Math – Patterns, Relations, and Functions

Louisiana Student Standard

- **K.OA.A.2 Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.**

Louisiana Connector

- **LC.K.OA.A.2a Solve one step addition and subtraction word problems, and add and subtract within 10 using objects, drawings, pictures.**

Concrete Understandings:

- Count up to 10 objects.
- Make a set of up to 10 objects.
- Join or separate objects and recount to get a total.

Representation:

- Select a numeral to place under each representation in a modeled equation.
- Select a pictorial representation of an array that matches the addition or subtraction problem.
- Know the following vocabulary: add, subtract

Suggested Instructional Strategies:

- Teach explicitly how to count objects in a set and that the last number said tells the number of counted objects.
- Present a set of objects for the student to count.
- Rearrange the objects and ask the student how many object there are (the student understands cardinality of numbers if s/he states the same number without recounting the objects).
- Teach explicitly how to create a group/row/set of objects for a given number or for a number provided in a simple word problem.
- Multiple Exemplar Training
- An array/row: "This is a group/row of three apples. This is another group/row of three apples. This is another group/row of three apples. This is one apple. Show me a group/row of three apples."
- Example / Nonexample
- Present a row of objects (≤ 10). Present a second row of objects that has a different number of objects. Ask the student to select the row with a specified number of objects.
- Present three rows of objects (≤ 10), two that are equal and one that is not equal. As the student to match the two rows that both include the same number of specified objects (e.g., a row of three hats, a row of three hats, a row of 5 shoes).
- Use System of Least Prompts to form an array (group/row) given a number:

- "Make a row/group of three pencils." The student responds correctly. "Good work. You made a row/group of three pencils." OR The student doesn't respond. Wait 3-5 seconds and provide a gesture prompt by pointing to the pencils, OR The student doesn't respond. Wait 3 -5 seconds and provide a verbal prompt. "Pick up three pencils. Make a group of three pencils." OR The student makes an error; provide a physical prompt. Take the student's hand and give him or her three pencils and help them make a row of pencils.
- Model-Lead-Test ("Watch me make a row of four books. Let's make a row of four books. Now you try to make a row of four books.")
- Model-Lead-Test ("Here is a story problem. It says there are seven dogs. Watch me make a set of seven dogs to match the story problem. Let's make a set of seven dogs together. Now you try to make a set of seven dogs."); repeat with the other number of object in the story problem.
- Task Analysis: Use two rows of pictures or objects to model a one step addition and subtraction problems.
- Present a simple one step addition problem (e.g., The boys have four backpacks. The girls have two backpacks. How many backpacks to the boys and girls have?)
- Present a set of objects and a problem solving template:
- Template: ___ ___ ___ ___ + ___ ___ = ___ ___ ___ ___ ___ ___
- Show me a row of four backpacks. Put the backpacks in the equation.
- Show me a role two backpacks. Put the backpacks in the equation.
- Combine the backpacks; Fill in the equation with the total number of backpacks the boys and girls have.
- Backward chaining: Model setting up a one-step addition word problem using two arrays and ask the student to complete the last step by combining the arrays and/or counting the number of objects in the combined arrays.
- Forward chaining: Present a one step addition or subtraction word problem and ask the student to complete the first step (e.g., Show me a row of four backpacks.) Then complete the steps to solve the equation.

Suggested Supports and Scaffolds:

- Counters
- 2D and 3D shapes or objects, pictures
- Counters
- Number lines
- Egg cartons or muffin tins to illustrate/create arrays
- Ones blocks to form different rectangles (rows and columns)

- Manipulatives, visuals and Wiki Sticks to illustrate/define arrays
- Raised grid (to keep structure of array) or graph paper
- Highlighted text is present simple word problem
- Use PPT and shape tool to create arrays to match a provided problem
- Interactive whiteboard or other technology to create arrays

Louisiana Student Standard

- **1.OA.A.1 Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.**

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- **LC.1.OA.A.1c Using objects or pictures respond appropriately to "add __" and "take away ___."**

Concrete Understandings:

- Show addition with objects to an existing set.
- Count objects.
- Make a set with objects or with drawings given a number.

Representation:

- Select a pictorial of a set that has been added or taken away from.
- Know the following symbols and vocabulary: =, +, - , take away, add.

Suggested Instructional Strategies:

- Teach explicitly the meaning of "add" and "take away" by connecting the vocabulary to known language (e.g. "add" means plus, more, join; "take away" means less, fewer);
- Teach/model "adding to" a set of object results in a larger set; teach "take away" from a set of objects results in a smaller set;
- Compare two sets of unequal number of objects and ask the student which set has been added to (larger set) OR which set has objects taken away (smaller set)
- Model-Lead-Test:
  - Model "adding to" and "taking away" use objects (e.g., "Watch me add to this group of objects. …Let's add to this group of objects together…You try adding to this group of objects. Good, this group is bigger because we added to it.").
  - Indicate that the new group of objects is larger is adding to and smaller if taking away.
- Use counting strategies and modeling problem solving with supports.

