



CCGPS Frameworks Student Edition

Mathematics

Third Grade Unit Seven
Measurement



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"Making Education Work for All Georgians"

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UNIT OVERVIEW

In this unit students will:

- Tell and write time to the nearest minute and measure time intervals in minutes.
- Solve elapsed time, including word problems, by using a number line diagram.
- Reason about the units of mass and volume.
 - Understand that larger units can be subdivided into equivalent units (partition).
 - Understand that the same unit can be repeated to determine the measure (iteration).
 - Understand the relationship between the size of a unit and the number of units needed (compensatory principle).
- Demonstrate a thorough understanding of area and solve real world and mathematical problems that relate to area.
 - Explore the concept of covering a region with “unit squares,”
 - Counting the square units to find the area could be done in metric, customary, or non-standard square units.
 - Tiling rectangles, then multiplying side lengths to show the answer is the same.
- Find the perimeter of polygons; use addition to find perimeters; solve for an unknown length and recognize the patterns that exist when finding the sum of the lengths and widths of rectangles.
- Graph data that is relevant to their lives. While exploring data concepts, students should Pose a question, Collect data, Analyze data, and Interpret data (PCAI).

Mathematically proficient students communicate clearly by engaging in discussion about their reasoning, using appropriate mathematical language. Students recognize area as an attribute of two-dimensional regions. They measure the area of a shape by finding the total number of same size square units required to cover the shape without gaps or overlaps. Students understand that rectangular arrays can be decomposed into identical rows or into identical columns. By decomposing rectangles into rectangular arrays of squares, students connect area to multiplication, and justify using multiplication to determine the area of a rectangle.

STANDARDS FOR MATHEMATICAL PRACTICE

Content standards are interwoven and should be addressed throughout the year in as many different units and activities as possible in order to emphasize the natural connections that exist among mathematical topics.

Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.

MCC. 3.MD.1 Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

MCC.3.MD.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step

word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.

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.

Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

MCC.3.MD.7 Relate area to the operations of multiplication and addition.

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

MCC.3.MD.8 Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

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

Time...

- The duration of an event is called elapsed time and it can be measured.

Mass and Volume...

- Mass and volume are important parts of everyday life and can be determined a variety of ways.
- Larger units can be subdivided into equivalent units (partition).

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- The same unit can be repeated to determine the measure (iteration).
- There is a relationship between the size of a unit and the number of units needed (compensatory principle).

Area and Perimeter...

- The length around a polygon can be calculated by adding the lengths of its sides.
- The space inside a rectangle or square can be measured in square units.

Data and Graphing...

- Charts, tables, line plot graphs, pictographs, Venn diagrams, and bar graphs may be used to display data.
- One way to compare data is through the use of graphs.
- The scale increments used when making a bar graph is determined by the scale intervals being graphed.

ESSENTIAL QUESTIONS

Telling Time...

- What does it mean to tell time to the nearest minute?
- What strategies can I use to help me tell and write time to the nearest minute and measure time intervals in minutes?
- What connections can I make between a clock and a number line?
- How can I use what I know about number lines to help me figure out how much time has passed between two events?
- How can we determine the amount of time that passes between two events?
- What part does elapsed time play in our daily life?
- How can I demonstrate my understanding of the measurement of time?

Volume and Mass...

- What does the liquid volume of an object tell me?
- What types of tools are used to measure volume?
- How can estimating help me to determine liquid volume of something?
- What are some ways I can measure the liquid volume of something?
- What does the mass of an object tell me about it?
- What ways can I measure mass?
- What strategies can I use to help me to solve problems involving volume?
- What strategies can I use to help me to solve problems involving mass?
- Why is mass and volume important in my everyday life?
- What determines your choice of a measurement tool?
- What estimation strategies are used in measurement?
- How is the appropriate unit for measurement determined?
- How is the reasonableness of a measurement determined?
- Why are units important in measurement?
- How can I demonstrate my understanding of the measurement of volume and mass?

Area and Perimeter...

- What is the difference between area and perimeter?
- How are the perimeter and area of a shape related?
- How does combining and breaking apart shapes affect the perimeter and area?
- Why/how would decomposing a polygon be helpful in finding the perimeter or area?
- How can rectangles have the same perimeter but have different areas?
- What methods can I use to determine the area of an object?
- How can I demonstrate my understanding of the measurement of area and perimeter?
- Why is it important to know area and perimeter in real life?
- What strategies will help me to solve for an unknown side when finding perimeter?

Graphing and Data...

- How are tables, bar graphs, and line plot graphs useful ways to display data?
- How do I decide what increments to use for my scale?
- How can you prove to your parents you do not spend too much time watching television?
- How can you use graphs to answer a question?
- How can surveys be used to collect data?
- How can surveys be used to answer a question?
- How can graphs be used to display data gathered from a survey?
- How can graphs be used to compare related data?
- How can data displayed in tables and graphs be used to inform?
- How can data be used to make decisions?
- How can data displays be used to describe events?
- How can I demonstrate my understanding of the data and graphing?
- How are a bar graph and a line plot related? What are their differences?

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.

- Fluency with basic addition and subtraction
- Conceptual understanding of multiplication
- Duration and sequence of events
- Telling time
- Comparison/Estimation/Ordering of measurements (length, weight, volume)
- Use straight edge and pencil to draw straight lines
- Measurement to the nearest inch
- Collecting and representing data
- Interpreting line plot and bar graphs
- Organizing and recording data using objects, pictures, pictographs, bar graphs, and simple charts/tables
- Relate addition and subtraction to length
- Using and understanding number lines

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.

- area
- attribute
- decompose
- elapsed time
- estimate
- gap
- gram (g)
- hour
- kilogram (kg)
- liquid volume
- liter (l)
- mass
- measure
- metric
- minute
- nonstandard units
- overlap
- plane figure
- side length
- square centimeter
- square foot
- square inch
- square meter
- square unit
- standard units
- tiling
- time
- time intervals
- volume

STRATEGIES FOR TEACHING AND LEARNING

Taken from:

<http://www.education.ohio.gov/GD/Templates/Pages/ODE/ODEDetail.aspx?Page=3&TopicRelationID=1704&Content=118060>

Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.

MCC. 3.MD.1 Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

MCC.3.MD.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.

Time...

- A clock is a common instrument for measuring time. Learning to tell time has much to do with learning to read a dial-type instrument and little to do with time measurement.
- Students have experience in telling and writing time from analog and digital clocks to the hour and half hour in Grade 1 and to the nearest five minutes, using a.m. and p.m. in Grade 2. Now students will tell and write time to the nearest minute and measure time intervals in minutes.
- Provide analog clocks that allow students to move the minute hand.
- Students need experience representing time from a digital clock to an analog clock and vice versa.
- Provide word problems involving addition and subtraction of time intervals in minutes. Have students represent the problem on a number line. Student should relate using the number line with computation from Grade 2.

Volume and Mass...

- Provide opportunities for students to use appropriate tools to measure and estimate liquid volumes in liters only and masses of objects in grams and kilograms. Students need practice in reading the scales on measuring tools since the markings may not always be in intervals of one. The scales may be marked in intervals of two, five or ten.
- Allow students to hold gram and kilogram weights in their hand to use as a benchmark. Use water colored with food coloring so that the water can be seen in a beaker.
- Students should estimate volumes and masses before actually finding the measuring. Show students a group containing the same kind of objects. Then, show them one of the objects and tell them its weight. Fill a container with more objects and ask students to estimate the weight of the objects.
- Use similar strategies with liquid measures. Be sure that students have opportunities to pour liquids into different size containers to see how much liquid will be in certain whole liters. Show students containers and ask, “How many liters do you think will fill the container?”

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.

Data and Graphing...

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
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.

Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

MCC.3.MD.7 Relate area to the operations of multiplication and addition.

Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures,

MCC.3.MD.8 Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

Area and Perimeter...

- Students can cover rectangular shapes with tiles and count the number of units (tiles) to begin developing the idea that area is a measure of covering. Area describes the size of an object that is two-dimensional. The formulas should not be introduced before students discover the meaning of area.

- The area of a rectangle can be determined by having students lay out unit squares and count how many square units it takes to completely cover the rectangle completely without overlaps or gaps. Students need to develop the meaning for computing the area of a rectangle. A connection needs to be made between the number of squares it takes to cover the rectangle and the dimensions of the rectangle. Ask questions such as:
 - What does the length of a rectangle describe about the squares covering it?
 - What does the width of a rectangle describe about the squares covering it?
- The concept of multiplication can be related to the area of rectangles using arrays. Students need to discover that the length of one dimension of a rectangle tells how many squares are in each row of an array and the length of the other dimension of the rectangle tells how many squares are in each column. Ask questions about the dimensions if students do not make these discoveries. For example:
 - How do the squares covering a rectangle compare to an array?
 - How is multiplication used to count the number of objects in an array?



- Students should also make the connection of the area of a rectangle to the area model used to represent multiplication. This connection justifies the formula for the area of a rectangle.
- Provide students with the area of a rectangle (i.e., 42 square inches) and have them determine possible lengths and widths of the rectangle. Expect different lengths and widths such as, 6 inches by 7 inches or 3 inches by 14 inches.

EVIDENCE OF LEARNING

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

Time...

