# CCGPS
# Frameworks
# Student Edition

## Mathematics

Third Grade Unit Two
Operations and Algebraic Thinking:
The Relationship Between Multiplication
and Division

# Unit 2
# The Relationship Between Multiplication and Division

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## OVERVIEW

In this unit, students will:
- begin to understand the concepts of multiplication and division
- learn the basic facts of multiplication and their related division facts

Students 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.

Some common misconceptions that students may have are thinking a symbol (? or  ) is always the place for the answer. This is especially true when the problem is written as $15 ÷ 3 =?$ or $15 =  \times 3$. Students also think that $3 ÷ 15 = 5$ and $15 ÷ 3 = 5$ are the same equations. The use of models is essential in helping students eliminate this understanding.

Another key misconception is that the use of a symbol to represent a number once cannot be used to represent another number in a different problem/situation. Presenting students with multiple situations in which they select the symbol and explain what it represents will counter this misconception.

| | **Unknown Product** | **Group Size Unknown** ("How many in each group? Division) | **Number of Groups Unknown** ("How many groups?" Division) |
|---|---|---|---|
| | $3 \times 6 = ?$ | $3 \times ? - 18$, and $18 \div 3 = ?$ | $? \times 6 = 18$, and $18 \div 6 = ?$ |
| **Equal Groups** | There are 3 bags with 6 plums in each bag. How many plums are there in all? *Measurement example.* You need 3 lengths of string, each 6 inches long. How much string will you need altogether? | If 18 plums are shared equally into 3 bags, then how many plums will be in each bag? *Measurement example.* You have 18 inches of string, which you will cut into 3 equal pieces. How long will each piece of string be? | If 18 plums are to be packed 6 to a bag, then how many bags are needed? *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? |
| **Arrays[1], Area[2]** | There are 3 rows of apples with 6 apples in each row. How many apples are there? *Area example.* What is the area of a 3 cm by 6 cm rectangle? | If 18 apples are arranged into 3 equal rows, how many apples will be in each row? *Area example.* A rectangle has area 18 square centimeters. If one side is 3 cm long, how long is a side next to it? | If 18 apples are arranged into equal rows of 6 apples, how many rows will there be? *Area example.* A rectangle has area 18 square centimeters. If one side is 6 cm long, how long is a side next to it? |
| **Compare** | A blue hat costs $6. A red hat costs 3 times as much as the blue hat. How much does the red hat cost? *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? | A red hat costs $18 and that is 3 times as much as a blue hat costs. How much does a blue hat cost? *Measurement example.* A rubber band is stretched to be 18 cm long and that is 3 times as long as it was at first. How long was the rubber band at first? | A red hat costs $18 and a blue hat costs $6. How many times as much does the red hat cost as the blue hat? *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? |
| **General** | $a \times b = ?$ | $a \times ? = p$, and $p \div a = ?$ | $? \times b = p$, and $p \div b = ?$ |

*Adapted from Common Core State Standards Glossary, pg 89*

## COMMON MULTIPLICATION AND DIVISION SITUATIONS

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[1] 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.

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

## STANDARDS FOR MATHEMATICAL CONTENT

**Represent and solve problems involving multiplication and division.**

**MCC.3.OA.1** Interpret products of whole numbers, e.g., interpret $5 \times 7$ as the total number of objects in 5 groups of 7 objects each.

**MCC.3.OA.2** Interpret whole-number quotients of whole numbers, e.g., interpret $56 \div 8$ as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each.

**MCC.3.OA.3** Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

**MCC. 3.OA.4** Determine the unknown whole number in a multiplication or division equation relating three whole numbers.

**Represent and interpret data.**

**MCC.3.MD.3.** Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*

**MCC.3.MD.4.** Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.

## STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

**\*\*\*Mathematical Practices 1 and 6 should be evident in EVERY lesson\*\*\***

## ENDURING UNDERSTANDINGS (Taken From Georgia Frameworks)

- Multiplication and division are inverses; they undo each other.
- Multiplication and division can be modeled with arrays.

- Multiplication is commutative, but division is not.
- There are two common situations where division may be used.
  - Partition (or fair-sharing) - given the total amount and the number of equal groups, determine how many/much in each group
  - Measurement (or repeated subtraction) - given the total amount and the amount in a group, determine how many groups of the same size can be created.
- As the divisor increases, the quotient decreases; as the divisor decreases, the quotient increases.
- There is a relationship between the divisor, the dividend, the quotient, and any remainder.

## ESSENTIAL QUESTIONS

- How are multiplication and addition alike?
- How are multiplication and addition different?
- How are multiplication and addition related?
- How are multiplication and division related?
- How are subtraction and division related?
- How can I show data using a line plot graph?
- How can multiplication and division be used to solve real world problems?
- How can the same array represent both multiplication and division?
- How can we connect multiplication facts with their array models?
- How can we model division?
- How can we model multiplication?
- How can we practice multiplication facts in a meaningful way that will help us remember them?
- How can we use patterns to solve problems?
- How can we write a mathematical sentence to represent a multiplication model we have made?
- How can we write a mathematical sentence to represent division models we have made?
- How do I decide what increment scale to use for a bar graph?
- How do I decide what symbol to use when constructing a pictograph?
- How do the parts of a division problem relate to each other?
- How do you create a bar graph or table?
- How do you display collected data?
- How do you interpret data in a graph?
- How is the commutative property of multiplication evident in an array model?
- Is there more than one way of multiplying to get the same product?
- Is there more than one way to divide a number to get the same quotient?
- What are strategies for learning multiplication facts?
- What do the parts of a division problem represent?
- What happens to the quotient when the dividend increases or decreases?
- What is the relationship between the divisor and the quotient?

- What parts are needed to make a complete chart, table, or graph?  (title, labels, etc.)
- Why would you organize data in different ways?

## CONCEPTS/SKILLS TO MAINTAIN

It is expected that students will have prior knowledge/experience related to the concepts and skills identified below. It may be necessary to pre-assess in order to determine if time needs to be spent on conceptual activities that help students develop a deeper understanding of these ideas.

- Odd and even numbers
- Skip counting by twos, threes, fives, and tens
- Determining reasonableness using estimation
- Addition and subtraction as inverse operations
- Basic addition facts
- Making tens in a variety of ways
- Basic subtraction facts
- Modeling numbers using base 10 blocks and on grid paper
- Using addition to find the total number of objects in a rectangular array

## SELECTED TERMS AND SYMBOLS

The following terms and symbols are often misunderstood. These concepts are not an inclusive list and should not be taught in isolation. However, due to evidence of frequent difficulty and misunderstanding associated with these concepts, instructors should pay particular attention to them and how their students are able to explain and apply them.

The terms below are **for teacher reference only** and are not to be memorized by the students. Teachers should present these concepts to students with models and real life examples. Students should understand the concepts involved and be able to recognize and/or demonstrate them with words, models, pictures, or numbers.

- array
- dividend
- division
- divisor
- equal groups
- equations
- factor
- groups of
- measurement division (or repeated subtraction)
- multiplicand
- multiplication
- multiplier
- partial products
- partitioned equally
- product
- quotient
- unknown

## STRATEGIES FOR TEACHING AND LEARNING
*(Adapted from Common Core Resources, NC Dept. of Public Instruction)*
**Represent and solve problems involving multiplication and division.**

In Grade 2, students found the total number of objects using rectangular arrays, such as a 5 x 5, and wrote equations to represent the sum. This strategy is a foundation for multiplication because students should make a connection between repeated addition and multiplication.

Students need to experience problem-solving involving equal groups (whole unknown or size of group is unknown) and multiplicative comparison (unknown product, group size unknown or number of groups unknown) as shown in the table in the unit overview.  No attempt should be made to teach the abstract structure of these problems.

Encourage students to solve these problems in different ways to show the same idea and be able to explain their thinking verbally and in written expression. Allowing students to present several different strategies provides the opportunity for them to compare strategies.

Sets of counters, number lines to skip count and relate to multiplication and arrays/area models will aid students in solving problems involving multiplication and division. Allow students to model problems using these tools. They should represent the model used as a drawing or equation to find the solution.



This shows multiplication using grouping with 3 groups of 5 objects and can be written as $3 \times 5$.

Provide a variety of contexts and tasks so that students will have more opportunity to develop and use thinking strategies to support and reinforce learning of basic multiplication and division facts.

Have students create multiplication problem situations in which they interpret the product of whole numbers as the total number of objects in a group and write as an expression. Also, have students create division-problem situations in which they interpret the quotient of whole numbers as the number of shares.

Students can use known multiplication facts to determine the unknown fact in a multiplication or division problem. Have them write a multiplication or division equation and the related multiplication or division equation. For example, to determine the unknown whole number in $27 \div \underline{\quad} = 3$, students should use knowledge of the related multiplication fact of $3 \times 9 = 27$. They should ask themselves questions such as, "How many 3s are in 27 ?" or "3 times what number is 27?" Have them justify their thinking with models or drawings.

**Represent and interpret data.**

Representation of a data set is extended from picture graphs and bar graphs with single-unit scales to scaled picture graphs and scaled bar graphs. Intervals for the graphs should relate to multiplication and division with 100 (product is 100 or less and numbers used in division are 100 or less). In picture graphs, use values for the icons in which students are having difficulty with multiplication facts. For example, ☺ represents 7 people. If there are three ☺, students should use known facts to determine that the three icons represents 21 people. The intervals on the vertical scale in bar graphs should not exceed 100.

Students are to draw picture graphs in which a symbol or picture represents more than one object. Bar graphs are drawn with intervals greater than one. Ask questions that require students to compare quantities and use mathematical concepts and skills. Use symbols on picture graphs that student can easily represent half of, or know how many half of the symbol represents. Students are to measure lengths using rulers marked with halves and fourths of an inch and record the data on a line plot. The horizontal scale of the line plot is marked off in whole numbers, halves or fourths. Students can create rulers with appropriate markings and use the ruler to create the line plots.

Although intervals on a bar graph are not in single units, students count each square as one. To avoid this error, have students include tick marks between each interval. Students should begin each scale with 0. They should think of skip- counting when determining the value of a bar since the scale is not in single units.

