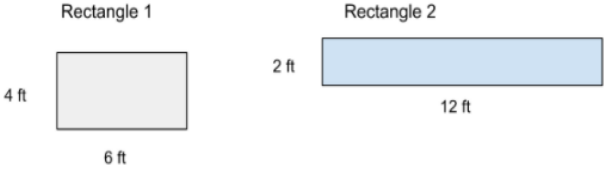
Standards	Clarifications
and $a \times c$. Use area models to represent the distributive property in mathematical reasoning. d. Recognize area as additive. Find areas of figures that can be decomposed into non-overlapping rectangles by adding the areas of the non-overlapping parts, applying this technique to solve real world problems. **MP.1**, **MP.8**	

Attending to the Standards for Mathematical Practice

Students use 1 inch color tiles to cover a rectangle, understanding that color tile as a square inch (**MP.5**). As students place the tiles in repeated rows to fill the rectangle, they notice each row has the same number of tiles and the number of tiles that will fill a rectangle can be written as [number of tiles in one row] x [number of rows] (**MP.8**). They solve story problems that sometimes have the area as the unknown and sometimes have the number of rows or columns as the unknown and use their knowledge of area to solve the problem (**MP.1**).

Measurement and Data	
Standards for Mathematical Practice	
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.

Cluster: Geometric measurement: Recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

Standards	Clarifications
KY.3.MD.8 Solve real world and mathematical problems involving perimeters of polygons. a. Find the perimeter given the side lengths of a polygon. b. Find an unknown side length, given the perimeter and some lengths. c. Draw rectangles with the same perimeter and different areas or with the same area and different perimeters. **MP.1, MP.4**	c. **Rectangles with the Same Perimeter but Different Areas**  Rectangle 1 and 2 have the same perimeter of 26 feet. Rectangle 1 has an area of 36 sq. ft, while Rectangle 2 has an area of 40 sq. ft. **Rectangles with Different Perimeters, but Same Area**  Rectangle 1 and 2 have the same area of 24 sq. feet. Rectangle 1 has a perimeter of 20 ft., while Rectangle 2 has a perimeter of 28 ft. Coherence KY.3.MD.8→KY.4.MD.3

Attending to the Standards for Mathematical Practice

Students recognize perimeter is a measure of length and see perimeters of polygons as a collection of side lengths added together to form the perimeter (**MP.1**). Therefore, they see if a side length is missing, it is like a missing addend problem and write an equation or draw a bar diagram to solve for the missing value (**MP.4**). Students recognize they can use a given perimeter (such as 16 inches) and form different rectangles (such as 4 x 4, 3 x 5, 2 x 6, 1 x 7) and that these rectangles have different areas (**MP.1**).

The identified mathematical practices, coherence connections and clarifications are possible suggestions; however, they are not the only pathways.

Geometry	
Standards for Mathematical Practice	
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.
Cluster: Reason with shapes and their attributes.	
Standards	**Clarifications**
KY.3.G.1 Classify polygons by attributes. a. Recognize and classify polygons based on the number of sides and vertices (triangles, quadrilaterals, pentagons and hexagons). b. Recognize and classify quadrilaterals (rectangles, squares, parallelograms, rhombuses, trapezoids) by side lengths and understanding shapes in different categories may share attributes and the shared attributes can define a larger category. c. Identify shapes that do not belong to a given category or subcategory. **MP.6**, **MP.7**	Students describe, analyze and compare properties of two–dimensional shapes. Coherence KY.2.G.1→KY.3.G.1→KY.4.G.2
KY.3.G.2 Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. **MP.2**, **M.5**	Partitioned parts should be halves, thirds, fourths, sixths, eighths. Students partition a shape into 6 parts with equal areas and describe the area of each part as $\frac{1}{6}$ of the area of the shape. KY.3.NF.1 Coherence KY.2.G.3→KY.3.G.2
Attending to the Standards for Mathematical Practice	
Students describe attributes they notice for a particular type of quadrilateral, focusing on side lengths and angles (**MP.6**). They explain what different types of quadrilaterals have in common and can distinguish between what are defining attributes (such as having four sides) and what are not defining (such as its size or color) (**MP.3**). Students use a variety of tools and drawings to show fractional parts (**MP.5**) and they reason if a shape is partitioned into four equal-sized parts (even if they are not the same shape), each part represents one-fourth of the whole shape (**MP.2**).	

The identified mathematical practices, coherence connections and clarifications are possible suggestions; however, they are not the only pathways.