- Tell time to the minute.
- Solve elapsed time, including word problems.
- Use a number line to solve for elapsed time

Mass and Volume...

- Reason about the units of mass and volume and demonstrate a basic understanding of the size and weight of a liter, a gram, and a kilogram.
- Solve one-step word problems about mass and volume that include the same units.

Area and Perimeter...

- Demonstrate a thorough understanding of area and solve real world and mathematical problems that relate to area.
- Find the perimeter of objects; use addition to find perimeters; and recognize the patterns that exist when finding the sum of the lengths and widths of rectangles.

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- Recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

Data and Graphing...

- Read and solve problems using scaled graphs using different intervals.
- Use understanding of number facts to create
- Use the PCAI model to **P**ose a question, **C**ollect data, **A**nalyze data, and **I**nterpret data and graph data that is relevant to their lives.

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TASKS

The following tasks represent the level of depth, rigor, and complexity expected of all third grade students. These tasks or a task of similar depth and rigor should be used to demonstrate evidence of learning. It is important that all elements of a task be addressed throughout the learning process so that students understand what is expected of them. The following is a description of the types of tasks you will see in this unit and their purpose.

Task Name	Task Type <i>Grouping Strategy</i>	Skills
Let's Talk About Time	Scaffolding Tasks <i>Individually, Pairs, or Small Groups</i>	Time to the Minute, Elapsed Time
Time to Get Clean	Constructing Task <i>Partner/Small Group Task</i>	Problem Solving with Elapsed Time
Daily Schedule	Constructing Task <i>Whole Group/Individual Task</i>	Determining Elapsed Time
How Do I Spend My Day?	Constructing Task <i>Individual/Partner Task</i>	Collect, Record, and Display Data (tables, line plot graphs, bar graphs) Determining Elapsed Time
The Fence or the Yard	Scaffolding Tasks <i>Individually, Pairs, or Small Groups</i>	Perimeter and Area
Pentomino Perimeters	Constructing Task <i>Whole Group/Partner Task</i>	Determining Perimeter and Area, Finding Different Perimeters with Same Area
Rectangles Rule	Constructing Task <i>Individual Task</i>	Finding Different Areas, Keeping Perimeters the Same
How Big is a Desk?	Constructing Task <i>Whole Group/Partner Task</i>	Estimating and Measuring Perimeter and Area, Using Different Units of Measurement
Guess Who's Coming to Dinner?	Constructing Task <i>Small Group Task</i>	Making Different Rectangles, Finding Different Perimeters with Same Area
How Many Paper Clips?	Constructing Task <i>Small Group Task</i>	Use a balance scale; Estimate and measure using a non-standard unit
Setting the Standard	Constructing Task <i>Small Group Task</i>	Understand and use a standard unit of measure (gram)
Making a Kilogram	Constructing Task <i>Whole Group/Individual Task</i>	Use a spring scale; Estimate and measure using kilograms
Worth the Weight	Constructing Task <i>Small Group Task</i>	Estimate and weigh items using grams and kilograms

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Fill It Up!	Constructing Task <i>Small Group Task</i>	Estimate and measure capacity using liters
More Punch Please!	Constructing Task <i>Small Group Task</i>	Estimate and measure capacity using liters
The Data Station	Scaffolding Tasks <i>Individually, Pairs, or Small Groups</i>	Data and Graphing
The Magic Number	Practice Task <i>Whole Group/Individual Task</i>	Determining Elapsed Time
It's in the Data	Constructing Task <i>Small Group Task</i>	Collect, Record, and Display Data (tables, line plots, bar graphs)
Field Trip to the Zoo	Culminating Task <i>Individual</i>	

These tasks will help your students build up to the culminating task in this unit. Each task is an opportunity for teachers to formatively assess student knowledge of key concepts and identify strengths, weaknesses, and misunderstandings.



SCAFFOLDING TASK: LET'S TALK ABOUT TIME

Adapted from North Carolina's Core Essentials Mathematics Program

APPROXIMATE TIME: 3-5 Days

STANDARDS FOR MATHEMATICAL CONTENT

MCC. 3.MD.1 Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

STANDARDS FOR MATHEMATICAL PRACTICE

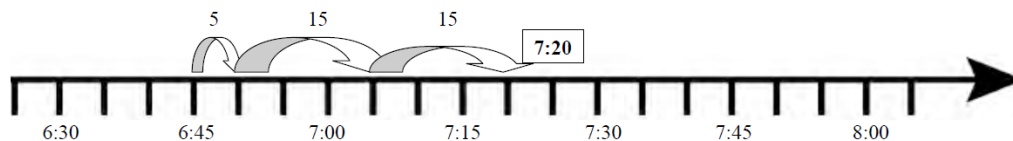
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
8. Look for and express regularity in repeated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

BACKGROUND

One expectation in the third grade is for students to solve elapsed time, including word problems. Students could use clock models or number lines to solve. On the number line, students should be given the opportunities to determine the intervals and size of jumps on their number line. Students could use pre-determined number lines (intervals every 5 or 15 minutes) or open number lines (intervals determined by students).

Example:

Tonya wakes up at 6:45 a.m. It takes her 5 minutes to shower, 15 minutes to get dressed, and 15 minutes to eat breakfast. What time will she be ready for school?



ESSENTIAL QUESTIONS

- What does it mean to tell time to the nearest minute?
- What strategies can I use to help me tell and write time to the nearest minute and measure time intervals in minutes?
- What connections can I make between a clock and a number line?
- How can I use what I know about number lines to help me figure out how much time has passed between two events?

- How can we determine the amount of time that passes between two events?
- What part does elapsed time play in our daily living?

MATERIALS

- clock
- number lines (teacher created or previously made)
- math journals (or paper)
- manipulatives/cut outs (to help students create models for their problems)

GROUPING

Students may be grouped individually, in pairs, or in small groups at the teacher's discretion.

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I (Whole Group)

As a class, create a list of people/places that use schedules on a regular basis. Talk about why time to the minute and elapsed time are important. Try these activities to build understanding of time to the minute and elapsed time. Discuss and clarify misunderstandings and misconceptions.

- What strategies can you use to help you figure out time to the minute?
 - Ask students to figure out the time to the minute for various analog clock faces.
 - Using a clock, have students show a selected time while thinking aloud.
- How is figuring out elapsed time like giving back change or counting on? What strategies do you use? Show with pictures, numbers, and words.
- What time is it three hours and thirty minutes before 12:36? Four hours after?

Part II (Small Group)

“TV Time!”

In small groups, solve this problem. Use pictures, numbers, models, and words to prove your thinking. When you are finished, compare your findings with other groups.

Make a list of your favorite TV shows and the length of time of each. If you watched all of these shows in one week, how much time did you spend watching TV? *Share your findings with a friend.*

Part III (Partner Task)

Look at your classroom clock. Create a number line from 1 to 12. Use your number line to help fill in the movie schedule below for Hollywood 12 Cinema.

Movie	Start Time	End Time	Duration
Alvin and the Chipmunks	12:15		1 hour, 10 minutes
Harry Potter	2:34	4:34	
Ice Age	4:30		90 minutes
The Muppets		7:20	1 hour, 20 minutes
The Smurfs	7:30	8:47	



FORMATIVE ASSESSMENT QUESTIONS

- How did you determine a start time when the end time and duration were given?
- How did you determine the end time, when the start time and duration were given?
- How did you determine the total time you spent in one week watching T.V?

DIFFERENTIATION

Extension

- Imagine that you have a friend who can tell time to the nearest five minutes, but cannot tell time to the minute. Write a letter to him/or her explaining how to do it. Try to explain it to them in at least two different ways.
- Larry reads an average of 20 pages in an hour. How many hours will it take him to read 160 pages? 200?

Intervention

- Write your daily schedule from the time you wake up, until the time you go to bed. Tell how much time elapses from event to event.
- It takes Nancy 15 minutes to walk one mile. How many miles would she walk in one and a half hours?



CONSTRUCTING TASK: TIME TO GET CLEAN

Adapted from Inside Mathematics (Noyce Foundation)

APPROXIMATE TIME: 2 Days

STANDARDS FOR MATHEMATICAL CONTENT

MCC. 3.MD.1 Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

STANDARDS FOR MATHEMATICAL PRACTICE

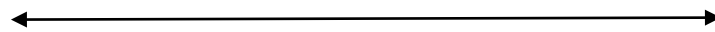
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
8. Look for and express regularity in repeated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

BACKGROUND KNOWLEDGE

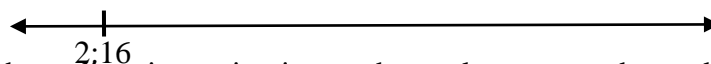
In this task, students will record and draw time to the nearest minute and calculate elapsed time in 15, 30, and 60 minute intervals.