Suggested Supports and Scaffolds:

- Counters (chips)
- Picture and objects

- Number line
- Graphic organizers

Louisiana Student Standard

- **3.OA.D.9** Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.

Louisiana Connector

- **LC.3.OA.D.9c** Identify multiplication patterns in a real word setting.

Concrete Understandings:

- Identify that a pattern is formed by repeatedly adding the same number to a set.
- Add within 100 with calculator and/or manipulatives.

Representation:

- Match a pattern using symbols or objects to represent a provided growing multiplication pattern in a real-word setting.
- Recognize patterns and use words to describe the patterns they see.
- Understand the following concepts and vocabulary: growing pattern, multiplication, level, increasing/increases, decreasing/decreases, objects or shapes

Suggested Instructional Strategies:

- Multiple Exemplar Training or Example/Non-Example Training
- Growing Pattern: "Here is a growing pattern. Here is a growing pattern. Here is growing pattern. This not a growing pattern. Show me a growing pattern."
- Ask students to determine if a rule exists for a provided pattern. (A pattern follows a predictable sequence OR There is no predictable sequence in this example, i.e., no rule can be stated.)
- Model-Lead-Test
- Teach/model growing addition patterns using 2D shapes or 3D objects as a pattern that increases by the same number in each row of the pattern (e.g., a pattern that grows by +2 would have 1 in the first row, 3 in the second row, 5 in the third row, and 7 in the fourth row).
- Teach/model a growing multiplication problem using pictures (1 flower, 2 bees; 2 flowers, 4 bees; 3 flowers, 6 bees).
- Task Analysis (Backward Chaining)
- Provide the first three rows of a growing addition pattern and ask the student to create the fourth row.

- Using a T-chart, provide the first three parts of the growing pattern and ask the student to create the fourth part of the pattern.

Suggested Supports and Scaffolds:

- Examples of repeating patterns in a real-world setting (e.g., in the environment and art)
- T-Charts for growing patterns
- Use of graphic organizers to illustrate a pattern of sets in which the student places 2D or 3D shapes or colors using addition or multiplication (e.g., +3 growing pattern)

- Counters
- 2D and 3D shapes, objects, or pictures
- Interactive whiteboard or other technology to model growing patterns

Louisiana Student Standard

- **3.OA.A.1** Interpret products of whole numbers, e.g., interpret 5×7 as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as* 5×7.

Louisiana Connector

- **LC.4.OA.A.1** Use objects to model multiplication and division situations involving up to 5 groups with up to 5 objects in each group and interpret the results.
- **LC.3.OA.A.3b** Use objects to model multiplication and division situations involving up to 10 groups with up to 5 objects in each group and interpret the results.

Concrete Understandings:

- Create an array (e.g., show me 2 groups/rows of 3; or 2X3).
- Use calculator and/or manipulatives to add and subtract within 50.

Representation:

- Use an array to represent a multiplication or division problem.
- Select a numeral to place under each representation in the modeled equation.
- Select a pictorial representation of an array that matches the multiplication or division problem.
- Understand the following concepts, vocabulary and symbols: =, X, ÷ , groups, objects, set, equal groups, combination, comparison, multiplication, division, array, row, column, equation.

Suggested Instructional Strategies:

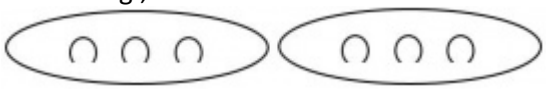
- Multiple Exemplar Training
  - Equal sets: "This is a set. This is an equal set. This is an equal set. This is not an equal set. Show me an equal set."
- Teach multiple ways of describing multiplication (e.g., 2 x 2 = 4; 2 times 2 = 4; a 2 by 2 array is 4).
- Task Analysis for solving simple multiplication and division problems using arrays:
  - **When multiplying**, teach that "X" means multiply and to read the multiplication symbol as "rows of." For example, read the problem 2 x 3 as "two rows of three."
    - Teach that the first number indicates the number of rows and the second number indicates the number of shapes/objects in each row.
    - Using grid paper or other graphic organizer, draw the first row of the array (e.g., one row of three).

- Draw the second row of the array (e.g., second row of three).
- Count the symbols, shapes, pictures, or objects in both rows to solve.
- To interpret the results, state the answer (total number of symbols, shapes, pictures, or objects).

- **When dividing**, solve the problem using arrays. For example, solve 20 ÷ 4:
  - Create a set of 20 shapes/objects based on the first number (the dividend).
  - Divide/separate the set into 4 equal sets (given the second number (4) in the division problem).
  - Count the number of equal sets to solve the problem.