Pictographs: Scaled pictographs include symbols that represent multiple units. Below is an example of a pictograph with symbols that represent multiple units. Graphs should include a title, categories, category label, key, and data. How many more books did Juan read than Nancy?

| **Number of Books Read** | |
|---|---|
| Nancy | 📙 📙 📙 📙 📙 |
| Juan | 📙 📙 📙 📙 📙 📙 📙 📙 |
| 📙 = 5 books | |
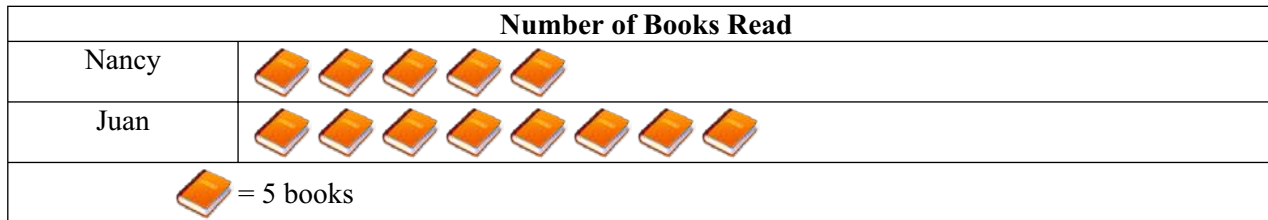
<u>Single Bar Graphs</u>: Students use both horizontal and vertical bar graphs. Bar graphs include a title, scale, scale label, categories, category label, and data.

**Types of Books Read**
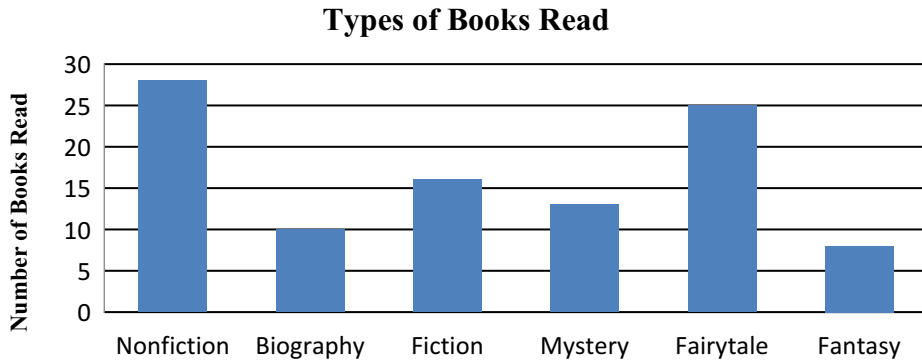


**Analyze and Interpret data:**
- How many more nonfiction books where read than fantasy books?
- Did more people read biography and mystery books or fiction and fantasy books?
- About how many books in all genres were read?
- Using the data from the graphs, what type of book was read more often than a mystery but less often than a fairytale?
- What interval was used for this scale?
- What can we say about types of books read? What is a typical type of book read?
- If you were to purchase a book for the class library which would be the best genre? Why?

Students in second grade measured length in whole units using both metric and U.S. customary systems. It is important to review with students how to read and use a standard ruler including details about halves and quarter marks on the ruler. Students should connect their understanding of fractions to measuring to one-half and one-quarter inch. Third graders need many opportunities measuring the length of various objects in their environment.

This standard provides a context for students to work with fractions by measuring objects to a quarter of an inch.

Example:
Measure objects in your desk to the nearest ½ or ¼ of an inch, display data collected on a line plot. How many objects measured ¼? ½? etc. …

**Objects on My Desk**



*Measurements in Inches*
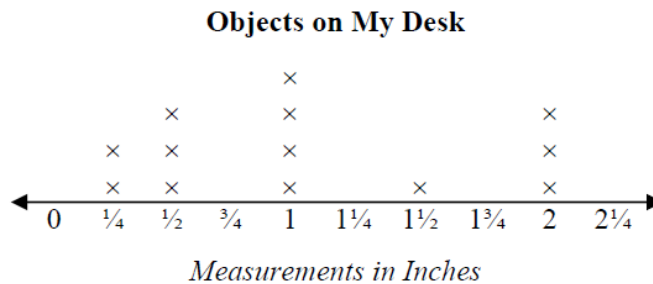
### EVIDENCE OF LEARNING

By the conclusion of this unit, students should be able to demonstrate the following competencies:

- use mental math to multiply and divide
- use estimation to determine reasonableness of products and quotients computed
- be able to read, interpret, solve, and compose simple word problems dealing with multiplication and division
- understand how to use inverse operations to verify accuracy of computation
- understand division as an unknown-factor problem. For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.
- fluently multiply and divide within 100, using strategies such as the patterns and relationships between multiplication and division

<u>**TASKS**</u>

| Scaffolding Task | Constructing Task | Practice Task | Performance Tasks |
|---|---|---|---|
| Tasks that build up to the constructing task. | Constructing understanding through deep/rich contextualized problem solving tasks | Games/activities | Summative assessment for the unit. |

| Task Name | Task Type<br>*Grouping Strategy* | Skills |
|---|---|---|
| One Hundred Hungry Ants**!** | Scaffolding Task<br>*Individual/Partners* | Multiplication |
| What's My Product? | Scaffolding Task<br>*Individual/Partners* | Multiplication |
| Base Ten Multiplication | Practice  Task<br>*Partners* | Multiplication |
| Field Day Blunder | Constructing Task<br>*Partners* | Multiplication |
| Stamp Shortage | Constructing Task<br>*Individual/Partners* | Multiplication |
| Sharing Pumpkin Seeds | Constructing Task<br>*Individual/Partners* | Division |
| What Comes First? | Constructing Task<br>*Individual/Partners* | Division |
| Shake, Rattle, and Roll Revisited | Practice Task<br>*Individual/Partners* | Multiplication |
| Stuck on Division | Scaffolding Task<br>*Individual/Partners* | Division |
| Division Patterns | Scaffolding Task<br>*Individual/Partners* | Division |
| Skittles Cupcake Combos | Constructing Task<br>*Individual/Partners* | Division |
| Animal Investigation | Scaffolding Task<br>*Individual/Partners* | Data |
| Our Favorite Candy | Constructing Task<br>*Individual/Partners* | Data |
| Leap Frog | Constructing Task<br>*Individual/Partners* | Data |
| **Ice Cream Scoops** | **Culminating Task**<br>*Individual* | **Multiplication, Division, and Data** |

<u>SCAFFOLDING TASK</u>: One Hundred Hungry Ants!

## STANDARDS FOR MATHEMATICAL CONTENT
**MCC.3.OA.1.** Interpret products of whole numbers, e.g., interpret $5 \times 7$ 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 $5 \times 7$.*

## STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

## BACKGROUND KNOWLEDGE

(Information from Van de Walle and Lovin, Teaching Student-Centered Mathematics: Grades 3-5, page 167)

When multiplying whole numbers it is a good idea to establish the meaning of the factors. We would say that 4 x 5 means that we have 4 sets of 5. The first factor will tell how much of the second factor you have. This along with simple story problems is a good beginning to developing the concept of multiplication.

## ESSENTIAL QUESTIONS
- What are the strategies for learning multiplication?
- How can we practice multiplication facts in a meaningful way that will help us remember them?
- How is the commutative property of multiplication evident in an array model?

## MATERIALS

- Colored tiles or two-sided counters
- Linking cubes (100 for groups of 4)
- Something to help organize groups such as paper plates, cups, bowls, etc.
- *One Hundred Hungry Ants,* by Elinor J. Pinczes or similar story

## GROUPING

Individual/Partners

## TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION
In this task students determine the factors by creating equal groups of counters/colored tiles.

### Part I
Begin the lesson by reading *One Hundred Hungry Ants,* by Elinor J. Pinczes or similar story. Discuss the ways the ants reorganized themselves into equal groups. You can begin the discussion by asking the following question: When the ants were first interrupted, how did they arrange themselves? (you will want to draw the pattern on the board or have linking cubes available to demonstrate the first grouping) Write the multiplication sentence next to the model. Ask students to explain the factors. "Which number represents which part of the model?" At this point the discussion will develop around groups and how many are in the groups. Continue discussing and modeling the arrangements that the ants are put into each time they are interrupted. To emphasize the idea of equal groups, you may want to ask the students, "Why did the ants not organize into groups of 3 or 6?" Allow students time to struggle with this idea. Provide groups of 4 with 100 linking cubes and let them investigate this idea.

### Part II
After students have had discussions about the ways that the ants have organized themselves, they will have an opportunity to organize ants of their own. Students will be given 20 counters and asked to arrange them in as many different equal groups as they can. Students should record their reasoning using pictures, words, and numbers.

## QUESTIONS FOR FORMATIVE ASSESSMENT
- How many ways were you able to organize 20 ants?
- Can you think of another way to organize 20 ants?
- What does your number sentence look like?
- How can you explain your picture and number sentence in words?

## DIFFERENTIATION

**Extension**
- Allow students to use different numbers of ants. (24, 36, 42). They should explain their reasoning using pictures, words, and numbers.

**Intervention**

- Allow students to work in small guided groups and reduce the number of ants to 12

**SCAFFOLDING TASK: What's My Product?**

**STANDARDS OF MATHEMATICAL CONTENT**

**MCC.3.OA.1.** Interpret products of whole numbers, e.g., interpret $5 \times 7$ 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 $5 \times 7$.*

**STANDARDS FOR MATHEMATICAL PRACTICE**

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

**BACKGROUND KNOWLEDGE**
        Traditionally multiplication tables are emphasized when students begin learning about multiplication.  Students are sent home with flash cards without a true understanding of what multiplication is. This way of learning multiplication can be difficult for students to understand. Naturally, students make groups and groups of groups. The creation of groups is a way to find the total of something in the most efficient way.  The following activity allows students to build on their natural ability to form groups and learn multiplication without memorizing facts in isolation, but as number facts that can be related to each other in a multitude of ways (Frans van Galen and Catherine Twomey Fosnot, 2007, Context for Learning Mathematics).

**ESSENTIAL QUESTIONS**
- What are the strategies for learning multiplication?
- How can we practice multiplication facts in a meaningful way that will help us remember them?
- How is the commutative property of multiplication evident in an array model?

**MATERIALS**

- Colored tiles or two-sided counters
- Something to help organize groups such as paper plates, cups, bowls, etc.
- "What's My Product" recording sheet

## GROUPING

Individual/Partners

## TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

This task allows students to interpret products of whole numbers by creating equal groups with manipulatives.

### Task Directions

### Part I

Discuss with students how to group objects. Show a container of 20 counters. Discuss with students an easy way to count the total number of counters in the container. Have students arrange the counters into equal groups. As students discuss how to put the 20 counters into groups write their thinking on the board. Explain to students that in a multiplication problem one number represents the number of groups and the other number represents the number of objects in a group.

### Part II

Provide students with a given a set of counters or tiles to separate into equal groups.
The students will continue to rearrange tiles into different groupings that are equal. As each group is arranged, write a multiplication fact to match the arrangement. Students will record their thinking in the "What's My Product?" recording Sheet.