Teachers may want to begin with a discussion of daily activities in students' lives and the amount of time those activities typically take. For example, getting ready for school may begin at 7:06 AM and end at 7:36 AM, a 30 minute duration. Then engage students in a discussion of activities that typically happen during the school day and their estimates of the duration of these activities. One book that explores elapsed time, *The Long Wait* by Annie Cobb, discusses wait-time at an amusement park. As the calculations are made, you should encourage students to explore a linear model of time as well as a traditional analog clock. The linear model can be created using an open number line. Jumps are made from the beginning time to the ending time much like movement on a number line and increments of time may be recorded above the jumps. An example is shown below:

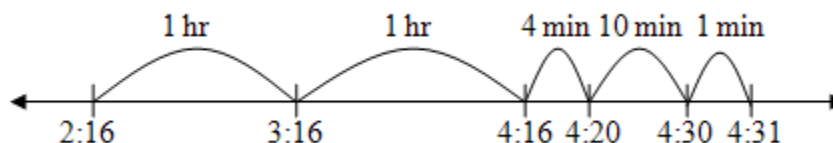
To find the elapsed time from 2:16 pm to 4:31 pm, start with an open number line:



Add the starting time:



Then count up to the ending time using jumps that make sense to the students:



If telling time is built into daily routines, students should have had classroom experiences with telling time to the nearest minute. Daily routines can be extended to elapsed time by asking students the stopping time if they start work now and work for 15 minutes or 30 minutes. Additionally, students could be asked what time they will return to the classroom if they will be returning in one hour.

ESSENTIAL QUESTIONS

- What strategies can I use to help me tell and write time to the nearest minute and measure time intervals in minutes?
- How can we determine the amount of time that passes between two events?
- What part does elapsed time play in our daily living?
- How can I demonstrate my understanding of the measurement of time?

MATERIALS

- book, *The Long Wait* by Annie Cobb, or similar text
- “Time to Get Clean” student recording sheet
- clock (Classroom clock or individual clocks for each student)
- empty number line, or any material students may need to assist them with measuring elapsed time

GROUPING

Small Group/Partner Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Students will examine a family’s morning bathroom routine. In this task, they will discuss and explore telling time to the minute as well as elapsed time. Students will follow the directions below from the “Time to Get Clean” student recording sheet.

- Closely examine the *Time to Get Clean* chart below.
- With a partner or small group, fill in the missing parts of this schedule.
- Answer the questions below about the bathroom schedule.
 - Who spends the most time in the bathroom?
 - Who spends the shortest time in the bathroom?
 - How long to Dad and Grandpa spend in the bathroom in all?
 - How much longer does Meagan spend in the bathroom than Carl?
 - The first person goes into the bathroom at 6AM. It is in use until everyone is finished getting clean. At what time will the bathroom be free each day?
 - Choose one person’s bathroom slot. Tell how you figured out their missing information.

FORMATIVE ASSESSMENT QUESTIONS

- What strategies did you use to figure out the missing times on the chart?
- What connections can you make to parts of the hour (half hour, quarter hour, etc?)
- What is the hardest part about telling time to the nearest minute and elapsed time?
- What part of this task did you find was easiest to complete?
- How did you determine the elapsed time?
- Is there more than one way to figure out elapsed time?

DIFFERENTIATION

Extension

- Have students make a list of other values and their equivalents (i.e. $\frac{1}{2}$ hour = 30 minutes).
- Have students create their own schedule with missing values for a classmate to complete.
- Have students prepare a “Telling Time Toolkit” for a visitor from prehistory (or at least before clocks were invented!) explaining everything they need to know about telling time to the nearest minute and explaining how to figure out elapsed time.

Intervention

- Provide beginning and ending times for activities that do not cross the hour mark. For example, show a beginning time of 11:15 and an ending time of 11:45 for a given activity. Be sure students understand the elapsed time of 30 minutes before moving to activities of a longer duration that begin and end in different hours.
- Only provide the elapsed time in minute form.
- Allow students to use clock, calculators, and number lines for help.
- Facilitate a teacher-guided group.

TECHNOLOGY CONNECTION

- http://nlvm.usu.edu/en/nav/frames_asid_318_g_2_t_4.html Elapsed time problems using two clocks, both analog and digital
- <http://www.shodor.org/interactivate/activities/ElapsedTime/?version=disabled&browser=MSIE&vendor=na&flash=10.0.32> Several activities surrounding elapsed time using analog or digital clocks.
- <http://donnayoung.org/math/clock.htm> Printable blank clock faces.



Time to Get Clean!

The Freeman Family Bathroom is a busy place in the mornings! So, the Freeman kids decided to create a chart for everyone to follow so things wouldn't get too crowded. There's one problem. Baby Freeman (Georgie) erased some important parts of the schedule. The Freeman kids are very nervous about this because they will have to show their new schedule to the family tonight and be ready to explain it. Can you help them?

- Closely examine the Freeman Family Morning Bathroom Schedule below.
- Fill in the missing parts of the schedule. Use clocks or other tools to help you.
- Answer the questions about the schedule on the space provided.

Part I: The Freeman Family Morning Bathroom Schedule

Person	Activities	Start Time	End Time	Time Taken
Megan	Shower, wash hair, dry hair, brush teeth		6:30	½ hour
Carl	Shower, brush teeth	6:30	6:56	
Baby Georgie	Take a bath	6:56		24 minutes
Mom	Shower, brush teeth		8:05	¾ hour
Dad	Shower, shave, brush teeth	8:05	8:47	
Grandpa	Take a bath, shave	8:47		35 minutes

Part II: Explanations for the Family Meeting

1. Who spends the most time in the bathroom? _____
2. Who spends the shortest time in the bathroom? _____
3. How long to Dad and Grandpa spend in the bathroom in all? _____
4. How much longer does Meagan spend in the bathroom than Carl? _____
5. The first person goes into the bathroom at 6AM. It is in use until everyone is finished getting clean. At what time will the bathroom be free each day? _____
6. Choose one person's bathroom slot. Tell how you figured out their missing information below.



CONSTRUCTING TASK: DAILY SCHEDULE

APPROXIMATE TIME: 1-2 Days

STANDARDS FOR MATHEMATICAL CONTENT

MCC. 3.MD.1 Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

STANDARDS FOR MATHEMATICAL PRACTICE

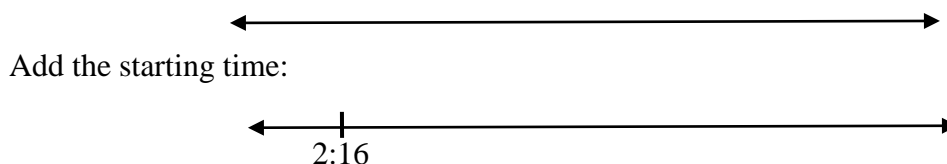
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look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

BACKGROUND KNOWLEDGE

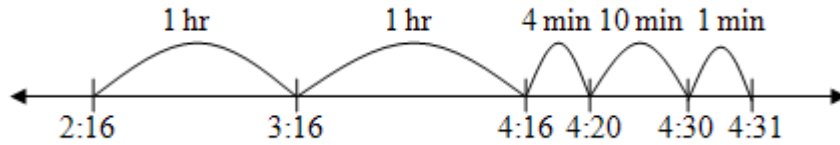
In this task, students will record and draw time to the nearest minute and calculate elapsed time in 15, 30, and 60 minute intervals.

Teachers may want to begin with a discussion of daily activities in students' lives and the amount of time those activities typically take. For example, getting ready for school may begin at 7:06 AM and end at 7:36 AM, a 30 minute duration. Then engage students in a discussion of activities that typically happen during the school day and their estimates of the duration of these activities. One book that explores elapsed time, *The Long Wait* by Annie Cobb, discusses wait-time at an amusement park. As the calculations are made, you want to encourage students to explore a linear model of time as well as a traditional analog clock. The linear model can be created using an open number line. Jumps are made from the beginning time to the ending time much like movement on a number line and increments of time may be recorded above the jumps. An example is shown below:

To find the elapsed time from 2:16 pm to 4:31 pm, start with an open number line:



Then count up to the ending time using jumps that make sense to the students:



If telling time is built into daily routines, students should have had classroom experiences with telling time to the nearest minute. Daily routines can be extended to elapsed time by asking students the stopping time if they start work now and work for 15 minutes or 30 minutes. Additionally, students could be asked what time they will return to the classroom if they will be returning in one hour.

ESSENTIAL QUESTIONS

- How can we determine the amount of time that passes between two events?
- What part does elapsed time play in our daily living?
- What does it mean to tell time to the minute?
- What strategies can I use to help me tell and write time to the nearest minute and measure time intervals in minutes?

MATERIALS

- *The Long Wait* by Annie Cobb, or a similar book about elapsed time
- “Daily Schedule” student recording sheet
- Clock (Classroom clock or individual clocks for each student)

GROUPING

Whole Group/Individual Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Note: As students record daily events, be sure the elapsed time is in 15, 30, or 60 minute intervals. Alternatively, provide a daily schedule that is already filled in with start and stop times. Then have students calculate the elapsed time, or duration, of each activity and record it on the chart.

Students will follow the directions below from the “Daily Schedule” student recording sheet.

In the Daily Schedule chart below, record six of your class’ daily activities. Then calculate the elapsed time, or duration, of each activity and record it on the chart.

Choose three events. List the event and record the start time and end time for each event on the clock faces below.

Choose one of the events above and explain how you found the elapsed time.

FORMATIVE ASSESSMENT QUESTIONS

- How did you determine your start and end times?
- What kinds of activities can you typically complete in a quarter-hour, half-hour and hour?
- How did you determine the elapsed time?
- Is there more than one way to figure out elapsed time?