- Use arrays to model multiplication and division problems.
  - Show (2 X 3): two (number of groups/rows) times three (counters in each group); using a rectangle, the height is the number of rows and the base is the number of units in each row:

  - e.g., Show 6 ÷ 2:



- Trial and error to form equal sets of objects to make the arrays
- Multiple exemplars for equal and not equal

- Model-Lead-Test

Suggested Supports and Scaffolds:

- Counters
- Number lines
- Egg cartons or muffin tins to illustrate/create arrays
- Ones and tens blocks to form different rectangles (rows and columns)
- Manipulatives, visuals, and Wiki Sticks to illustrate/define arrays
- T-chart with two columns showing the multiplier in the first column and the number of units in the second column to represent a growing pattern
- Raised grid (to keep structure of array) or graph paper
- Use PPT and shape tool to create arrays to match a provided problem
- Interactive whiteboard or other technology to create arrays

Suggested Supports and Scaffolds:

- Interactive whiteboard
- Labeled 2-D and 3-D shape as a model
- Assistive technology/voice output devices for identifying shapes
- Shapes (both 2-D and 3-D) with raised/textured edges (can be made with puffy paint for raised, hole punched/decorative scissors for textured)
- Magnetic shapes and a magnet board for easy movement and control of shapes
- Use errorless choices when working with a student who requires assistance instead of doing the task for them or correcting their choices.
- Use pool noodles to stabilize materials on trays or tables.
- Use high contrast, raised, neon colors for students with visual impairments.

Louisiana Student Standard

- **5.NF.B.5** Interpret multiplication as scaling (resizing), by:
  a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.
  b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case).
  c. Explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number.
  d. Relating the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1.

Louisiana Connector

- **LC.5.NF.B.5** Determine whether the product will increase or decrease based on the multiplier.

Concrete Understandings:

- Show what happens to a set when it's multiplied by 1(1X) or some other whole number (2X).
- Example: I have 3 chips; which is one set of 3 chips…Now show me 2 sets of 3 chips. …Which is more?
- Use whole numbers.

Representation:

- Select a pictorial representation that matches the multiplication problem.
- Recognize that when a number is multiplied by a fraction or decimal, the product will decrease.
- Recognize that when a number is multiplied by a number greater than one, the product will increase.
- Know the following vocabulary and symbols: =, X, >, <, proportion, product, multiplier, factor.

Suggested Instructional Strategies:

- Explicitly teach that a multiplicand multiplied by a whole number multiplier increases the product and a fraction/decimal multiplier decreases the product; demonstrate a strategy for self-checking the answer.
- Task analysis example:
  - State the problem using a whole number multiplier.
  - Predict if the product will increase or decrease.
  - Show me one set of (X) chips. Count the chips. How many?
  - Now show me 2 sets of (X) chips. Count the chips. How many?
  - State the total number of chips.

- Student states if the product is greater or less than the multiplicand.

- Task analysis example:
  - State the problem using a fraction multiplier.
  - Predict if the product will increase or decrease.
  - Provide a set of total number of chips to be divided by a fraction.
  - Model the number of created sets.
  - Student states if the product is greater or less than the multiplicand.
- Use counting strategies.
- Use number patterns (i.e., skip counting).
- Modeling problem solving with supports.
- Show multiplication as repeated addition (write 3 X 3 as 3 + 3 + 3).

Suggested Supports and Scaffolds:

- Counters (chips)
- Picture and objects
- Number line
- Fraction strips and tables
- Decimal tables
- Multiplication table or calculator to self-check answers
- Graphic organizers (rows and columns)

Louisiana Student Standard

- **6.EE.B.7** Solve real-world and mathematical problems by writing and solving equations and inequalities of the form x + p = q and px = q for cases in which p, q and x are all nonnegative rational numbers. Inequalities will include <, >, ≤, and ≥.

Louisiana Connector

- **LC.6.EE.B.7b** Solve real world, single step linear equations.

Concrete Understandings:

- Use objects to solve one-step addition and subtraction equations with whole numbers.

Representation:

- Match a representation of an equation with a variable to a real-world problem.
- Set up an equation in which both sides are equal (adding or subtracting the same number/value from both sides of the equation).
- Understand the following vocabulary and symbols: +, -, X, ÷, =
- Understand the following concepts and vocabulary: variable, solution, equation

Suggested Instructional Strategies:

- Explicitly teach strategies for determining the operation required to solve a single step real-world problem.
- Task analysis
  - Read the story problem.
  - Identify what question is being asked (define "**x**").
  - Identify the facts and the operation (+, - , x, ÷) in the story to write an equation.
  - Add or subtract the value number/value from both sides of the equation.
  - Solve the equation for "**x**".
  - Show the answer as "**x**" = ___.
- Adding and subtracting strategies.

Suggested Supports and Scaffolds:

- Pictures and manipulatives
- Template for solving an equation
- Number line
- Calculator

Louisiana Student Standard

- **6.RP.A.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."*

Louisiana Connector

- **LC.6.RP.A.1c** Describe the ratio relationship between two quantities for a given situation.

Concrete Understandings:

- Match/identify a simple ratio (1:X) as the relationship between two quantities.
- Given a situation use objects or a calculator to set up a ratio.