## FORMATIVE ASSESSMENT QUESTIONS

- How many ways were you able to organize the number of counters you were given?
- Can you think of another way to organize your counters?
- What does your number sentence look like?
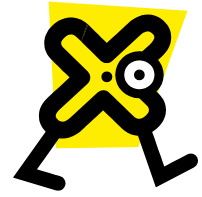- How can you explain your picture and number sentence in words?

## DIFFERENTIATION

### Extension

- Increase the numbers of counters in the students' baggies.

### Intervention
- Provide smaller numbers of counters and allow students to work with a partner.

Name_____Date_____

## What's My Product?

Directions: Arrange counters into equal groups.  Complete the table below with your arrangements.

| Groups | # of Tiles/Counters | Multiplication Fact | Total |
|---|---|---|---|
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

**PRACTICE TASK: Base Ten Multiplication**
(Inspired by Catherine Twomey Fosnot's, *Young Mathematicians at Work, Constructing Multiplication and Division*)

## STANDARDS FOR MATHEMATICAL CONTENT

**MCC.3.OA.1.** Interpret products of whole numbers, e.g., interpret $5 \times 7$ 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 $5 \times 7$.*

## STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

## BACKGROUND KNOWLEDGE

When students begin multiplication they are just getting used to counting. Before multiplication, 6 equaled a group of six objects. They also know that 4 equals a group of four objects. However, to think of 4 X 6 they have to think of the group of six as one unit because they need to make four sixes. The four is now used to count groups not objects. This is a hard concept to grasp for students just learning about numbers. Students have to reorganize their thinking (Frans van Galen and Catherine Twomey Fosnot, 2007, Contexts for Learning Mathematics).

The following task will give students practice in reorganizing numbers and developing strategies that allow them to make sense of the mathematics.

## ESSENTIAL QUESTIONS

- What are the strategies for learning multiplication?
- How can we practice multiplication facts in a meaningful way that will help us remember them?
- How is the commutative property of multiplication evident in an array model?

## MATERIALS

- Base Ten Blocks, up to 51 cubes and 60 longs per pair (base 10 template has been provided as well)
- Spinner, numbered 1-9
- Packs of 3" X 5" index cards, from 1 to 9 cards per pack, 1 pack per pair
- Overhead Base Ten Blocks (optional)
- Math journal

## GROUPING

Partners

## TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

In this task students determine the factors of 100 by creating addition and/or multiplication models by placing equal number of Base Ten Blocks of a kind on index cards according to the spin of a spinner. Students then record the number sentences that their model represents.

**Part I**:

  Ask two volunteers to hold out their hands, palms up.

  Count out 2 units into each hand. Ask children how they can find the number of units in the four hands. Lead children to count the units by twos. Write this on the chalkboard as the addition sentence $2 + 2 + 2 + 2 = 8$. Elicit that 2 units in each of 4 hands means that there is a total of 8 units. Point out that because the same number, 2, is added 4 times, another way of recording this is with multiplication. Write the multiplication sentence $4 \times 2 = 8$ on the board. Read it aloud as "Four groups of two equal eight." Have students to suggest ways to record 2 cubes in each of 4 hands.

**Part II**:

  Students will work with a partner to determine how many different ways to cover each card from a pack (prearranged according to the students needs) with equal numbers of Base Ten Blocks.

  Distribute the prearranged packs of index cards to the students. Instruct the students to determine how many cards are in their packs. They will spread out the cards, then spin a spinner. The number that was spun will determine the number of unit blocks on each card.
- *How many cards?*
- *How many* units *on each?*

  The students will determine the product and record the number sentence in their math journal.

  Next students will clear off their cards and put an equal number of longs in their place.
- *How many cards?*
- *How many* longs *on each?*

  Students will determine the product of the longs and record their number sentence in the math journal. Students will be asked to compare the values they found for the units and for the same number of longs. What did they notice? Repeat the activity several times. (If you spin the same number as before, just spin again!)

## FORMATIVE ASSESSMENT QUESTIONS
- What pattern are you noticing?
- What is the relationship between the units and the longs?
- How did you determine your product?
- Could you have determined your product another way?

## DIFFERENTIATION
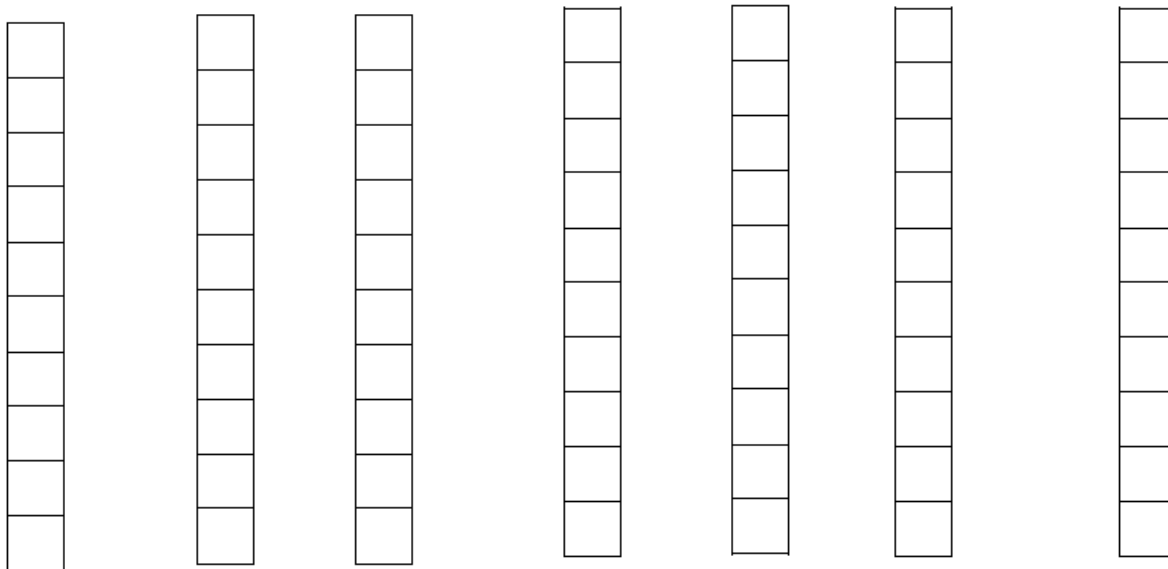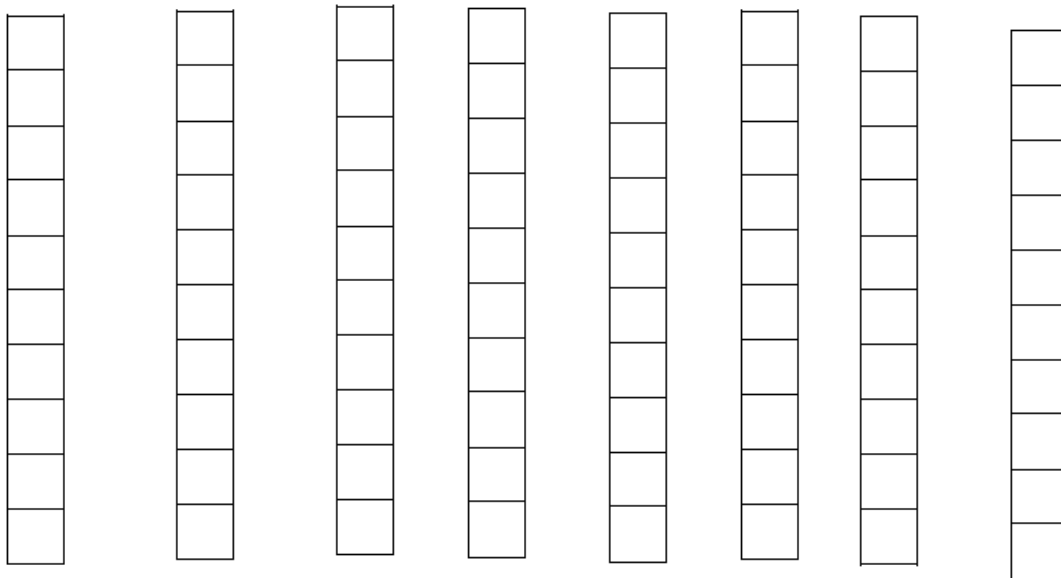**Extension**
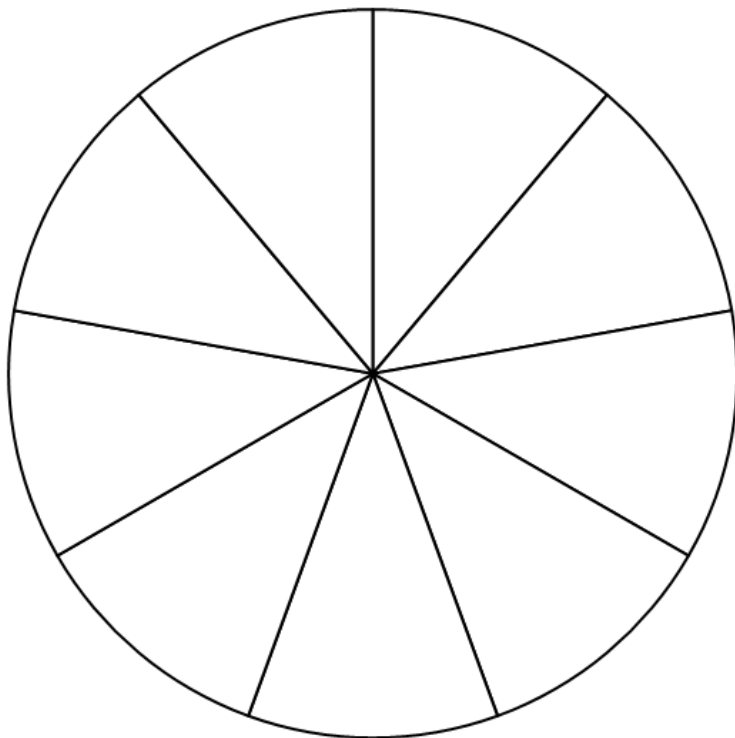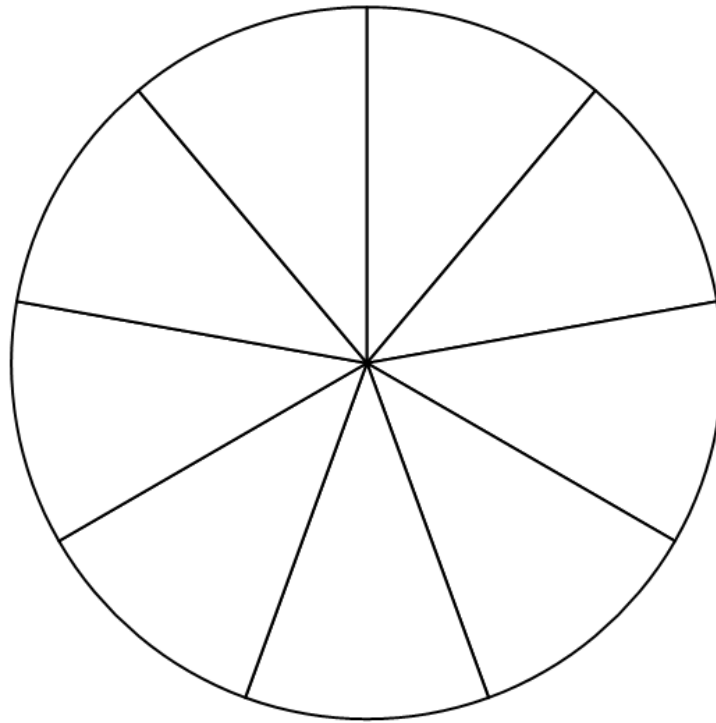- Use larger numbers with students that are ready for the challenge

**Intervention**
- Use smaller numbers and allow students to work in a small group under teacher direction.

**CONSTRUCTING TASK: Field Day Blunder**

## STANDARDS FOR MATHEMATICAL CONTENT

**MCC.3.OA.3** Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

**MCC. 3.OA.4** Determine the unknown whole number in a multiplication or division equation relating three whole numbers.


## STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.


## BACKGROUND KNOWLEDGE

Multiplication and division are usually taught separately.  However, multiplication and division should be combined in order for students to see how they are related.  "Experiences with making and counting groups, especially in contextual situations, are extremely useful. Products or quotients are not affected by the size of numbers as long as the numbers are within the grasp of the students" (Teaching Student-Centered Mathematics, 2006, John A. Van de Walle and LouAnn H. Lovin).


## ESSENTIAL QUESTIONS
- What are the strategies for learning multiplication?
- How can we practice multiplication facts in a meaningful way that will help us remember them?


## MATERIALS

- drawing paper, blocks, any other materials that will help students visualize the problem
- "Field Day Blunder" student recording sheet


## GROUPING

Partners

## TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Students will follow the directions below from the "Field Day Blunder" recording sheet.

Mrs. Nelson's third grade class was very excited about the upcoming field day events. Each third grade class was given a helmet and a sack for the upcoming sack race. Once the sack race was complete, Mrs. Nelson's class moved on to the next race. As the students rushed to the next event, they left all of their helmets and sacks in a big pile. Christopher and Megan were left to match the helmets with the sacks. Some of the sacks were for 2 people, and some were for 3 people. There were 24 helmets in all. Christopher and Megan were able to match all of the helmets to their sacks. How many 2- and 3-person sacks could there be?

## FORMATIVE ASSESSMENT QUESTIONS

- What combinations of blocks have you tried so far?
- How will you know when you find the right combination?
- Do you think there is more than one right solution for this task? Why do you think so? How can you find out?

## DIFFERENTIATION

### Extension
- Using 24, or another appropriate number. Ask students to develop a strategy to solve the problem. Then allow students to share their strategies.
- Replace 24 chairs with 30, 36 or 72 for students who can work with larger numbers.

### Intervention
- Replace 24 with a smaller number such as 12, 18 or 20. Model this task or a similar one in a small group setting.

Name _____ Date _____

<u>**Field Day Blunder**</u>

Mrs. Nelson's third grade class was very excited about the upcoming field day events.  Each third grade class was given a helmet and a sack for the upcoming sack race. Once the sack race was complete, Mrs. Nelson's class moved on to the next race. As the students rushed to the next event, they left all of their helmets and sacks in a big pile. Christopher and Megan were left to match the helmets with the sacks. Some of the sacks were for 2 people, and some were for 3 people. There were 24 helmets in all. Christopher and Megan were able to match all of the helmets to their sacks. How many 2- and 3-person sacks could there be?

1. Draw pictures to show all the ways you can arrange the sacks and helmets.
2. Label and write matching number sentences for each arrangement.
3. Choose your favorite arrangement and explain why you think it would be the best arrangement so that every student has a helmet and a sack.

**CONSTRUCTING TASK**: Stamp Shortage

**STANDARDS FOR MATHEMATICAL CONTENT**
**MCC.3.OA.3** Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

**MCC. 3.OA.4** Determine the unknown whole number in a multiplication or division equation relating three whole numbers.

**STANDARDS FOR MATHEMATICAL PRACTICE**

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

**BACKGROUND KNOWLEDGE**

Often the first strategy students use to solve multiplication problems is repeated addition. This is because they are viewing the situation additively. Repeated addition should be seen as a starting place in the journey to understanding multiplication. (Context for Learning Mathematics, Frans van Galen and Catherine Twomey Fosnot, 2007. In this task, students explore other strategies to solve multiplication and division strategies.

**ESSENTIAL QUESTIONS**
   • What are the strategies for learning multiplication?

**MATERIALS**

   • drawing paper
   • money
   • "Stamp Shortage" recording sheet

**GROUPING**

Individual/Partners

**TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION**

Students will follow the directions on the "Stamp Shortage" recording sheet. Encourage students to show their work using pictures, charts, or tables.

The local grocery store has run out of 47¢ stamps.  The only stamps left are 2¢, 3¢, and 4¢.  How many different combinations of stamps can be used to make 47¢?

## FORMATIVE ASSESSMENT QUESTIONS
- How could division help you solve this problem?
- How could multiplication help you solve this problem?
- How could estimation help you solve this problem?
- Is this the only solution?  Can you solve it another way?

## DIFFERENTIATION

**Extension**
- Allow students to create their own stamps and vary the prices.

**Intervention**
- Allow students to work with a small group and provide money and stamps (or stamp cut outs, counters, etc.) as manipulatives.
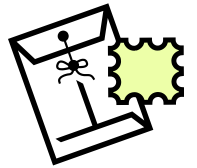
Name _____Date _____

### <u>Stamp Shortage</u>

The local grocery store has run out of 47¢ stamps. The only stamps left are 2¢, 3¢, and 4¢. How many different combinations of stamps can be used to make 47¢?

Solve the above problem.  Show all your work using drawings, charts, and/or tables.

**CONSTRUCTING TASK: Sharing Pumpkin Seeds**

**STANDARDS OF MATNEMATICAL CONTENT**

**MCC.3.OA.2** Interpret whole-number quotients of whole numbers, e.g.,
interpret $56 \div 8$ as the number of objects in each share when 56 objects are
partitioned equally into 8 shares, or as a number of shares when 56 objects
are partitioned into equal shares of 8 objects each.
**MCC.3.OA.3** Use multiplication and division within 100 to solve word
problems in situations involving equal groups, arrays, and measurement
quantities, e.g., by using drawings and equations with a symbol for the
unknown number to represent the problem.

**STANDARDS OF MATHEMATICAL PRACTICE**

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

**BACKGROUND KNOWLEDGE**
    This task provides students with an opportunity to develop and discuss strategies for dividing
a two- or three-digit number by a one-digit number. Possible strategies students may use to solve
this type of problem include, using base 10 blocks, using their knowledge of multiplication and
inverse operations, or using repeated subtraction. Third grade is students' first exposure to larger
number division and it is important to allow students time to make sense of this operation, so that
students will continue to be successful with division in later grades.

**ESSENTIAL QUESTIONS**

- How can we divide larger numbers?
- What is the meaning of a remainder?
- Does a remainder mean the same thing in every division problem?

**MATERIALS**

- "Sharing Pumpkin Seeds" recording sheet
- Base 10 blocks or other materials for counting available for students who wish to use
  them
- *How Many Seeds in a Pumpkin?* by Margaret McNamara or similar book

### GROUPING

Individual/Partner Task

### TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

In this task, students will decide how to share pumpkin seeds fairly with a group of children.

**Comments**

This task can be paired with the following science standard: S3L1b. Identify features of green plants that allow them to live and thrive in different regions of Georgia.

There are many children's books about pumpkins and pumpkin seeds, any one of them could be used as an introduction to this task. One book that deals directly with the number of seeds in a pumpkin is *How Many Seeds in a Pumpkin?* by Margaret McNamara, Illustrated by G. Brian Karas.

**Task Directions**

Students will solve the two sharing problems on the "Sharing Pumpkin Seeds" recording sheet.

**Problem 1**

Ben and his 3 friends toasted 80 pumpkin seeds from their pumpkin. How many seeds will each child get if they share the pumpkin seeds fairly?

Clearly explain your thinking using words, numbers, and/or pictures.

Students may approach the problem $80 \div 4$ in a variety of ways. Some students may build on their understanding of multiplication as the inverse of division to solve the problem.

*Example 1*

*I know 4 x 2 = 8, so 4 x 20 = 80. If I add 4 groups of 20, I know there are a total of 80. Therefore, each child will get 20 pumpkin seeds.*

Other students may build on their understanding of division as repeated subtraction.

*Example 2*

> *4 x 10 = 40          80-40 = 40*
> *Each child got 10 pumpkin seeds.*
>
> *4 x 10 = 40          40– 40 = 0*
> *Each child got 10 more pumpkin seeds.*
>
> *Each child received a total of 10 + 10  pumpkin seeds or 20 pumpkin seeds.*

Some students may choose to use base 10 blocks to represent the division problem.

***Example 3***
*First I took out blocks equal to 80.*
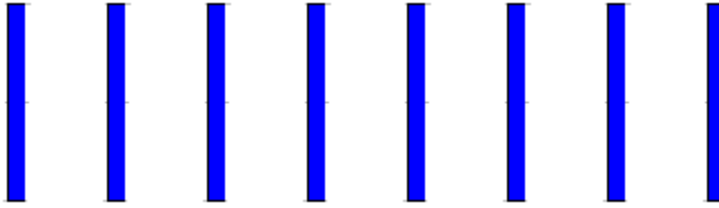
*Then I started sharing the ten strips among four groups.*
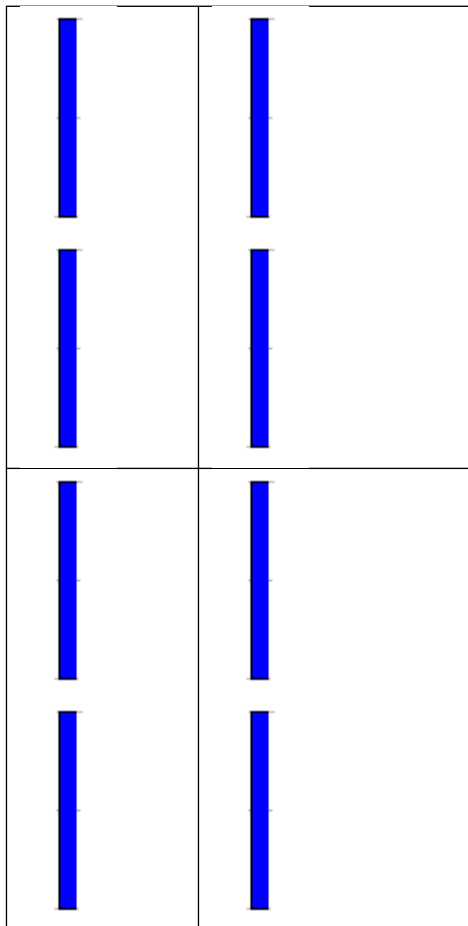
**Comments**

After students have had plenty of time to develop an understanding of division using a method that makes sense to them, begin to talk with students about an efficient way to record the various strategies they now use.