DIFFERENTIATION

Extension

- Have students use a digital camera to create an interactive slide show, flipchart, or schedule chart for display of the daily school events.
- On a paper divided into fourths, have students list as many things as they can that last approximately 15 minutes/30 minutes/1 hour/more than 1 hour.
- Ask students to complete a similar chart for a typical weekend day.

Intervention

- Provide beginning and ending times for activities that do not cross the hour mark. For example, show a beginning time of 11:15 and an ending time of 11:45 for a given activity. Be sure students understand the elapsed time of 30 minutes before moving to activities of a longer duration that begin and end in different hours.

TECHNOLOGY CONNECTION

- http://nlvm.usu.edu/en/nav/frames_asid_318_g_2_t_4.html Elapsed time problems using two clocks, both analog and digital
- <http://www.shodor.org/interactivate/activities/ElapsedTime/?version=disabled&browser=MSIE&vendor=na&flash=10.0.32> Several activities surrounding elapsed time using analog or digital clocks.
- <http://donnayoung.org/math/clock.htm> Printable blank clock faces.



Name _____ Date _____

Daily Schedule

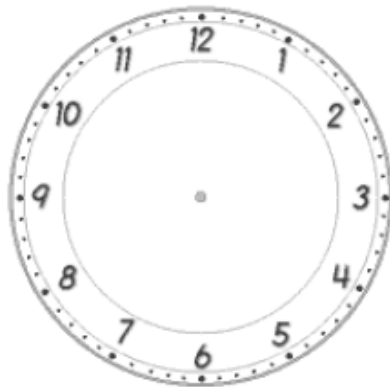
In the Daily Schedule chart below, record six of your daily class activities. Then calculate the elapsed time, or duration, of each activity and record it on the chart.

Daily Schedule			
Event	Start Time	Stop Time	Duration of Event

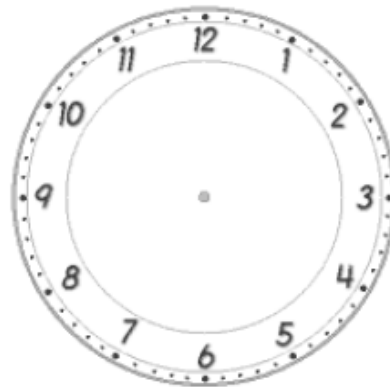
Choose three events. List the event and record the start time and end time for each event on the clock faces below.

1. Event: _____

Start Time

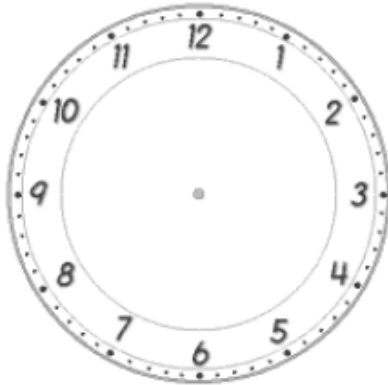


End Time

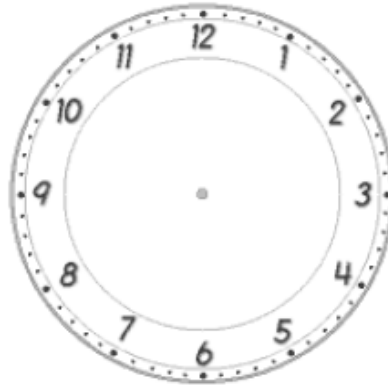


2. Event: _____

Start Time



End Time

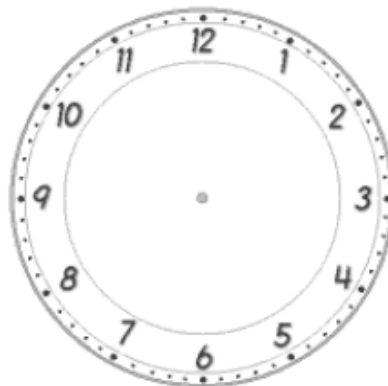


3. Event: _____

Start Time



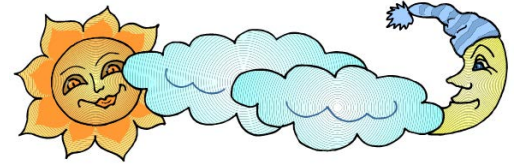
End Time



4. Choose one of the events above and explain how you found the elapsed time.

CONSTRUCTING TASK: HOW DO I SPEND MY DAY

APPROXIMATE TIME: 5 Days



STANDARDS FOR MATHEMATICAL CONTENT

MCC. 3.MD.1 Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

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 spend a week collecting data about how they spend their day. They use the data collected to create a graph of how they spend their time and to answer the question, “Do you spend too much time watching television?”

**** Please Note: This task will require a week of gathering data. ****

This task can be introduced by asking students the following questions (Record responses on the board or chart paper):

- What do you do during the day?
- What is your favorite TV show? How long does it last? How many times a week do you watch it?

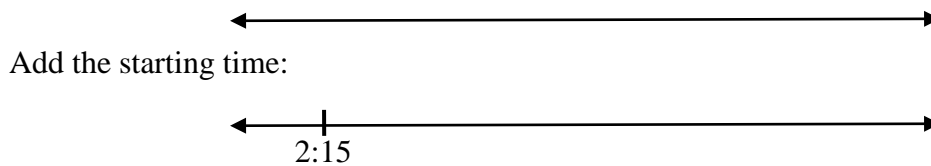
It is important to understand student interests before beginning this task. A different question may be more appropriate for different groups of students.

The book *Lemonade for Sale*, by Stuart J. Murphy, or a similar book about using bar graphs to display data would be appropriate to use with this task. The characters in the book keep track of the number of cups of lemonade sold, using tallies and make a bar graph to show how much they’ve sold.

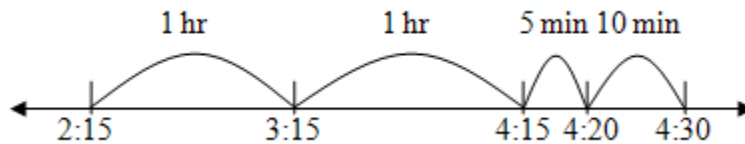
Students should have had opportunities to create and interpret data from bar graphs. Additionally, students should have had opportunities to work with telling time and working with elapsed time.

As elapsed time calculations are made, you may want to encourage students to explore a linear model of time as well as a traditional analog clock. The linear model can be created using an open number line. Jumps are made from the beginning time to the ending time much like movement on a number line and increments of time may be recorded above the jumps. An example is shown below:

To find the elapsed time from 2:15 pm to 4:30 pm, start with an open number line:



Then count up to the ending time using jumps that make sense to the students:



Because students can record their time to the nearest quarter hour, student should use start and finish times to the nearest quarter hour as shown in the example above. The exact start time may have been 2:21, which is closest to 2:15.

ESSENTIAL QUESTIONS

- How can we determine the amount of time that passes between two events?
- How can you prove to your parents you do not spend too much time watching television?
- How can you use graphs to answer a question?

MATERIALS

- “How Do I Spend My Day?” students recording sheet
- Paper, markers, crayons, rulers, and other supplies needed to create graphs

GROUPING

Individual/Partner Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I

To begin this task, discuss possible activities with students – homework, school, eating, watching TV, reading, sports, sleeping, etc. Provide each student with a copy of the template and go through the example of how to complete the chart. Students should record ALL of their possible activities on the blank lines at this time. For the next 5 school days, students should record the time spent on each activity.

- Students should record the time they spend on each activity. This does not have to be an exact time, to the nearest quarter hour is sufficient.
- Check charts daily to ensure that students are keeping up with their data.

Once students have completed data collection, they can begin creating displays for their data.

- Discuss how to display the data. What information will your parents need to be convinced you do not spend too much time watching television? One way to display their data is to find the total number of hours spent on each activity for the week and graph these results.

Part II

Students will follow the directions below from the “How Do I Spend My Day?” student recording sheet.

Your parents claim you are spending too much time watching television during the week. You need to show your parents exactly how little of your time is spent watching television.

Keep track of what you do during a normal school week, graph the results, and show your parents how you spend your time.

On a separate piece of paper, use the data you collected to display your data and to answer the following questions:

- How much time do you spend on each of your activities?
- Do you spend too much time watching television? How do you know?

Daily Activities (Choose one activity to keep or you do not do.)	Length of Activity (Number of Hours)						Total Time for Activity
	Example	Sunday	Tuesday	Wednesday	Thursday	Friday	
Sleeping	9						
School (including travel)	8						
Eating	$1\frac{1}{2}$						
Homework	$1\frac{1}{2}$						
Reading	1						
Sports/Playing	$1\frac{1}{2}$						
Watching TV	2						
Taking Care of Me	$1\frac{1}{2}$						
TOTAL TIME (for each day)	24						

*Amount of time should be recorded to the closest $\frac{1}{4}$ hour.

Part III

After completing your table, complete the following.

1. Use the data above to create a bar graph display of the data.
2. Use the data and your graph to decide whether or not you spend too much time watching television.
3. Write a paragraph explaining how the data informed your decision.