Representation:

- Recognize the meaning of the placement of numbers in a ratio for a given situation.
- Show a ratio in three ways: number to number (1 to 2) expressed as a fraction (1/2) or using a colon 1:2.
- Represent the ratio of objects (e.g., red hats) to the total number of objects (red and green hats) (part-to-whole).
- Represent the ratio of the number of one object (red hats) to the number of other objects (green hats) from a set of objects (red and green hats) (part-to-part).
- Understand the following concepts and vocabulary: ratio, rate, proportion, prices, portions per person.

Suggested Instructional Strategies:

- Multiple Exemplar Training:
- Example for equal sets: "This is a proportional relationship. This is a proportional relationship. This is a proportional relationship. This is not a proportional relationship. Show me a proportional relationship."
- Example for representing ratios: There are three chairs for one/each table. The ratio is 3 to 1. The ratio is 3:1. The ratio is 3/1. The ratio is not 1 to 3. Show me the ratio for three chairs for one table.
- Explicit teaching of three ways to represent a ratio
- Task Analysis example:

- Read the story problem/situation: "In one (1) day, Jack reads two (2) books. How many books will Jack read in 4 days?
- Use the information to fill in a table. Find the word/picture that follows the number. Write the first word/picture in the first row/ column (point to the row/column).
- Write the second word/picture in the second row/first column (point to the row/column).
- Use the information in the problem/situation to fill in the number of days.
- Use the information in the problem/situation to fill in the number of books.

Day	1	2	3	4
Total Books Read	2			

  - Here is a way to show the ratio / compare the two numbers: (___: ___)
  - Put the numbers of days here. Put the number of books here.
  - You showed the ratio of days to books. Show/tell me the ratio.
- Teach what" twice as many" (2 times the original) or "three times as many" (3 times the original) means.
- Multiple Exemplar Training example:
- Ratio: Here is the ratio 3: 1. This picture shows the ratio.

- This picture shows the ratio.

- This does not show the ratio.

- Show me a picture that shows the ratio 3:1.
- Provide a ratio and ask the student to use unit blocks to show the ratio (e.g., the ratio of girls to boys in our class is 3:2. Use the unit blocks to show the ratio of girls to boys.).
- Provide unit blocks showing a ratio and ask the student to define the proportional relationship/rule.

Provide a ratio based on standard measurement and ask the student to complete a table for increasing quantities (e.g., 1 foot = 12 inches; 3 feet = 1 yard; 1 dime = 2 nickels or four quarters = one dollar).

Suggested Supports and Scaffolds:

- Unit blocks of ones
- Colored tiles
- Graphic organizer (tables with two columns)
- Grid paper or raised grid paper
- Colored 2D figures and 3D objects
- Interactive whiteboard or other technology to manipulate representations of ratios

Louisiana Student Standard

- **7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?

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

Louisiana Connector

- **LC.7.EE.B.4c** 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.

Concrete Understandings:

- Identify situation in which quantities are equal or unequal.
- Record/replace a variable in an equation with a fact from a story on a graphic organizer.

Representation:

- Create a pictorial array of a simple equation to translate wording.
- Understand the following concepts, vocabulary, and symbols: +, -, X, ÷, =, ≠, <, >, equation, equal, inequality.

Suggested Instructional Strategies:

- Explicitly teach equality vs. inequality.
- Explicitly teach strategies for determining the operation required to solve a single step real-world problem.
- Task analysis
- Read a story problem that is personally relevant to the student.
- Identify what question is being asked (define "x").
- Identify the facts and the operation (+, - x, ÷) in the story.
- Provide graphic organizer or template to organize the facts and write.
- Write an equation to solve for "x."

- Add, subtract, multiply or divide the number/value to both sides of the equation.
- Solve the equation for "x"
- Show the answer as "x" = ___.
- Explicit teaching of how to identify what question is being asked (i.e., what" x" represents in the story problem).
- Provide an equation for which the student will determine a story problem.
- Create a personally relevant story; provide graphic organizers as a means for organizing student's work; task analytic instruction to break down skills and chain them in order to isolate each step in solving the math task.
- Adding and subtracting strategies
- Multiplying and dividing strategies

Suggested Supports and Scaffolds:

- Counters
- Number lines
- Multiplication tables
- Calculator
- Interactive whiteboard

Louisiana Student Standard

- **7.RP.A** Use proportional relationships to solve multi-step ratio and percent problems of simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, and percent error.

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- **LC.7.RP.A.3e Use proportional relationships to solve multistep percent problems.**

Concrete Understandings:

- Identify how one variable changes in relation to another variable in a directly proportional relationship.
- a/b = c/d If a increases, what will happen to c?
- Apply understanding to convert percents to decimals.

Representation:

- Use a proportion method to solve (part/whole = number/100).
- Set up a proportion to solve for an unknown value.
- Follow a sequence of steps to solve a problem.
- Understand the following vocabulary and symbol: % (percent), proportion.