## FORMATIVE ASSESSMENT QUESTIONS
- What is your plan to solve this problem?
- How do you know your answer is correct?
- How does this help you answer the question in the problem?

## DIFFERENTIATION

### Extension
Have students to compare strategies used to solve each problem. Encourage them to look for similarities and differences in their approaches to the problem and to discuss the efficiency of each. Ask students to present their findings to the class.

### Intervention
Before asking students to solve the problems on the "Sharing Pumpkin Seeds" recording sheet, be sure students have been able to solve similar problems with two-digit dividends.

## TECHNOLOGY CONNECTION

http://mason.gmu.edu/~mmankus/whole/base10/asmdb10.htm#div A site for teachers and parents provides information on using base 10 blocks to solve division problems with an area model.

Name _____Date _____

**Sharing Pumpkin Seeds**

Ben and his 3 friends toasted 80 pumpkin seeds from their pumpkin. How many seeds will each child get if they share the pumpkin seeds fairly? Clearly explain your thinking using words, numbers, and/or pictures.

Sarah and her 5 friends toasted 96 pumpkin seeds from their pumpkin. How many seeds will each child get if they share the pumpkin seeds fairly? Clearly explain your thinking using words, numbers, and/or pictures.

**CONSTRUCTING TASK: What Comes First? Chicken? Egg?**

## STANDARDS OF MATHEMATICAL CONTENT

**MCC. 3.OA.4** Determine the unknown whole number in a multiplication or division equation relating three whole numbers.

## STANDARDS OF MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them. 2.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

## BACKGROUND KNOWLEDGE

This task provides students with an opportunity to develop and discuss strategies for dividing a two- or three-digit number by a one-digit number. Possible strategies students may use to solve this type of problem include, using base 10 blocks, using their knowledge of multiplication and inverse operations, or using repeated subtraction. Third grade is students' first exposure to larger number division and it is important to allow students time to make sense of this operation, so that students will continue to be successful with division in later grades.

## ESSENTIAL QUESTIONS

- How can multiplication and division be used to solve real world problems?
- How can we use patterns to solve problems?

## MATERIALS
- "What Comes First?" recording sheet
- drawing paper
- interlocking cubes or other manipulative if necessary

## GROUPING

Individual/Partner Task

## TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION
(adapted from Teaching Children Mathematics, Volume 15, Number 3, October 2008, p. 160).

**Part I**

Begin this task by reviewing their understanding of estimation from Unit 1. Discuss the word "approximate" and how it is used in estimating. Students should understand that rounding is not the only form of estimation.

**Part II**
Students will follow the directions on the "What Comes First" recording sheet. This should be solved using pictures, numbers, and words.

If most hens lay about 4 eggs each week, how many eggs does the average hen lay in one month? How many chickens would be needed to produce 50 eggs in one month? How many chickens would be needed to produce 70 eggs in one month? If 30 eggs were produced in one month, approximately how many chickens were needed to produce them?

**FORMATIVE ASSESSMENT QUESTIONS**
- How could you use patterns to help you solve this?
- How would a table be useful in solving this problem?
- How might you use multiplication/division to solve this problem?
- Could you write a number sentence to explain your picture/table?
- How can you use estimation to help you solve this problem?

**DIFFERENTIATION**

**Extension**
- You could increase the number of eggs up to 100 that are needed in a month
- Students could determine how many eggs a hen will lay in one year. (2 hens, 3 hens, etc.)

**Intervention**
- Decrease the number of eggs needed each month to numbers that 4 will divide into evenly such as (24, 36, 48)

Name _____    Date _____

## What Comes First

If most hens lay about 4 eggs each week, how many eggs does the average hen lay in one month? How many chickens would be needed to produce 50 eggs in one month? How many chickens would be needed to produce 70 eggs in one month? If 30 eggs were produced in one month, approximately how many chickens were needed to produce them?  Show your thinking using words, pictures, and numbers.

**PRACTICE TASK**: Shake, Rattle, and Roll Revisited

**STANDARDS FOR MATHEMATICAL CONTENT**

**MCC.3.OA.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.*

**MCC.3.OA.2** Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each.

## STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

## BACKGROUND KNOWLEDGE

Students are taught to write equations as early as Kindergarten. Variables and equations are powerful tools in representing mathematical ideas.  In this task students are able to use all of their strategies to figure out products, quotients, and factors. (Teaching Student-Centered Mathematics, John A. Van de Walle and LouAnn H. Lovin, 2006).

## ESSENTIAL QUESTIONS
- What are the strategies for learning multiplication?
- What are the strategies for learning division?
- How can we practice multiplication and division facts in a meaningful way that will help us remember them?

## MATERIALS

- drawing paper, blocks, any other materials that will help students visualize the problem
- "Shake Rattle and Roll" student game board
- 2 dice

## GROUPING
Partners

## TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Each player takes turns and rolls the number cubes and covers the product or any two factors of the product. For example, if a player rolls a 2 and an 8, the player could cover 16 (product), 2 (factor), or 8 (factor). If the product or factors has been covered, the player loses a turn. The first player to cover five squares in a row vertically, horizontally or diagonally wins the game. This same concept can be used to practice division facts follow the same concept however, change the numbers on the game board, focus on the divisor, dividend, and quotient.

## FORMATIVE ASSESSMENT QUESTIONS
- What multiplication/division strategies are you using?
- What patterns are you noticing?

## DIFFERENTIATION

### Extension
- Create game boards with larger numbers

### Intervention
- Create game boards with smaller numbers and use 1 die

# Shake, Rattle and Roll Revisited

**Directions:** Each player takes turns and rolls the number cubes and covers the product or any two factors of the product. If the product of factors has been covered, the player loses a turn. The first player to cover five squares in a row vertically, horizontally or diagonally wins the game.  To practice division facts follow the same concept however, change the numbers on the game board, focus on the divisor, dividend, and quotient.

| 24 | 4  | 9  | 3  | 18 | 2  | 20 | 12 | 4  |
|----|----|----|----|----|----|----|----|----|
| 4  | 1  | 20 | 12 | 4  | 3  | 25 | 5  | 8  |
| 2  | 3  | 6  | 4  | 30 | 36 | 1  | 5  | 18 |
| 4  | 9  | 1  | 18 | 6  | 5  | 16 | 1  | 9  |
| 25 | 20 | 4  | 25 | 3  | 2  | 5  | 4  | 8  |
| 5  | 12 | 2  | 1  | 15 | 12 | 6  | 18 | 5  |
| 24 | 3  | 24 | 8  | 3  | 5  | 4  | 24 | 2  |
| 15 | 8  | 6  | 9  | 36 | 3  | 18 | 6  | 24 |
| 8  | 5  | 16 | 25 | 2  | 30 | 6  | 2  | 3  |

**SCAFFOLDING TASK: Stuck on Division**

**STANDARDS FOR MATHEMATICAL CONTENT**

MATHEMATICS • GRADE 3• UNIT 2: Operations and Algebraic Thinking: the Relationship Between Multiplication and Division

**MCC.3.OA.2** Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each.

## STANDARDS FOR MATHEMATICAL PRACTICE
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

## BACKGROUND KNOWLEDGE
Students should clearly understand how to write number sentences and how to follow written directions before working independently.

One possible solution is shown below:

| Division is… | Diagram | Number Sentence |
|---|---|---|
| Repeated subtraction<br><br>"I took two circles away each time. I subtracted 2, 6 times." | | $12 - 2 - 2 - 2 - 2 - 2 - 2 = 0$ |
| Separating a whole into equal groups<br><br>"I separated the circles into groups of 4. I have 3 groups of four." | | $12 \div 4 = 3$ |
| The opposite of multiplication<br><br>"I have an array with four rows of three. That can be written as 4 x 3 = 12 or 12 ÷ 3 = 4." | | $4 \times 3 = 12$<br>$3 \times 4 = 12$<br>$12 \div 4 = 3$<br>$12 \div 3 = 4$ |

## ESSENTIAL QUESTIONS

• How can we model division?

- How are multiplication and division related?
- How are subtraction and division related?
- How can we write a mathematical sentence to represent division models we have made?
- Is there more than one way to divide a number to get the same quotient?

## MATERIALS

- 12 connecting cubes **per student**
- "Stuck on Division" task sheet
- "Stuck on Division" recording sheet
- *Divide and Ride* by Stuart J. Murphy or similar book

## GROUPING

Individual/Partner Task

## TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

In this task, students will experiment with a set of 12 connecting cubes to determine the division patterns when the dividend is 12.

**Comments**

You may choose to open this task by reading, discussing, and modeling the events in *Divide and Ride* by Stuart J. Murphy. *Divide and Ride* is a story about dividing a group of children to ride amusement park rides. Another suitable book about division is *One Hundred Hungry Ants* by Elinor J. Pinczes. Focus on the different ways division can be described (separating into equal groups, repeated subtraction, and inverse of multiplication.)

The three ways of looking at division are closely related and may be difficult for students to verbalize initially as they make connections between concrete models and their corresponding number sentences. Therefore, students need multiple experiences using a given number of cubes to model repeated subtraction, form equal groups, and explain how these two activities are alike and different. They also need to understand the inverse relationship of multiplication and division. Help students make connections to the language of mathematics and between visual and symbolic representations.

**Task Directions**

Students will follow the directions below from the "Stuck on Division" task sheet.