FORMATIVE ASSESSMENT QUESTIONS

- What activities do you typically participate in each week?
- How many minutes in a quarter hour? Half hour? (Students may want to work with minutes rather than fractions of an hour.)
- What data is important to display in your graph? Why?
- Do you spend too much time watching television? How do you know? What is “too much”?
- What parts of a graph need to be included?
- What increments will you use to label the scale of your graph? (Typically the scale would be along the vertical axis, but a bar graph can be horizontal or vertical, so don’t limit students to labeling the vertical axis with a scale and the horizontal axis with categories.)
- What categories will you display on your graph? Why did you choose those categories?

DIFFERENTIATION

Extension

- Ask students to describe how the data could be used to convince parents to allow the student to add an activity to or remove an activity from their weekly schedule. Would this require a new graph? How would it need to be different?

Intervention

- Support students in the use of student clocks and/or open number lines to determine elapsed time.
- Allow students to use one of the web-based applications in the “Technology Connection” section below to create a bar graph.

TECHNOLOGY CONNECTION

- <http://illuminations.nctm.org/ActivityDetail.aspx?ID=63> – Students can use this website to enter their data and create a bar graph.
- <http://www.shodor.org/interactivate/activities/BarGraph/> – different link to the same program as above.



Name _____ Date _____

How Do I Spend My Day?

Your parents claim you are spending too much time watching television during the week. You need to show your parents exactly how little of your time is spent watching television. Keep track of what you do during a normal school week, graph the results, and show your parents how you spend your time.

On a separate piece of paper use the data you collected to display your data and to answer the following questions:

- How much time do you spend on each of your activities?
- Do you spend too much time watching television? How do you know?

<i>Daily Activities</i> (Cross out any activity you do not do.)	<i>Length of Activity</i> (Number of Hours)						<i>Total Time for Activity</i>
	<i>Example</i>	<i>Monday</i>	<i>Tuesday</i>	<i>Wednesday</i>	<i>Thursday</i>	<i>Friday</i>	
<i>Sleeping</i>	9						
<i>School</i> (including travel)	8						
<i>Eating</i>	$1\frac{1}{2}$						
<i>Homework</i>	$\frac{1}{2}$						
<i>Reading</i>	1						
<i>Sports/Playing</i>	$1\frac{1}{2}$						
<i>Watching TV</i>	2						
<i>Taking Care of Me</i>	$\frac{1}{2}$						
<i>TOTAL TIME</i> (for each day)	24						

*Amount of time should be recorded to the closest $\frac{1}{4}$ hour.

After completing your table, complete the following.

1. Use the data above to create a bar graph display of the data.
2. Use the data and your graph to decide whether or not you spend too much time watching television.
3. Write a paragraph explaining how the data informed you in your decision.

SCAFFOLDING TASKS: THE FENCE OR THE YARD?

Adapted from North Carolina's Core Essentials Mathematics Program

APPROXIMATE TIME: 3-5 Days



STANDARDS FOR MATHEMATICAL CONTENT:

MCC.3.MD.7 Relate area to the operations of multiplication and addition.

MCC.3.MD.8 Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

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

Area can be found by tiling a rectangle and then counting the square units used to cover the rectangle or multiplying the side lengths to show it is the same. Students will also be using this knowledge to solve real world problems.

To find the area, one could count the squares or multiply $3 \times 4 = 12$.

1	2	3	4
5	6	7	8
9	10	11	12

Students develop an understanding of the concept of perimeter by walking around the perimeter of a room or space, such as the playground or parking lot, using rubber bands to represent the perimeter of a plane figure on a geoboard, or tracing around a shape on an interactive whiteboard. They find the perimeter of objects; use addition to find perimeters; and recognize the patterns that exist when finding the sum of the lengths and widths of rectangles.

ESSENTIAL QUESTIONS

- How are the perimeter and area of a shape related?
- How can rectangles have the same perimeter but have different areas?
- What methods can I use to determine the area of an object?
- How can I demonstrate my understanding of the measurement of area and perimeter?

MATERIALS

- Math Journals (or paper)
- Manipulatives/cut outs (to help students create models for their problems)
- Tape
- Geoboards

GROUPING

Students may be grouped individually, in pairs, or in small groups at the teacher’s discretion.

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I (Whole Group)

As a class, try these activities to build understanding of the concepts of area and perimeter. Discuss and clarify misunderstandings and misconceptions.

Array Scavenger Hunt

Where are rectangular arrays used? Go for a walk through the school. Look in your classroom, your home, or outside to find examples of arrays. List the examples you find and write a multiplication equation for each array.

Comparing Area and Perimeter

Find a place in your school where there are square tiles. (Many schools have square tiles on the floor. If there are none, this activity can be done using geoboards.) With a teacher’s help, use tape to outline different rectilinear shapes. You can also create “Tetris-like” shapes as well.

- Find the perimeter of each shape.
- Find the area of each shape.
- Discuss the difference between the area and perimeter of your shapes.

Part II (Small Group)

“The Situation Station”

In small groups, discuss these questions and topics. Use pictures, numbers, models, and words to prove your thinking. When you are finished, compare your findings with other groups.

Situation #1: If someone says, “Perimeter is the fence, and area is the yard”, what do they mean?

Situation #2: You want to know the number of small squares on a checker board. Explain how a rectangular array could help you determine the number of squares quickly.

PART III (Partner Task)

Complete this task with a partner.

Use unit squares or tiles. The smallest size square you can make is from one square. Use the squares or tiles to make the next size square.

- How many squares did you use? What is the area of your new square?
- Build the next size square. What is the area of your new square?
- What do you notice?
- Can you figure out what the next square will be without using the tiles?
- How can you find “the next square?”

FORMATIVE ASSESSMENT QUESTIONS

- How did you find the area?
- How did you find the perimeter?
- What is the difference between area and perimeter?
- How do multiplication and arrays relate to area?

DIFFERENTIATION

Extension

- Draw or cut out all possible rectangles with a perimeter of 16 inches and label them. How many different rectangles can you find? Find and record the area of each rectangle. Which rectangle has the greatest area? If you were building a dog pen, which rectangle shape would be best? Why?

Intervention

- With a partner, make a t-chart. Label one side “perimeter.” Label the other side “area.”
 - Discuss times when someone would need to know the perimeter of something. Add them to the list.
 - Discuss times when someone would need to know the area of something. Add them to the list.
 - Share your list with other groups.

CONSTRUCTING TASK: PENTOMINO PERIMETERS

APPROXIMATE TIME: 2 Days

STANDARDS FOR MATHEMATICAL CONTENT



MCC.3.MD.7 Relate area to the operations of multiplication and addition.

MCC.3.MD.8 Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

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. .
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

In this task, students will explore area and perimeter and their relationship. Students should be given the opportunity to explore pentomino pieces freely before working this task. To further explore pentominoes, ask students to sort the pentomino pieces and determine the common attributes of the set (i.e., each piece has an area of 5 square units and all sides meet to form a right angle). Also, ask students to sort the shapes by perimeter. Students should notice that all of the pieces have a perimeter of 12 linear units with the exception of one shape that has a perimeter of 10 linear units. Discuss why only one piece has a different perimeter. Be sure students determine that shapes can have the same area but have different perimeters and vice versa. Use the correct terminology of square units and linear units in discussions. Teachers may want to discuss the questions on the “Working with Perimeters” activity on the following web site: http://nlvm.usu.edu/en/nav/frames_asid_114_g_2_t_3.html?open=activities before students complete this task.

In preparation for working with pentominoes, teachers may need to discuss how to manipulate the pieces by turning or flipping them.

To be successful with this task, students will need to understand how to find the perimeter and area of a figure. Also, students will need to understand the definition of a polygon so that they will be able to create a polygon using pentominoes.

ESSENTIAL QUESTIONS

- How are the perimeter and area of a shape related?
- How does combining and breaking apart shapes affect the perimeter and area?

MATERIALS

- “Pentominos Perimeters” student recording sheet (2 pages)
- Pentominos
- *Racing Around*, by Stuart J. Murphy, or similar book about finding perimeter

GROUPING

Whole Group/Partner Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

PART I

One way to introduce the concept of perimeter is to read *Racing Around*, by Stuart J. Murphy, or a similar book about finding perimeter.

PART II

Students will follow the directions below from the “Pentomino Perimeters” student recording sheet.

1. In each box below, choose three pentominos and create a polygon.
Trace your polygon in the box.
2. Find the area and perimeter of each polygon. Be sure to include the correct label for each measure.
3. Write to tell how you found the area and perimeter of your polygons.
4. Write to explain what you noticed about the areas and perimeters of your polygons.
5. CHALLENGE:
 - a. Using 3 pentomino pieces, what is the longest perimeter you can make? Sketch it below and explain how you know it has the longest possible perimeter.
 - b. Using 3 pentomino pieces, what is the largest area you can make? Sketch it below and explain how you know it has the largest possible area.

FORMATIVE ASSESSMENT QUESTIONS

- How does the area compare to the perimeter of this shape?
- What units are used to measure each? Why?
- What generalizations can you make about the relationship of perimeter and area of shapes?
- Look at the shapes of other classmates. How does your area and perimeter differ from theirs? If there is a difference, why is it so?