Suggested Instructional Strategies:

- Task Analysis example: Read the story problem/situation: *If 3 out of 5 animals are dogs, what percent of the animals is made up of dogs?*

1.
    1. Fill in the proportion using the provided information in the story problem to record what is known and what is unknown/represented by "x" (what to solve for).
    2. Say, "In this problem, you are being asked **3 is what percent** of 5. You are given two numbers (3 and 5) and asked to find the third (X) in this problem."
    3. The **3** is the part. Write **3** in the proportion.
    4. The **5** is the whole. Write **5** in the proportion.
    5. The percent is unknown or **x**. Write **x** in the proportion.

$$\frac{\text{part (3)}}{\text{whole (5)}} = \frac{\text{percent (x)}}{100}$$

2. Fill in the numbers on each side.

whole (5)	percent (x)	=	part (3)	100

3. Use the calculator to multiply the numbers on each side of the equation.
4. Use the calculator to divide each side of the equation by 5.
5. What percent is **X**? Write that number (3 is ___% of 5).

- Explicit instruction on using ratio tables to find a percent of a quantity
- Explicit instruction on cross multiplying
- Explicit instruction on solving for X (dividing both sides)

Suggested Supports and Scaffolds:

- Highlight text that provides important information/vocabulary
- Counters
- Multiplication table
- Calculator
- Table showing fractions and percentages (3/5 = 60%)
- Graphic organizers
- Interactive whiteboard or other technology to manipulate representations

Louisiana Student Standard

- **8.EE.C.7** Solve linear equations in one variable.

a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers).

b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Louisiana Connector

- **LC.3.G.A.1** Identify shared attributes of shapes.

Concrete Understandings:

- Use manipulatives or graphic organizer to solve a problem.
- Identify the reciprocal operation in order to solve one step equations.

Representation:

- Create a pictorial array of a simple equation to translate wording to solve for x or y.
- Understand the following concepts, vocabulary, and symbols: +, -, X, ÷, =, variable, equation.

Suggested Instructional Strategies:

- Explicit strategy: Solve an equation by dividing both sides of the equation by the value in front of the variable and then simplify.
- Use trial and error to determine the value of x or y. (Is the product too low, too high?)
- Use arrays (e.g., 3**y** = 12; When you have a total of 12 counters divided into three equal sets, how many tokens are in each set (= "**y**")?).
- Task analysis
  - Read the story problem.
  - Identify what question is being asked / what x represents (define "**x**").
  - Identify the facts and the operation (+, - x, ÷) in a story to write an equation.
  - Solve the equation for "**x**."
- Show the answer as "**x**" = ___.

Suggested Supports and Scaffolds:

- Counters
- Grids or graphic organizers to create arrays
- Multiplication chart

- Calculator
- Interactive whiteboard

Louisiana Student Standard

- **8.EE.B.5** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.

Louisiana Connector

- **LC.8.EE.B.5** Represent proportional relationships on a line graph.

Concrete Understandings:

- Identify parts of a line graph.
- Identify the 2 coordinates of a point on a line graph.
- Examine the values of the x variable or y variable to look for a pattern.
- Recognize a positive relationship between two variables.

Representation:

- Graph a series of coordinates on a graph.
- Identify given coordinates (x,y) as a point on a graph.
- Identify the intercept(s) on a graph.
- Understand the following concepts, vocabulary, and symbols: coordinates, ordered pairs(x,y), intercept, grid, axis, point, proportion, line, slope.

Suggested Instructional Strategies:

- Teach explicitly that a coordinate grid has two perpendicular lines, or axes, labeled like number lines.
- Teach explicitly how to recognize the relationship between y and x using the coordinates of several points (e.g., **y** increases as **x** increases; the ratio is the same for all values if they are directly proportional).
- Provide multiple examples of line graphs with different, labeled coordinates and slopes.
- Teach explicitly how to plot coordinates on a grid and draw the line.
- Teach explicitly how to define a line provided on a grid by multiple coordinates.
- Teach explicitly simple distance/time problems that illustrate how the rates of two objects can be represented, analyzed and described graphically.
- Task Analysis
    - Provide a series of proportional coordinates.
    - Present a labeled graph.
    - Identify the **x** coordinate and **y** coordinate and plot each point.
    - List coordinates on a "T" chart, (**x** in one column and **y** in the other) for each set of coordinates.
- State the proportional relations;_ : _

Suggested Supports and Scaffolds:

- Grid paper with raised perpendicular lines (horizontal and vertical lines) and points
- Models
- T-chart, graphic organizer
- Rulers, straightedge
- Calculator

Louisiana Student Standard

- **8.F.B.4** Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

Louisiana Connector

- **LC.8.F.B.4** Identify the rate of change (slope) and initial value (y-intercept) from graphs.

Concrete Understandings:

- Indicate the point on a line that crosses the y-axis.
- Describe the rate of change qualitatively (e.g., steep = rapid change).

Representation:

- Interpret/define a line graph with coordinates for multiple points.
- Identify coordinates (points) on a graph.
- Understand the following concepts and vocabulary: x axis, y axis, x intercept, y intercept, line, rise, fall, slope, rate of change.