Use 12 connecting cubes to complete this task.
1. Begin with 12 cubes and remove the same number of cubes over and over again until there are none left. Remember, you must remove the *same number* each time. Make a model of your idea with the cubes.
2. Use the first row of the "Stuck on Division" recording sheet to
   a. write about what you did
   b. draw a diagram of your model

     c.   write a subtraction number sentence that describes your model

3.  Find a way to separate your cubes into equal groups. How can you show the dividend, divisor, and quotient with your cubes?
4.  Use the second row of the "Stuck on Division" recording sheet to
     a.   write about what you did
     b.   draw a diagram of your cube groups
     c.   write a division number sentence
5.  Now think of a multiplication fact whose product is twelve. Can you make groups of cubes that prove that division is the opposite of multiplication?
6.  Use the third row of the "Stuck on Division" recording sheet to
     a.   write about what you did
     b.   draw a diagram of your cube groups
     c.   write the fact family for your diagram
7.  Compare your answers with your friends. Did everyone have the same answers? How can you tell whose solutions are correct?

## FORMATIVE ASSESSMENT QUESTIONS

- Can you explain more than one way to think about dividing a number?
- How can you write your model in a number sentence so others will understand your model?
- How can we show your model as both a division number sentence and a subtraction number sentence?

## DIFFERENTIATION

### Extension
Have students to complete the chart with 13 blocks. Ask students to include leftovers in their explanations, diagrams, and number sentences.

### Intervention
Direct instruction in small groups can provide support for students who struggle with these concepts and can enable them to develop the ability to describe their thinking.

## TECHNOLOGY CONNECTION

- http://mcq.wrdsb.on.ca/Admin/Documents/WORC/PDFs/LESSON%20PrimaryMath.pdf
- http://www.lessonplanspage.com/MathLAMultiplicationDivisionUsingTheDoorbellRang23.htm Both websites above provide teacher resources for the book *The Doorbell Rang* by Pat Hutchins.
- http://www.stuartjmurphy.com/activities/activity_ideas.php  Stuart Murphy website with activity suggestions for *Divide and Ride.* (Click on level 3 and then click on the title of the book.)

Name _____Date _____

Stuck on Division
Task Sheet

Use 12 connecting cubes to complete this task.

1. Begin with 12 cubes and remove the same number of cubes over and over again until there are none left. Remember, you must remove the *same number* each time. Make a model of your idea with the cubes.

2. Use the first row of the "Stuck on Division" recording sheet to
   a. write about what you did
   b. draw a diagram of your model
   c. write a subtraction number sentence that describes your model

3. Find a way to separate your cubes into equal groups. How can you show the dividend, divisor, and quotient with your cubes?

4. Use the second row of the "Stuck on Division" recording sheet to
   a. write about what you did
   b. draw a diagram of your cube groups
   c. write a division number sentence

5. Now think of a multiplication fact whose product is twelve. Can you make groups of cubes that prove that division is the opposite of multiplication?

6. Use the third row of the "Stuck on Division" recording sheet to
   a. write about what you did
   b. draw a diagram of your cube groups
   c. write the fact family for your diagram

7. Compare your answers with your friends. Did everyone have the same answers? How can you tell whose solutions are correct?

Name _____ Date _____

Stuck on Division
Recording Sheet
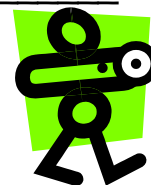
| Division is… | Diagram | Number Sentence |
|---|---|---|
| **Repeated subtraction** | | |
| **Separating a whole into equal groups** | | |
| **The opposite of multiplication** | | |

<u>**SCAFFOLDING TASK:**</u> **Division Patterns**

<u>**STANDARDS FOR MATHEMATICAL CONTENT**</u>

**MCC.3.OA.2** Interpret whole-number quotients of whole numbers, e.g., interpret $56 \div 8$ as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each.

<u>**STANDARDS OF MATHEMATICAL PRACTICE**</u>

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

<u>**BACKGROUND KNOWLEDGE**</u>

Students should begin to master multiplication facts in connection with division facts. When we are trying to determine the quotient for $36 \div 9$, we are often think 9 times what number is going to give me 36. It is not a separate fact but closely tied together (Teacher Student-Centered Mathematics, John A. Van de Walle and LouAnn H. Lovin, 2006).

<u>**ESSENTIAL QUESTIONS**</u>

• How do the parts of a division problem relate to each other?
• What is the relationship between the divisor and the quotient?
• What happens to the quotient when the dividend increases or decreases?
• What do the parts of a division problem represent?

<u>**MATERIALS**</u>

"Division Patterns" recording sheet

<u>**GROUPING**</u>

Individual/Partner Task

## TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

In this task, students will analyze patterns in division.

**Comments**

You may want to demonstrate how to use the times table chart to determine the answers to basic division problems if students have not yet learned the division facts. Teaching the algorithm for long division **is not required at this point**, it will be addressed later in this unit.

You may want to open this task by reading and discussing, the events in *The Doorbell Rang* by Pat Hutchins or similar book. *The Doorbell Rang* is a story about dividing a batch of cookies by a varying number of children. Focus on how the number of cookies each child gets changes as the number of children increases.

**Task Directions**

Students will follow the directions below from the "Division Patterns" recording sheet.

There are three parts to every division problem: the dividend, the divisor, and the quotient. Look at the division problem below to understand what these terms mean:

$$28 \div 4 = \triangle$$

**28** is the underlined dividend, the total amount before we divide.
**4** is the divisor, the number of groups we will make **or** the number of items in each group.
△ is the quotient, number of items in each group **or** the number of groups.

1. Complete the chart.
2. What do you notice about the dividend numbers as you go from the top of the chart to the bottom of the chart?
3. What do you notice about the divisor numbers as you go from the top of the chart to the bottom of the chart?
4. What do you notice about the quotient numbers as you go from the top of the chart to the bottom of the chart?
5. Describe the pattern that shows the relationship between the dividend, divisor, and quotient.

| Dividend | | Divisor | | Quotient |
|---|---|---|---|---|
| 4 | | 4 | | 1 |
| 8 | | 4 | | |
| 12 | | 4 | | |
| 16 | | 4 | | |
| 20 | ÷ | 4 | = | |
| 24 | | 4 | | |
| 28 | | 4 | | |
| 32 | | 4 | | |
| 36 | | 4 | | |
| 40 | | 4 | | |

## FORMATIVE ASSESSMENT QUESTIONS

- What is the same about all of the division problems?
- What is different about all of the division problems?
- What do you notice about the quotients of the division problems?
- Can you describe a pattern you see in this task?

## DIFFERENTIATION

**Extension**

Have students experiment with keeping a different part of the division problem constant such as the quotient or dividend and make predictions about the outcomes. Have students record their results and describe their conclusions.

**Intervention**

Use base-ten manipulative pieces or grid paper as necessary for students who may need to model each division problem.

## TECHNOLOGY CONNECTION

- http://mcq.wrdsb.on.ca/Admin/Documents/WORC/PDFs/LESSON%20PrimaryMath.pdf
- http://www.lessonplanspage.com/MathLAMultiplicationDivisionUsingTheDoorbell Rang23.htm  Both websites above provide teacher resources for the book *The Doorbell Rang* by Pat Hutchins.
- http://www.softschools.com/math/games/division_practice.jsp Division practice; the student or teacher can determine the parameters for the divisor, dividend, and number of problems

Name _____ Date _____

Division Patterns

There are three parts to every division problem: the dividend, the divisor, and the quotient. Look at the division problem below to understand what these terms mean:

<center>28 ÷ 4 = △</center>

**28** is the <u>dividend</u>, the total amount before we divide.

**4** is the <u>divisor</u>, the number of groups we will make **or** the number of items in each group.

△ is the <u>quotient</u>, the number of items in each group.

1. Complete the following chart:

| Dividend | | Divisor | | Quotient |
|:---:|:---:|:---:|:---:|:---:|
| 4 | | 4 | | 1 |
| 8 | | 4 | | |
| 12 | | 4 | | |
| 16 | | 4 | | |
| 20 | ÷ | 4 | = | |
| 24 | | 4 | | |
| 28 | | 4 | | |
| 32 | | 4 | | |
| 36 | | 4 | | |
| 40 | | 4 | | |

2. What do you notice about the dividend numbers as you go from the top of the chart to the bottom of the chart?

_____

_____

_____

_____

3. What do you notice about the divisor numbers as you go from the top of the chart to the bottom of the chart?

_____

_____

_____

4. What do you notice about the quotient numbers as you go from the top of the chart to the bottom of the chart?

_____

_____

_____

5. Describe the pattern that shows the relationship between the dividend, divisor,

and

quotient._____

_____

<u>CONSTRUCTING TASK</u>: Skittles Cupcake Combos

## STANDARDS FOR MATHEMATICAL CONTENT
**MCC.3.OA.3** Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

## STANDARDS OF MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning

## Background Knowledge
When students are given trivial word problems, they often just ask themselves what operation is called for; the context becomes irrelevant as they manipulate numbers, applying what they know. True context keeps students focused and interested in making sense of the math. Students begin to notice patterns and ask questions about what is going in the problem. Then students begin to defend their math to one another. The following activity allows students to build on their knowledge of grouping materials in order to divide more efficiently. (Frans van Galen and Catherine Twomey Fosnot, 2007, Context for Learning Mathematics).

This task assesses students' understanding of division and their ability to organize data.

## ESSENTIAL QUESTIONS

- How are multiplication and division related?

## MATERIALS
- paper
- graph paper
- counters, interlocking cubes

## GROUPING

Individual/Partner Task

## TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Students will follow directions from the "Skittles Cupcake Combo" recording sheet.

> I love Skittles and cupcakes! I decided to bake some cupcakes. I put a bag of Skittles, 45 in all, into my batter and baked a dozen cupcakes. Each cupcake had at least three Skittles and no more than five. What are the different possible combinations of Skittles?

## FORMATIVE ASSESSMENT QUESTIONS
- What combinations of blocks have you tried so far?
- How will you know when you find the right combination?
- Do you think there is more than one right solution for this task? Why do you think so? Do you have a way of finding out?

## DIFFERENTIATION

### Extension
- Using 45, or another appropriate number. Ask students to develop a strategy to solve the problem. Then allow students to share their strategies.
- Replace 50, 75, 90 for students who can work with larger numbers.

### Intervention
- Replace 45 with a smaller number such as 12, 24, or 36. Model this task or a similar one in a small group setting.

Name _____     Date _____

### Skittles Cupcake Combos

I love Skittles and cupcakes! I decided to bake some cupcakes. I put a bag of Skittles, 45 in all, into my batter and baked a dozen cupcakes. Each cupcake had at least three Skittles and no more than five. What are the different possible combinations of Skittles?

1. Draw pictures to show all the ways you can arrange the Skittles.
2. Label and write matching number sentences for each arrangement.