DIFFERENTIATION

Extension

- Ask students to complete the challenge on the student recording sheet.
- Challenge students to find 4 pieces that create a 4 x 5 rectangle or 5 pieces that form a 5 x 5 square. For more extension activities, see the following web site:
<http://people.rit.edu/mecmsa/Professional/Puzzles/Pentominoes/P-A.html>

Intervention

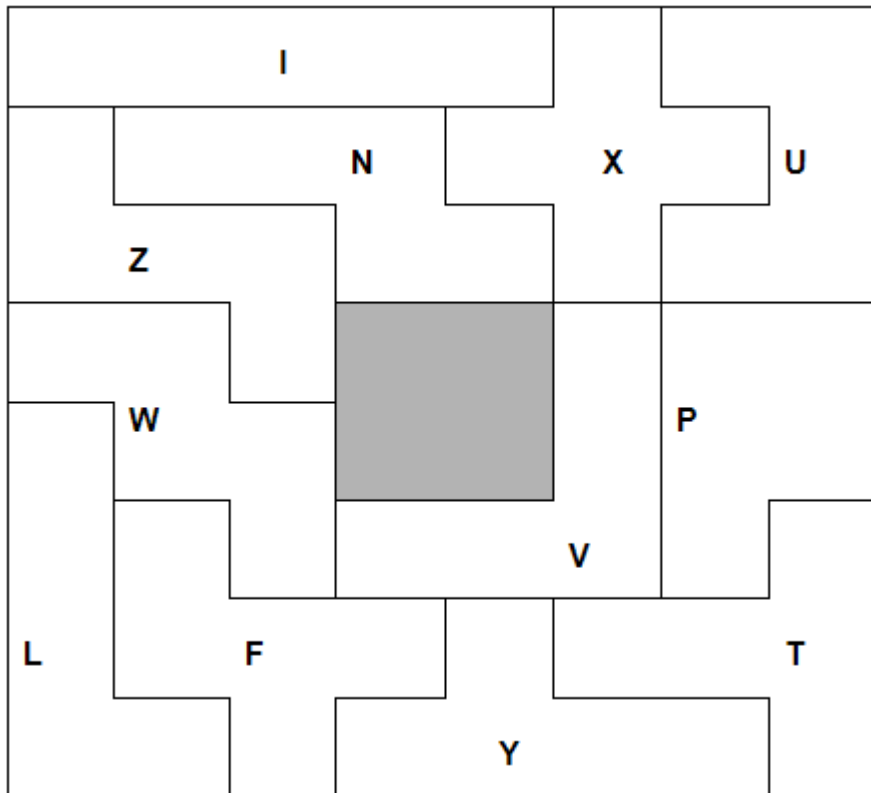
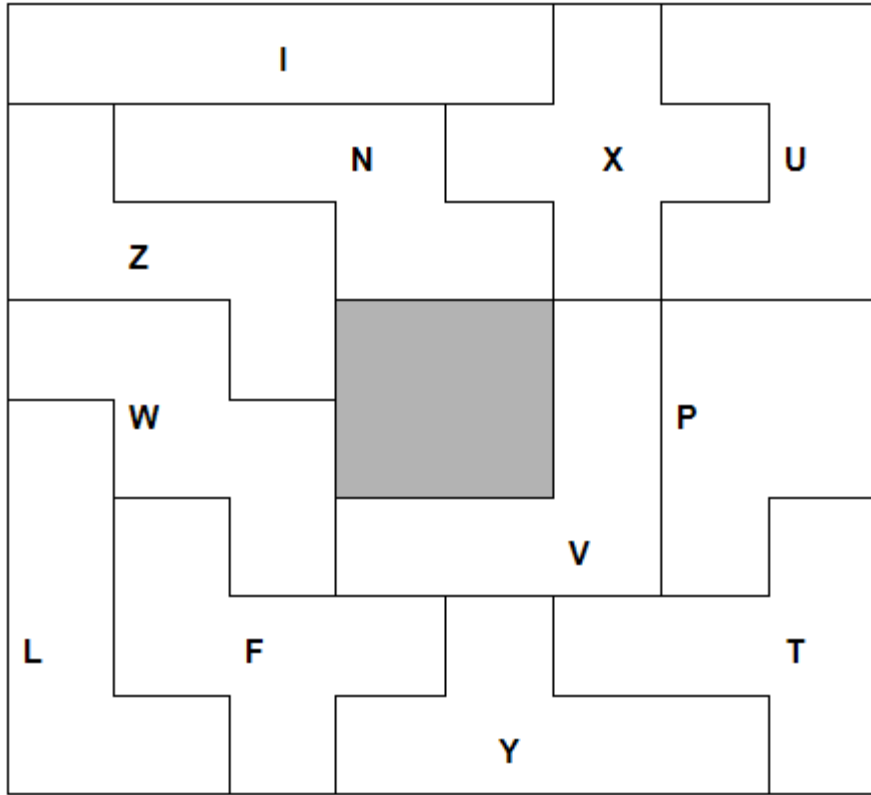
- Have students copy and draw the square units inside a pentomino piece and then label the perimeter and area for further understanding.
- Use a visual model for students to copy.

TECHNOLOGY CONNECTION

- http://nlvm.usu.edu/en/nav/frames_asid_114_g_2_t_3.html?open=activities Interactive pentomino tasks
- <http://people.rit.edu/mecmsa/Professional/Puzzles/Pentominoes/P-A.html> Provides several beginner problems with solutions for pentominoes.
- <http://puzzler.sourceforge.net/docs/pentominoes.html> Solutions to several pentominoes puzzles such as the one below.

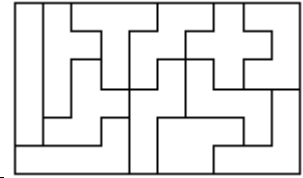


Pentomino Pieces



Name _____ Date _____

Pentomino Pandemonium



1. In each box below, choose three pentominos and create a polygon.
 Trace your polygon in the box.

A.	B.
C.	D.

2. Find the area and perimeter of each polygon. Be sure to include the correct label for each measure.

	Polygon A	Polygon B	Polygon C	Polygon D
Area				
Perimeter				

3. Write to tell how you found the area and perimeter of your polygons.

4. Write to explain what you noticed about the areas and perimeters of your polygons.

5. **CHALLENGE:** Using 3 pentomino pieces, what is the longest perimeter you can make? Sketch it below, and explain how you know it has the longest possible perimeter.

6. **CHALLENGE:** Using 3 pentomino pieces, what is the largest area you can make? Sketch it below and explain how you know it has the largest possible area.

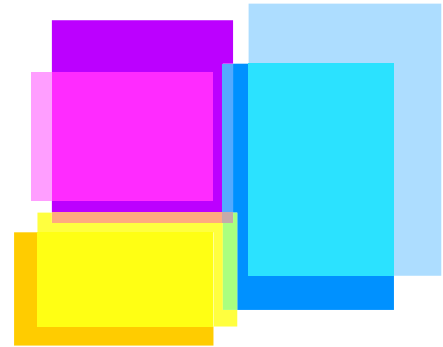
CONSTRUCTING TASK: RECTANGLES RULE!

APPROXIMATE TIME: 1 Day

STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.MD.7 Relate area to the operations of multiplication and addition.

MCC.3.MD.8 Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.



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.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

In this task, students will use given perimeters to draw rectangles and compare areas of various rectangles.

When drawing rectangles with a given perimeter, it might be helpful for some students to share methods of finding rectangles with the correct perimeter. Some students might use trial and error or an organized list; others might realize they need to find two numbers that add up to half of the perimeter. By sharing strategies, some students might be able to use more efficient methods. However, allow students to use a method that makes sense to them.

Once students have finished with the task, post the students' work so that students can see several different examples of rectangles with the same perimeter arranged in order by area. Ask students to compare their work with others and engage them in a discussion of the relationship between perimeter and area. Students should notice that the narrower the rectangle, the smaller the area. Also, students should notice that the largest area is found in rectangles that are squares or as close to a square as possible, given the perimeter. Students may also notice properties of rectangles: four right angles, four sides, and opposite sides equal.

Students should have had prior experience determining area and perimeter.

ESSENTIAL QUESTIONS

- What is the relationship between perimeter and area?
- How can rectangles have the same perimeter but have different areas?

MATERIALS

- “Rectangles Rule” student recording sheet
- Construction paper
- Glue and scissors

GROUPING

Individual Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Students will follow the directions below from the “Rectangles Rule” student recording sheet. Assign each pair of students a perimeter. Possible perimeters are 12, 18, 24, 34, and 36.

Directions:

1. On the dot paper below, draw all the rectangles you can with the same perimeter.
My perimeter is _____.
2. Find the area and record it inside the rectangle. Show how you found the area.
3. Cut out the rectangles and order them from smallest area to largest area.
4. Glue them on construction paper in order.
5. Write a paragraph explaining what you notice about how the shape of a rectangle and its area are related.

FORMATIVE ASSESSMENT QUESTIONS

- Have you found all of the rectangles possible? How do you know?
- What strategies are other students using to find rectangles with the given perimeter?
- What do you notice about the shape of the rectangles?
- How are shape and area related?
- Other than perimeter, what do all of these rectangles have in common?

DIFFERENTIATION

Extension

- Given a rectangle with a perimeter of 36 units, what is the smallest possible area it could have? What is the largest possible area? How do you know?