Suggested Instructional Strategies:

- Explicitly teach axes (x-axis is the horizontal axis and the y-axis is the vertical axis) and coordinates for points.
- Explicitly teach identifying x,y coordinates for points on a graph.
- Explicitly teach counting distances between points on each axis.
- Explicitly teach that when x = 0, you are on the y-axis (the y-intercept); the initial value is the "starting point" where the line only passes through the y-axis once.
- Models of lines graphs (positive: rises from left to right; negative: falls from left to right; and coordinates of varying slope; match coordinates to graphs)
- Task analysis for rate of change/slope:
    - Present a line graph showing the unit rate as the slope for a series of proportional coordinates.
    - Present a formula template: slope = rise/run.
    - Teach that the steepness, or slant, of a line is called the slope (e.g., a steep mountain).
    - Identify two points on the line.
    - Label the p points 1 and 2.
    - Using two different colored pencils, mark the rise(red) and run (blue).

- Count the rise. (How many units do you count **up** (positive) or **down** (negative) to get from one point to the next? Record this number (change in value) as your numerator.)
- Count the run. (How many units do you count **left (**down/negative) or right to get to the point? Record this number (change in value) as your denominator.)
- Simplify the fraction if possible.

- Give students opportunities to gather their own data or graphs in familiar contexts.
- Task Analysis for initial value (y-intercept)
  - Provide a template for recording the y-intercept: y-intercept/starting point = (0, (**y**))
  - Find the y-axis.
  - Highlight the y-axis.
  - Look at the graph and identify and circle the point at which the line passes through the **y**-axis.
- Fill in the value of y in the template.

Suggested Supports and Scaffolds:

- Grid paper with raised perpendicular lines (horizontal and vertical lines) and points
- Models
- T-chart, graphic organizer
- Rulers, straightedge
- Colored pencils/markers
- Interactive white board

Louisiana Student Standard

- **A1: A-CED.A.1** Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear, quadratic, and exponential functions.

Louisiana Connector

- **LC.A1: A-CED.A.1** Translate a real-world problem into a one variable linear equation.

Concrete Understandings:

- Match an equation with one variable to a real-world context.

Representation:

- Create a pictorial array of a simple equation to translate wording.
- Know the following vocabulary and symbols: +, -, X, ÷, =, linear, variable.

Suggested Instructional Strategies:

- Task analysis
  - Present the story problem based on a real-world, relevant context and provide a template for recording facts/operation to solve the real-world problem.
  - Highlight key information in the problem; strike through irrelevant information.
  - Identify what question is being asked (define *x*).
  - Identify the facts.
  - Fill in the facts in the order presented in the story problem on the template.
  - Determine the operation(s) (+, - X, ÷).
  - Identify what operation should be completed first.
  - Fill in the operation.
  - State the equation.
  - Solve for *x*.
- Answer the problem statement.

Suggested Supports and Scaffolds:

- Counters
- Multiplication chart
- Calculator

Louisiana Student Standard

- **4.G.A.3** Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

Louisiana Connector

- **LC.4.G.A.3** Recognize a line of symmetry in a figure.

Concrete Understandings:

- Distinguish 2-D figures from other figures.
- Fold paper so all the sides match up to test whether it has a line of symmetry.

Representation:

- Given a picture, select shapes that have a line of symmetry already drawn.
- Given a picture, select shapes that are symmetrical.

Suggested Instructional Strategies:

- Show students a picture of a happy face. Using paint or ink, mark one eye and half of the mouth, and then fold it length-wise in half. Ask the students if they think that the picture is the same on both sides of the fold. Unfold the picture and see what pattern the ink or paint made. Do the same thing, this time fold the picture width-wise. Ask the students again if they think that the picture is the same on both sides of the fold. Unfold the picture and see what pattern the ink or paint made. Tell students that when you can fold a picture and have both sides match up, that picture has symmetry, it matches. The line you can fold it on is called the line of symmetry. That line may NOT be in more than one place on a picture. Hand out or try the same thing with several pictures. See if students can find a line of symmetry or more than one line of symmetry in the pictures.
- Using wikistix, have students try to find lines of symmetry on different shapes. Once they place the wikistix, have them fold the shape along the wikistix and see if the shape is the same along the fold. If not, they must replace the wikistix in a different area and try again. If it works, they can draw the line with pen or pencil.
- Multiple exemplar training

Suggested Supports and Scaffolds:

- Picture of common symmetrical item (happy face, butterfly, button)
- Paint or ink
- Wikistix

Louisiana Student Standard

- **5.G.A.1** Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number in the ordered pair indicates how far to travel from the origin in the direction of one axis, and the second number in the ordered pair indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., *x*-axis and *x*-coordinate, *y*-axis and *y*-coordinate).

Louisiana Connector

- **LC.5.G.A.1c** Use order pairs to graph given points.

Concrete Understandings:

- Identify the x- and y- axis.
- Identify the origin (i.e., point of intersection).
- Complete concrete graphing of points (e.g., put the straw up on 3 on the x-axis; put the next straw across on 2 on the y-axis. Put a chip there [for 3,2]).
- Identify that in an ordered pair, the first coordinate is the location on the x-axis and the second is the location on the y-axis.