SCAFFOLDING TASK: **Animal Investigation**

## STANDARDS FOR MATHEMATICAL CONTENT

**MCC.3.MD.3.** Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*

## STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

## BACKGROUND KNOWLEDGE

Students should develop questions that can be aligned with data and collect, organize, and display data in different ways. Data collection should be for a purpose such as answering a question. The analysis of data should have the agenda of adding information about some aspect of our world. (Teaching Student-Centered Mathematics, John A. Van de Walle and LouAnn H. Lovin, 2007). In this activity students will create picture graphs and bar graphs for a data set and interpret what the data means.

## ESSENTIAL QUESTIONS

- How do I decide what increment scale to use for a bar graph?
- How do you interpret data in a graph?
- How can I show data using a line plot graph?
- How do I decide what symbol to use when constructing a pictograph?

## MATERIALS

- Chart paper/graphing paper

## GROUPING

Individual/Partner Task

## TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Review creating tally charts with the class. List five or more common animals on the board. The animals listed could be a part of the students study on habitats. Then have students raise their hands for an animal he/she would like to know more information about. Write a tally mark for next to each animal chosen. If necessary, review how to count tally marks and mark them correctly for counting purposes. Students should record the data placed on the board on their own tally sheet. Explain to students that they will display the data in another way using a picture graph. As an example create a chart on the board and label it with habitats. Have students come up to the board one at a time and draw a smiley face next to a habitat they have visited or would like to. Ask the students what the title of the picture graph should be. Enter their suggestion above the graph. Discuss what they notice from the picture graph. Have students make comparisons between the rows as well as telling the number of faces in each row. Now ask, "How many votes does each face represent?" [One] Model how to create a legend at the bottom of the chart.

Create a second chart near the first one, but use the legend 🙂 = 3. Ask the students what that might mean. Each smiley face now stands for three votes. Students will now create their own pictograph using the data they collected about animals they would like to know more information about.

## FORMATIVE ASSESSMENT QUESTIONS

- How did we display our data?
- How did we make it easier to count the tallies in the tally graph?
- Why did that notation make it easier?
- Can you name the categories that we collected data about for the second tally chart?
- How did we show what we found out?
- What questions can you answer from looking at the tally graph?

## DIFFERENTIATION

**Extension**
- Allow students to survey other classrooms and create a graph based on this new data.

**Intervention**
- Provide a set of data for students and allow them to work in small groups.

Name _____ Date _____

## Animal Investigation

Using the data gathered on the Tally Chart for "Animal Investigation" create a pictograph. Be sure to include all the elements of a graph.  Answer the questions that follow.

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
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<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

1. Which animal received the most votes?

2. Which animal received the least amount of votes?

3.  How many more students want to investigate the animal with the most amount of votes than your choice?

**CONSTRUCTING TASK**: **Our Favorite Candy**

**STANDARDS ADDRESSED**

**MCC.3.MD.3.** Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*

**STANDARDS FOR MATHEMATICAL PRACTICE**

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

**BACKGROUND KNOWLEDGE**

It is important for students to be able to gather their own data about a topic that is important to them. When students formulate the questions they want to ask, the data they gather become more and more meaningful. (Teacher Student-Centered Mathematics, John A. Van de Walle and LouAnn H. Lovin, 2006). How they organize the data and the techniques for analyzing them have a purpose. In this task students will collect data based their favorite candy.

**ESSENTIAL QUESTIONS**

- How do I decide what increment scale to use for a bar graph?
- How do you interpret data in a graph?
- How can I show data using a line plot graph?
- How do I decide what symbol to use when constructing a pictograph?

**MATERIALS**

- Chart paper/graphing paper

**GROUPING**

Individual/Partner Task

## TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

### Part I
Review with students how to collect data using a tally chart. Explain to students how to count tallys appropriately. Review the elements of a graph. Create a class graph as a model over something that is familiar to students; favorite cars, favorite game, etc.

### Part II
Students follow the directions on the "Our Favorite Candy" recording sheet. Have students analyze the chart on the student recording sheet and complete the numbered tasks.
1. Organize the data by making a tally chart below to record the data.
2. Create a bar graph using the tally chart. Be sure to include a title, labels for the x and y axis, a scale, and accurate bars.
3. Write two statements that you can learn from analyzing (looking at) this data.

## FORMATIVE ASSESSMENT QUESTIONS

- How do I decide what increment scale to use for a bar graph?
- How do you interpret data in a graph?
- How can I show data using a line plot graph?
- How do I decide what symbol to use when constructing a pictograph?

## DIFFERENTIATION

### Extension

- Have students survey a class for the same information. Have students compare the data from the original data set to the data they collected from another class.

### Intervention

- Lessen the amount of data in the table in order to be more manageable for struggling students.

Name_____    Date_____

**Our Favorite Candy**

| | |
|---|---|
| Ryan | Skittles |
| Mark | M & M's |
| Anthony | Gummy Bears |
| Sarah | Starburst |
| Jenise | Snickers Candy Bar |
| Annittra | Airheads |
| Janice | Skittles |
| Jasmine | M & M's |
| Teresa | Airheads |
| Lania | M & M's |
| Ronnie | Starburst |
| Jeremy | M & M's |
| Rick | Airheads |
| Khalil | Gummy Bears |
| Samantha | M & M's |
| Megan | Airheads |
| Joanie | Starburst |
| Kavon | Skittles |
| Stephanie | Skittles |

**1.** Organize the data by making a tally chart below to record the data

**2.** Create a bar graph using the tally chart.  Be sure to include a title, labels for the x and y axis, a scale, and accurate bars.  Use your journal or another sheet of paper.

**3.** Write two things you can learn from analyzing (looking at) this data. Use complete sentences.

**CONSTRUCTING TASK: Leap Frog**
 **(adapted from Baltimore County Public Schools)**

**STANDARDS FOR MATHEMATICAL CONTENT**

**MCC.3.MD.4.** Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.

**STANDARDS OF MATHEMATICAL PRACTICE**
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

**BACKGROUND KNOWLEDGE**
"The need to gather data will come from the class naturally in the course of discussion or from questions arising in other content areas.  Science, of course, is full of measurements and thus abounds in data requiring analysis. Line plots are useful counts of things along a numeric scale. One advantage of a line plot graph is that every piece of data is on the graph.  " (Teacher Student-Centered Mathematics, John A. Van de Walle and LouAnn H. Lovin, 2006).
In this task students will use data gathered from frog jumps to create a line plot graph.

**ESSENTIAL QUESTIONS**

- What parts are needed to make a complete chart, table, or graph?  (title, labels, etc.)
- Why would you organize data in different ways?

**MATERIALS**

- Student recording sheet
- 3 x 5 index card
- Scissors
- Rulers
- Masking Tape
- Internet Access
- Directions for origami frog http://www.ljhs.sandi.net/faculty/mteachworth/avid-information/origami-frog-lab-avid.pdf

## GROUPING

Individual/Partner Task

## TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

This task is designed to deepen students understanding of collecting and displaying data. In this task students will measure the leaps of origami frogs to the nearest inch and plot the measurement on a line plot graph.

### Part I

Have students discuss graphs and their purpose. On the board have examples of different types of graphs third graders are responsible for learning. Have students identify each graph and discuss each graphs purpose. Students can attach labels to graphs for a visual representation. Explain to students that they will be creating a line plot graph. Go into detail of what a line plot graph is and why it is used.

### Part II

Tell students that they are going to create a line plot graph showing how far Origami Frogs jump. Have students watch a brief YouTube video on Frog Jumping Contest to pique their interests. You can find a video of a contest on [http://www.frogtown.org/](http://www.frogtown.org/) . View video prior to lesson to make sure it is appropriate. After viewing the video have students discuss what they saw. Display data of a frog jumping contest you "attended". Ask students how the data was gathered. Students should mention that the data is in inches. Briefly discuss measuring and using a ruler. Ask students which type of graph would best fit the data you collected from a frog jumping contest. If students do not automatically choose line plot graph, discuss the graph they chose and why it would not be appropriate and then discuss line plot graphs again. Model plotting two pieces of data from your data sheet.

### Part III

Explain to students that they will have their own frog jumping contest by creating Origami frogs out of paper. You can find a video of how to make an origami frog on [http://www.youtube.com/watch?v=luG7_nzBHjI&feature=fvo&ad=21937675894](http://www.youtube.com/watch?v=luG7_nzBHjI&feature=fvo&ad=21937675894) . The video is easy, however, you may want to write some directions down for your students. Also model each fold of the frog for clarification. Give students a few minutes to practice jumping with their paper frogs. Break students into groups of four to six. Students should take turns measuring the distance the frogs jump. Each group needs masking tape to mark the starting and end point, a ruler to measure the jump, and a recording sheet. Students should not measure their own jumps. Have students follow the directions on the student recording sheet.

## FORMATIVE ASSESSMENT QUESTIONS

- What parts are needed to make a complete chart, table, or graph?  (title, labels, etc.)
- Why would you organize data in different ways?
- Why are graphs used to display data?
- What is an appropriate tool to use in order to measure in inches?

## DIFFERNTIATION

**Extension**
- Have students create a frog out of larger paper to see if it makes a difference in the distance the frogs jump.  Have students predict the outcome.

**Intervention**
- Plot distances with students who are struggling. Guide them as they measure and plot data.

Name _____ Date _____

## Leap Frog

A. Each frog in the group will take one leap.  Someone in your group will measure the distance your frog jumps. Be sure to place a piece of masking tape on the starting and end point of the jump.  Use a ruler and measure the distance the frog jumps to the nearest inch. Record the distance on the chart below.  Use the information collected in the table to create a group line plot graph.

| Frog Owner | Distance Jumped (nearest inch) |
|---|---|
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

B. Using the data in the table above create a line plot graph for your group.  Be sure to include all the elements of a line plot graph.

C. Create a line plot graph using all the data from each group.

D. Looking at your class data and your group data what conclusions can you draw? Were there any outliers?

## UNIT TWO CULMINATING TASK

## PERFORMANCE TASK: ICE CREAM SCOOPS

## STANDARDS ADDRESSED

**MCC.3.OA.1** Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each.

**MCC.3.OA.2** Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each.

**MCC.3.OA.3** Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

**MCC.3.OA.4** Determine the unknown whole number in a multiplication or division equation relating three whole numbers.

**MCC.3.MD.3.** Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*
**MCC.3.MD.4.** Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.

## BACKGROUND KNOWLEDGE
     As students begin to work on this task, they need to understand the meaning of the terms single, double, triple and double-double scoops of ice cream.  The term "double-double" is another way of saying "quadruple" and you may want to ask students to explain why this is true.