Intervention

- Use graph paper or geoboards instead of dot paper to count the square units.

TECHNOLOGY CONNECTION

http://nlvm.usu.edu/en/nav/frames_asid_172_g_2_t_3.html?open=activities Geoboard with area/perimeter activity (Look for the activity titled, “Shapes with Perimeter 16.”)
http://highered.mcgraw-hill.com/sites/0072532947/student_view0/grid_and_dot_paper.html
Printable dot and graph paper

Name _____ Date _____

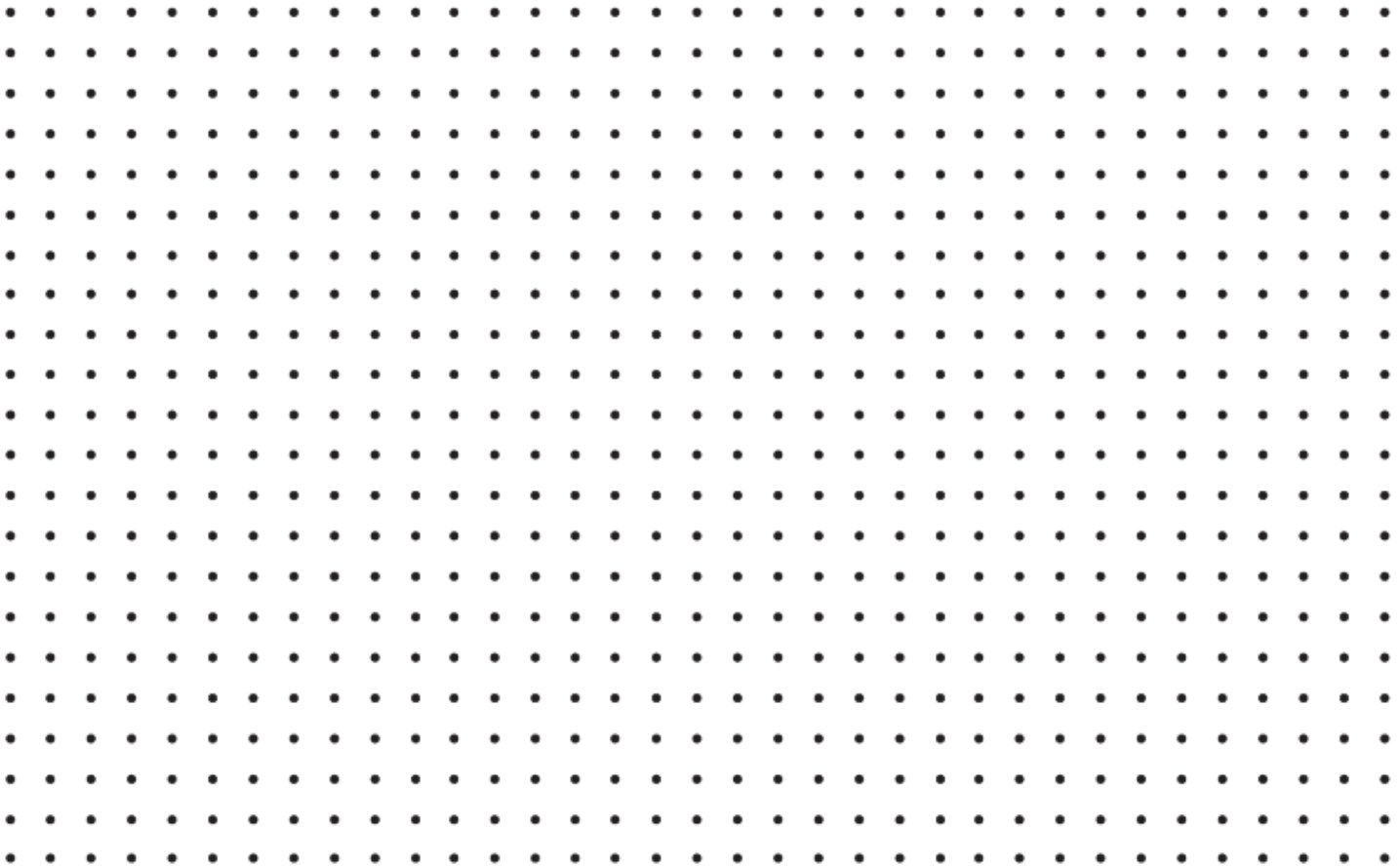
Rectangles Rule

Directions:

1. On the dot paper below, draw all the rectangles you can with the same perimeter.

My perimeter is _____.

2. Find the area and record it inside the rectangle. Show how you found the area.
3. Cut out the rectangles and order them from smallest area to largest area.
4. Glue them on construction paper in order.
5. Write a paragraph explaining what you notice about how the shape of a rectangle and its area are related.



(if you need more dot paper, please ask)



CONSTRUCTING TASK: HOW BIG IS A DESK?

APPROXIMATE TIME: 2-3 Days

STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.MD.7 Relate area to the operations of multiplication and addition.

MCC.3.MD.8 Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

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

In this task, students will use square units to estimate and measure the perimeter and area of a figure and compare the perimeter and area using different units.

It is very likely that the multiplication involved for finding area will be larger than a 1-digit number by a 2-digit number. Students may use calculators for this activity. The goal of this task is to explore the relationship between the size of linear units used to measure and the resulting perimeter and area. Therefore, the use of a calculator is appropriate.

Students should recognize that as the size of the unit of measure increases the number of units required to describe perimeter and area decreases. Conversely, as the size of the unit of measure decreases the number of units required to describe perimeter and area increases. In other words, if the pieces are smaller, you will need more of them to cover the same area; and if the pieces are larger you will need fewer of them to cover the same area.

Students should have had several opportunities to work with the perimeter and area of a rectangle and understand the difference between linear and square units.

ESSENTIAL QUESTIONS

- How do the measure of lengths change when the unit of measure changes?
- How are the perimeter and area of a shape related?
- What methods can you use to determine the area of an object?

MATERIALS

- Square units (i.e. centimeter cubes, 1-inch square tiles, 1x1 foot square pieces of paper)
- *Bigger, Better, Best!* by Stuart J. Murphy or a similar book about measuring area

GROUPING

Whole Group/Partner Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I

As an introduction to this task, read *Bigger, Better, Best!* by Stuart J. Murphy or a similar book about measuring area. Then, review perimeter and area and the units that can be used for each (linear units vs. square units). Throughout the lesson, emphasize the key vocabulary used in determining perimeter and area. Create an anchor chart as students discuss vocabulary and concepts.

Part II

Students will follow the directions below from the “How Big Is a Desk?” student recording sheet.

How would you describe the size of your desk? You will measure your desk using one inch tiles, a one foot ruler, and one centimeter cubes.

- Before measuring, look at the one inch tiles and record an estimate for the length and width of your desk in the table below.
- Use the tiles to find the actual measurement and record it in the table below.
- Find the perimeter of your desk using the tiles (or a method of your choice) and record it below.
- Find the area of your desk using the tiles (or a method of your choice) and record it below.
- Repeat steps 1 through 4 for the ruler and then for the centimeter cubes. Note: There are probably not enough centimeter cubes to measure the area of the desks. What other method could be used?

Part III

My Desk

	Length		Width		Perimeter	Area
	Estimate	Actual	Estimate	Actual		
1 Inch Tiles						
1 Foot Ruler						
1 Centimeter Cubes						

1. Write to explain how you found the perimeter of your desk. What is a different way to find perimeter?
2. Write to explain how you found the area of your desk. What is a different way to find area?
3. What happened to the perimeter and area of the desk as different units of measure were used?

FORMATIVE ASSESSMENT QUESTIONS

- What unit is the most appropriate to use to measure the desk? Why?
- What method would you choose to use when measuring a rectangle? Why?
- Describe how you found the perimeter of your desk.
- Describe how you found the area of your desk.

DIFFERENTIATION

Extension

Have students use 3” squares and/or 6” squares (cut from paper) to use as one square unit. In a math journal, ask students to estimate the area and perimeter of their desk and explain how they determined their estimates. Then ask them to find the area of their desk by tiling or multiplying.

Intervention

Have one inch and one centimeter grid paper available for those students who would like to “tile” their desks to find the area. If the grid paper is cut into 10 x 10 squares, counting to find the area will be easier. Or, have students measure a smaller item, such as a tissue box.

TECHNOLOGY CONNECTION

- http://www.shodor.org/interactivate/activities/ShapeExplorer/?version=1.6.0_07&browse_r=MSIE&vendor=Sun_Microsystems_Inc.&flash=10.0.32 Randomly generated rectangles for which the perimeter and the area can be found
- http://www.bgfl.org/bgfl/custom/resources_frp/client_frp/ks2/maths/perimeter_and_area/index.html Instruction on finding area and perimeter of shapes with practice. Levels 2 and 3 for area require finding the area of several rectangles and adding the areas together.

Name _____ Date _____

How Big Is a Desk?



How would you describe the size of your desk? You will measure your desk using one inch tiles, a one foot ruler, and one centimeter cubes.