Representation:

- Understand the following concepts and vocabulary: coordinates, ordered pair, origin, axis, grid, point.

Suggested Instructional Strategies:

- Task analysis: Identify number to be plotted on x-axis, plot, identify number to be plotted on the y-axis, plot.
- Use games such as "Battleship" to practice graphing.
- Use a grid on the floor and have students move to coordinates.
- Make a treasure hunt with ordered pairs.
- Use ordered pairs that create a picture when graphed.

Suggested Supports and Scaffolds:

- Grid paper
- Models
- Graphic organizer
- Computer websites
- Raised graph paper
- Raised coordinate plane with raised x- and y-axis and raised horizontal and vertical lines
- Visual representation of task analysis
- Maps of local and/or well-known cities
- Maps of school or classroom

Louisiana Student Standard

- **6.G.A.3** Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.

Louisiana Connector

- **LC.6.G.A.3a** Use coordinate points to draw polygons.

Concrete Understandings:

- Identify the x- and y- axis.
- Identify the origin (i.e., point of intersection).
- Complete concrete graphing of points (e.g., put the straw up on 3 on the x-axis; put the next straw across on 2 on the y-axis. Put a chip there [for 3,2]).
- Identify that in an ordered pair, the first coordinate is the location on the x-axis and the second is the location on the y-axis.
- Recognize that polygons can be formed by connected, selected points in a coordinate plane.
- Decontextualize situation to identify coordinate points.

Representation:

- Understand the following concepts and vocabulary: coordinates, ordered pair, origin, axis, grid, point.

Suggested Instructional Strategies:

- Model-Lead-Test determining if number is x or y for coordinate points
- Task analysis for finding coordinate points on graph:
  - Determine if each point is x,y.
  - Determine quadrant to start points.
  - Locate each coordinate point.
  - Mark each point.
  - Connect points.

- Explicitly teach how to plot point on a graph.

Suggested Supports and Scaffolds:

- Graph with labels for x and y as well as +/- in each corresponding quadrant
- Raised line graph
- Large graph for students eye gaze to identify x, y coordinate points
- Adapted ruler
- Interactive technology
- AAC device
- Graph with less lines than typical graph paper

Louisiana Student Standard

- **6.G.A.1** Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

Louisiana Connector

- **LC.6.G.A.1c** Find area of quadrilaterals.

Concrete Understandings:

- Use square tiles to cover a rectangle.
- Count the number of tiles to determine the area.

Representation:

- Use formula to find area.
- Understand the following concepts and vocabulary: base, height, area, quadrilateral.

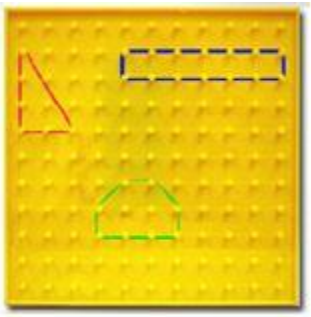
Suggested Instructional Strategies:

- Explicit instruction on using formula to find area
- Task analysis: Measure the length, put number in formula, measure height, put number in formula, use calculator to compute area

Suggested Supports and Scaffolds:

- Calculator
- Template with formula
- Ruler
- Labeled figure (with numbers)
- Grid or dot paper
- iPad/iTouch Geo Board apps
- 1x1 squares
- Tiling with unit squares of the appropriate unit fraction side lengths:

- Geo Board



Louisiana Student Standard

- **6.G.A.4** Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.
- **7.G.B.6** Solve real-world and mathematical problems involving area, volume, and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. (Pyramids limited to surface area only.)

Louisiana Connector

- **LC.6.G.A.4** Find the surface area of three dimensional figures using nets of rectangles or triangles.
- **LC.7.G.B.6b** Find the surface area of three-dimensional figures using nets of rectangles or triangles.

Concrete Understandings:

- Demonstrate an understanding of the concept of the surface area of a rectangular prism.
- Unfold three-dimensional objects into nets.

Representation:

- Use formulas for surface area.
- Understand symbols from formula.
- Understand 2- and 3-D dimensionality (2-D is space covered, 3-D is the space within).
- Understand the following concepts and vocabulary: base, height, slant, surface area, prism, net, face.

Suggested Instructional Strategies:

- Task analysis
    - Identify a face in the figure.
    - Find the area of each face in the figure
        - measure the length
        - put number in formula
        - measure height
        - put number in formula
        - use calculator to compute area
    - Add area of all faces together to find the surface area
- Explicit use of the formulas

Suggested Supports and Scaffolds:

- Template with formula
- Calculator
- Computer software
- Interactive whiteboard
- Numbered cubes
- Grid or dot paper
- Tiling with unit squares of the appropriate unit fraction side lengths
- Squares that can be joined together to develop nets for a cube

Louisiana Student Standard

- **7.G.B.6** Solve real-world and mathematical problems involving area, volume, and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. (Pyramids limited to surface area only.)