## ESSENTIAL QUESTION

- How do estimation, multiplication, and division help us solve problems in everyday life?

## MATERIALS

- "Ice Cream Scoops" recording sheet

## GROUPING

Independent Task

## TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

In this culminating task, students will use multiplication and division to show different ways they can spend $3.00 on different flavors of ice cream. In the process, they will double, triple, or quadruple the price for a single scoop of ice cream.

**Task Directions**

Have students follow the directions on the "Ice Cream Scoops" Recording Sheet.

## Part I. Picture Graph

Using the flavors in the table able, survey your classroom to see which flavor is the most liked in your class. Display your data in a picture graph. Be sure to add all elements of a picture graph.

## Part II. Multiplication and Division

The Super Delicious Ice Cream Shop has the very best ice cream in town. They sell their ice cream in <u>double scoops, triple scoops, or double-double</u> (that's four) scoops. The top selling ice creams are listed on the sign below. You have $3.00 to spend. Don't worry about tax.

Use words, pictures, and numbers to show all your work as you answer the questions below. Think about using estimation to help you consider your choices. Be sure to show your estimation work.

| Ice Cream Flavors and Prices for a Single Scoop | |
| --- | --- |
| Varoom Vanilla | $0.67 |
| Cha-cha Chocolate | $1.33 |
| Cheery Cherry | $1.04 |
| Rockin' Rocky Road | $1.12 |
| Striped Strawberry | $0.89 |
| Kid's Delight | $0.98 |

1. With $3.00, which flavor can you buy, triple Varoom Vanilla, or triple Cheery Cherry? Would you have any money left?
2. To spend most of your money, should you buy a double, triple, or double-double scoop of Rockin' Rocky Road? How much money would you have left?
3. Which ice cream flavor can you buy if you order a double-double scoop?
4. On a different day, you and 5 of your friends decide to combine your money. You have $11.76 total. You all want to order the same ice cream in a double scoop. Which flavors are you able to buy?
5. You have been saving pennies for a whole year! You have saved 425 pennies. If you and two of your friends share the pennies fairly, how many pennies will each of you have to buy ice cream?

## FORMATIVE ASSESSMENT QUESTIONS

- How are you using estimation to help you solve this task?
- What math facts would help you solve this problem?
- Can you use an inverse operation to be sure your solution is correct?

## DIFFERENTIATION

### Extension
Have students make up their own flavors and prices, use different amounts of money, and write their own Ice Cream Scoops stories to share with their classmates.

### Remediation
While fluency with multiplication facts is required of third graders, it is not required that all facts will be acquired in the first marking period of the school year. You may want to allow students to use cueing devices like a times table chart during this performance assessment as needed.

Name _____  Date _____

# Ice Cream Scoops

The Super Delicious Ice Cream Shop has the very best ice cream in town. They sell their ice cream in <u>double scoops, triple scoops, or double-double</u> (that's four) scoops. The top selling ice creams are listed on the sign below.  You have $3.00 to spend.  Don't worry about tax.

   Use words, pictures, and numbers to show all your work as you answer the questions below.  Think about using estimation to help you consider your choices. Be sure to show your estimation work.

| **Ice Cream Flavors and Prices for a Single Scoop** | |
|---|---|
| Varoom Vanilla | $0.67 |
| Cha-cha Chocolate | $1.33 |
| Cheery Cherry | $1.04 |
| Rockin' Rocky Road | $1.12 |
| Striped Strawberry | $0.89 |
| Kid's Delight | $0.98 |

**Part I. Picture Graph**

Using the flavors in the table able, survey your classroom to see which flavor is the most liked in your class.  Display your data in a picture graph.  Be sure to add all elements of a picture graph.
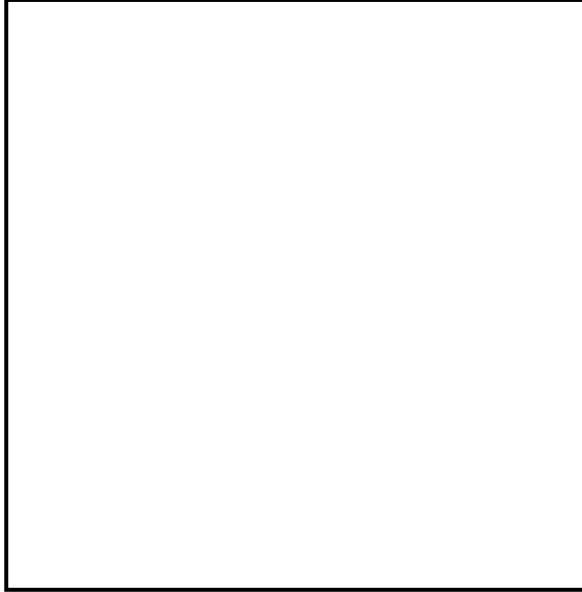
**Part II. Multiplication and Division**

1.  With $3.00, which flavor can you buy, triple Varoom Vanilla, or triple Cheery Cherry?  Would you have any money left?

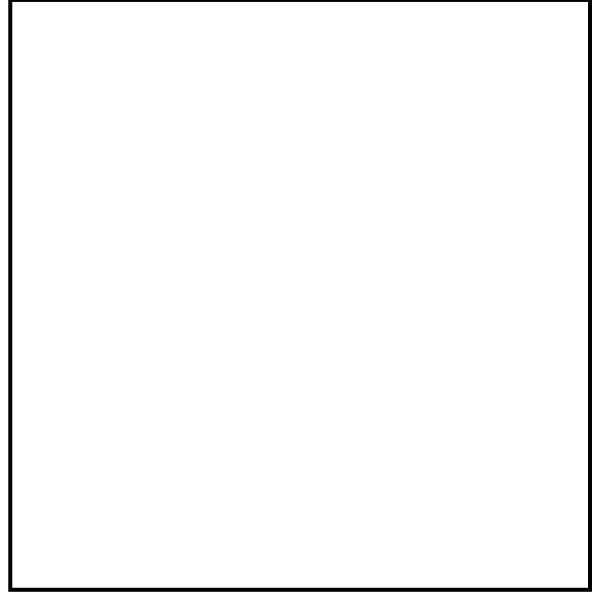M                                                                                                                    Division
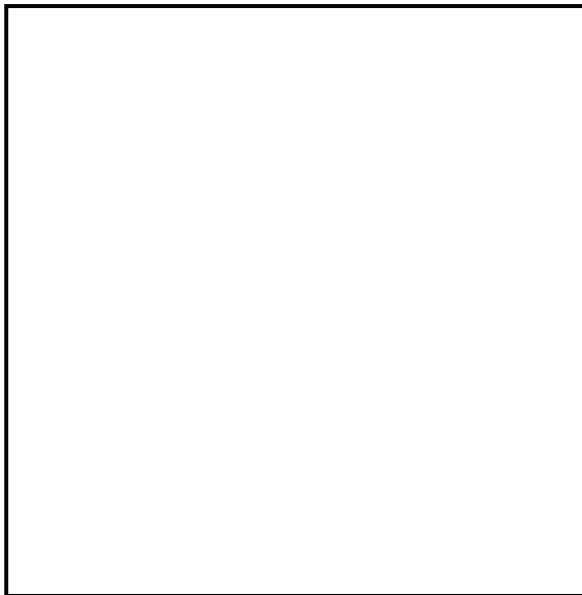
2.  To spend most of your money, should you buy a double, triple, or double-double scoop of Rockin' Rocky Road? How much money would you have left?
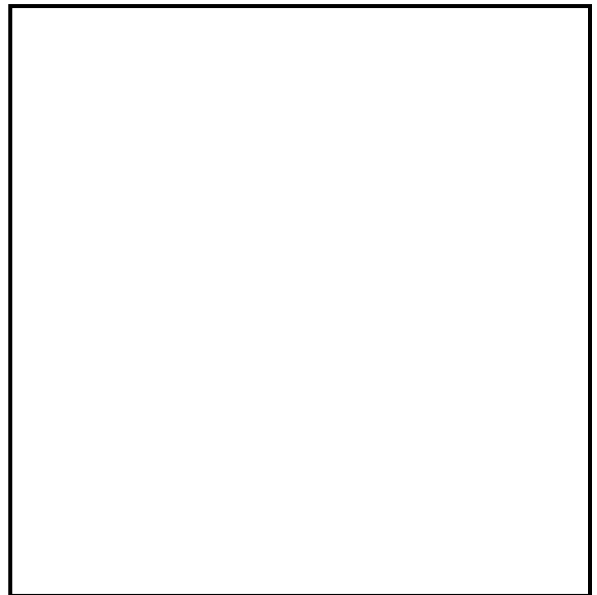
3.  Which ice cream flavor can you buy if you order a double-double scoop?

5.  On a different day, you and 5 of your friends decide to combine your money. You have $11.76 total.  You all want to order the same ice cream in a double scoop. Which flavors are you able to buy?

4.  You have been saving pennies for a whole year! You have saved 425 pennies. If you and two of your friends share the pennies fairly, how many pennies will each of you have to buy ice cream?

# 3rd Grade Unit 2 Performance Assessment Rubric

| Standard ↓ | Exceeding | Meeting | Not Yet Meeting |
|---|---|---|---|
| **CCGPS.3.OA.1** Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each | – Multiplication work shows use of diagrams, words, and/or other suitable representations for demonstrating mastery<br>– Evidence of estimation is shown with explanations | – Multiplication calculations are correct<br>– Evidence of estimation is shown | – Multiplication calculations are<br>– incorrect or omitted<br>– No evidence of estimation |
| **CCGPS.3.OA.2** Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. | – Work shows all division sentences correctly<br>– Thorough explanation of remainders is given<br>– Explanation of all the possible solutions is given with reasons for which solution is the best | – Division number sentence corresponds to the question asked in word problem.<br>– Response indicates the presence or lack of a remainder and what this indicates<br>– Solution to division problem is correct | – Division number sentence does not correspond to question<br>– No mention is made of remainder<br>– Solution to division problem is incorrect |
| **CCGPS.3.OA.3** Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem. | – Explanations are thorough and detailed and include reasoning as well as multiple representations to support conclusions | – Explanations are logical and use specific math vocabulary to describe multiplication or division process | – Explanations are omitted or illogical<br>– Explanations do not describe the process used to derive an answer to the question asked |
| **CCGPS.3.MD.3.** Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.* | – All data relevant to the solutions of both multiplication and division problems are accurately recorded in an organized fashion | – Work shown is organized and logically presented<br>– Work shown supports conclusions about which ice cream to buy | – Work is not shown<br>– Work shown is disorganized, inaccurate, or fails to communicate mathematical ideas |