Louisiana Connector

- **LC.7.G.B.6c** Find area of plane figures and surface area of solid figures (quadrilaterals).

Concrete Understandings:

- Demonstrate an understanding of the concept of the surface area of a rectangular prism.
- Unfold three-dimensional objects into flat nets where all faces are visible.
- Recognize that surface area is found by adding up the individual areas of each face.

Representation:

- Use formulas for surface area.
- Understand symbols from formula.
- Understand 2- and 3-D dimensionality (2-D is space covered, 3-D is the space within).
- Understand the following concepts and vocabulary: base, height, slant, surface area, prism, net, face.

Suggested Instructional Strategies:

- Task analysis: Identify a face in the figure, find the area of each face in the figure, add all faces together to find the surface area
- Explicit use of the formulas
- Model-Lead-Test: Locate plane figures in environment such as desk, wall, door, piece of paper then measure and find area

Suggested Supports and Scaffolds:

- Interactive whiteboard
- Visual task analysis for finding area
- Post-its to measure area of large quadrilaterals
- Template with formula
- Calculator
- Computer software
- Grid or dot paper

- Tiling with unit squares of the appropriate unit fraction side lengths
- Squares that can be joined together to develop nets for a cube

Louisiana Student Standard

- **8.G.A.2** Explain that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. (Rotations are only about the origin and reflections are only over the *y*-axis and *x*-axis in Grade 8.)
- **8.G.A.4** Explain that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. (Rotations are only about the origin, dilations only use the origin as the center of dilation, and reflections are only over the *y*-axis and *x*-axis in Grade 8.)

Louisiana Connector

- **LC.8.G.A.2** Recognize congruent and similar figures.
- **LC.8.G.A.4a** Recognize congruent and similar figures.

Concrete Understandings:

- Recognize corresponding points and sides in figures (e.g., match concrete examples of congruent shapes, match concrete examples of similar shapes).

Representation:

- Understand the following concepts and vocabulary: figures, congruent, similar
- Describe circles, squares, rectangles, and triangles, by telling about their shape, sides, lines, and angles.

Suggested Instructional Strategies:

- Teach using multiple exemplars using objects first then 2-dimensional figures (congruent, similar).
- Match to same
- Explain that similarities between objects can include shapes, lines, and angles.

Suggested Supports and Scaffolds:

- Graphic organizer
- Transparent figures
- Interactive whiteboard or other technology

- Create a book or handout showing vocabulary and examples
- Tracing paper
- Grid or dot paper
- Manipulatives (e.g., 3-D shapes)
- Attribute tiles

Louisiana Student Standard

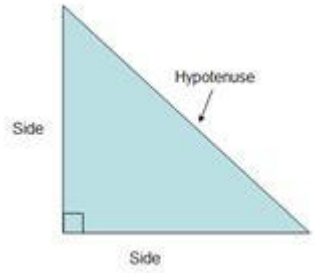
- **8.G.B.7** Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

Louisiana Connector

- **LC.8.G.B.7c** Find the missing side lengths of a two-dimensional right triangle (Pythagorean Theorem).

Concrete Understandings:

- Identify a right angle triangle.
- Identify sides and/or hypotenuse of a right triangle.



- Multiply a number by itself

Representation:

- Use formula to find missing side of a triangle.
- Represent/draw right triangles from given measures.
- Recognize meaning of exponents.
- Solve for square root.
- Understand the following concepts and vocabulary: hypotenuse, Identify symbol for exponent.

Suggested Instructional Strategies:

- Explicit instruction on the formula: Does this triangle have a right angle? Identify the right angle. Use sides of right angle to find length. Enter answer.
- Discuss application in real-world situations.

Suggested Supports and Scaffolds:

- Calculator
- Illustrations
- Template for equation
- Interactive whiteboard Graph with less lines than typical graph paper

Louisiana Student Standard

- **GM: G-CO.A.5** Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.

Louisiana Connector

- **LC.GM: G-CO.A.5** Construct, draw or recognize a figure after its rotation, reflection, or translation.

Concrete Understandings:

- Use coordinates to draw plane figures in a coordinate plane.

Representation:

- Distinguish between orientations of plane figures.
- Distinguish between translations, rotations, and reflections.

Suggested Instructional Strategies:

- Model-Lead-Test: Use math tools (e.g., tangrams, Legos, stickers) to demonstrate the transformation of the shape. Demonstrate one transformation at a time.
- Use most-to-least prompting to teach students to demonstrate transformations
- Given a picture or drawing of a shape, students use whatever tool is appropriate to transform the shape.
- Label the sides of a cube (dice) with letters or stickers (whichever is more recognizable to the student), rotate the cube and note the change.

Suggested Supports and Scaffolds:

- Manipulatives such as Geoboards, tangram shapes, pattern blocks, magnetic pattern blocks
- Legos to construct then manipulate the object
- Graphic Organizer
- Provide an arrow to show the direction of the movement of the object to create a flip, a turn, or a slide (transformation).
- Assistive Technology
- Virtual manipulatives