- Before measuring, look at the one inch tiles and record an estimate for the length and width of your desk in the table below.
- Use the tiles to find the actual measurement and record it in the table below.
- Find the perimeter of your desk using the tiles (or a method of your choice) and record it below.
- Find the area of your desk using the tiles (or a method of your choice) and record it below.
- Repeat steps 1 through 4 for the ruler and then for the centimeter cubes. Note: There are probably not enough centimeter cubes to measure the area of the desks. What other method could be used?

My Desk

	Length		Width		Perimeter	Area
	Estimate	Actual	Estimate	Actual		
1 Inch Tiles						
1 Foot Ruler						
1 Centimeter Cubes						

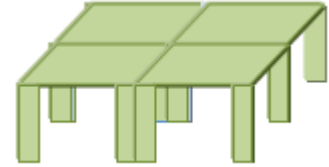
1. Write to explain how you found the perimeter of your desk. What is a different way to find perimeter?

2. Write to explain how you found the area of your desk. What is a different way to find area?

3. What happened to the perimeter and area of the desk as different units of measure were used?

CONSTRUCTING TASK: GUESS WHO'S COMING TO DINNER?

APPROXIMATE TIME: 2-3 Days



STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.MD.7 Relate area to the operations of multiplication and addition.

MCC.3.MD.8 Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

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

In this task, students will manipulate squares to alter the perimeter of given shapes in order to maximize seating potential. Students will then determine the size table cloth needed for the table of their choice.

Student responses to the “Guess Who’s Coming to Dinner?” task should reflect a variety of solutions. Student work should demonstrate that they paid close attention to the details of the problem. Work should be clearly labeled to show guests’ names. Written explanation should be easily understood. Ask students to share their solutions along with highlights of their group’s discussion that occurred while finding their solutions.

Students should have had experience with area and perimeter and understand the different uses for each. As students manipulate the squares, they will discover that when two separate squares (tables of four) are rearranged into a rectangle, two seating spaces are lost where the squares are joined together. Other observations about joining tables will become apparent as students manipulate the squares. Some students may recognize that as the perimeter gets smaller, the rectangle gets closer and closer to a square.

Remind students that most of the pentominos had a perimeter of 12 units, except for the one in which most of the squares shared two sides. This information may be helpful when working on this task.

ESSENTIAL QUESTIONS

- How are the perimeter and area of a shape related?
- How does combining and breaking apart shapes affect the perimeter and area?

MATERIALS

- *Spaghetti and Meatballs For All* by Marilyn Burns or similar book about perimeter
- “Guess Who’s Coming to Dinner?” student recording sheet
- 8 colored squares per group (about 2-inch squares)
- 1 large paper per group (about 18 x 24)

GROUPING

Small Group Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I

As an introduction to this task, read *Spaghetti and Meatballs for All*. In the story, relatives come to dinner and begin rearranging tables which results in losing seating places. After reading the book, have groups use the squares to model some of the events in the book. Discuss changes in area and/or perimeter caused by the moves.

Part II

Students will follow the directions below from the “Guess Who’s Coming to Dinner?” student recording sheet.

Pretend that four people live at your house (Your mom, dad, sister, and you). Aunt Sue, Uncle John and their six children (Jamal, Kevin, Carl, Annie, Stephanie, and Maxine) are coming for dinner. Uncle Kenny is coming, too. He is bringing his wife (Aunt Jenny) and four kids (Earl, Charles, Jasmine and Justine).

Mom has six square folding tables she can use but you don’t have to use all of them. (Each folding table seats four, one on each side.) You can put two or more of the folding tables together to form a rectangle if you like.

Job #1:

Your job is to work with a partner to decide on a seating arrangement that is best for your family and guests. When finished, draw a picture of the table arrangement and label each place to show who will be sitting there. Mom has the following rules:

- There should be no empty seats.
- There must be at least one grown-up at each table.

Write a few sentences to describe what happened to the perimeter as tables were pushed together. Then explain why the arrangement you chose is the best possible arrangement.

Part III

Job #2

Next, you need to determine what size tablecloth your mom needs in order to cover the table. Each side of each square is 3 feet long. The table cloth should be a perfect fit.

FORMATIVE ASSESSMENT QUESTIONS

- How does the area compare to the perimeter of this shape?
- How does combining or pulling apart shapes affect the perimeter and area of your pieces?
- What happens when you combine squares?
- What strategies are you using to make sure each guest has a seat?

DIFFERENTIATION

Extension

- Ask students work with a total of 24 dinner guests and 8 square tables.
- Challenge students to find more than one way to solve the problem.
- Ask students to describe how area and perimeter are alike and/or different.

Intervention

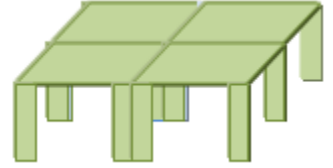
- As students try out a possible solution, have them trace the squares on a separate piece of paper and label the area and length of sides to determine the perimeter. Continue with this until the perimeter matches the number of guests. Then have students use name cards to move the guests around until a suitable solution is found.

TECHNOLOGY CONNECTION

- http://nlvm.usu.edu/en/nav/frames_asid_169_g_1_t_3.html?open=activities&from=category_g_1_t_3.html The squares from this virtual pattern blocks web site can be used. Students can use six squares from the pattern blocks and find different arrangements of the squares that meet the required conditions.
- http://www.learner.org/courses/learningmath/measurement/session9/part_a/index.html An interactive task for *teachers* to explore area and perimeter.

Name _____ Date _____

Guess Who's Coming to Dinner?



Pretend that four people live at your house (Your mom, dad, sister, and you). Aunt Sue, Uncle John and their six children (Jamal, Kevin, Carl, Annie, Stephanie, and Maxine) are coming for dinner. Uncle Kenny is coming, too. He is bringing his wife (Aunt Jenny) and four kids (Earl, Charles, Jasmine and Justine).

Mom has six square folding tables she can use but you don't have to use all of them. (Each folding table seats four, one on each side.) You can put two or more of the folding tables together to form a rectangle if you like.

You have two jobs to make this family feast a success.

Job #1:

Your job is to work with a partner to decide on a seating arrangement that is best for your family and guests. When finished, draw a picture of the table arrangement and label each place to show who will be sitting there. Mom has the following rules:

- There should be no empty seats.
- There must be at least one grown-up at each table.

Write a few sentences to describe what happened to the perimeter as tables were pushed together. Then explain why the arrangement you chose is the best possible arrangement.

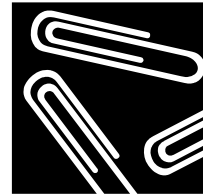
Job #2

Next, you need to determine what size tablecloth your mom needs in order to cover the table. Each side of each square is 3 feet long. The table cloth should be a perfect fit.

Write a few sentences to describe what happened to the perimeter as tables were pushed together. Then explain why the arrangement you chose is the best possible arrangement.

CONSTRUCTING TASK: HOW MANY PAPER CLIPS?

APPROXIMATE TIME: 2-3 Days



STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.MD.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.

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

BACKGROUND KNOWLEDGE

In this task, students will explore weight using simple household items and a balance scale. Students are introduced to the need for standardized units while exploring weight using paper clips.

Therefore, the emphasis of this unit should be placed on measurement. In the classroom, teachers should use the correct name (mass or weight) depending on the instrument used to make the measurement. (Mass is used when measuring with a balance scale; Weight is used when measuring with a spring scale, which includes scales like a bathroom scale.) The correct term for this task is mass because students are using a balance scale.

There are three parts to this task. First, students sort items by weight. Next, they sort the same items a second time using a balance scale. Finally, students find the weight of each item in terms of paper clips. After each part of this task, students should be brought together as a class to share what they found, to describe their procedures, and to defend their results. During each part of the task, students may record their results on the student task sheet, but also record their results in a way that data can be shared with the class (i.e., ask all groups to record their results on the white board, poster paper, or projected computer).

When introducing the third part of the task, ask students how the objects could be compared if each item was weighed separately. Students should recognize that there would need to be a value attached to each object in order to allow students to compare the objects. Tell students they will be using paper clips to measure the objects. Groups will get either jumbo paper clips or regular paper clips to use as a unit of measure (half of the groups should get regular paper clips and half of the groups should get jumbo paper clips). Model the

procedure for using paper clips to weigh an item (not one of the items in the set). Make sure each group uses a number and a unit to record results.

While there might be little differences between the groups that used the same size paper clips, the differences between the groups using different sized paper clips should be much more noticeable. When students discuss the shared results, it is important to let them determine why the measures are not the same.

Ask the students to think about times when it is important for everyone to agree upon the weight of an object. Examples might include the weight of produce at the grocery store if you are paying by the pound or the importance of accurate weight in a scientific experiment.

Students should have some experience using a balance scale and non-standard units of measurement. If necessary, explain to students that a balance scale is a tool that can help them be more accurate when comparing weight and demonstrate the use of the balance scale.

ESSENTIAL QUESTIONS

- What is a unit?
- What is weight?
- Why do we measure weight?

MATERIALS

For each group:

- “How Many Paper Clips?” student recording sheet
- Set of small objects to weigh (steel washer, plastic chip, wooden cube or dice, nickel, etc.)
- Primary balance (directions provided below)
- 100 paper clips (1/2 the class should have regular paper clips and 1/2 should have jumbo paper clips)

GROUPING

Small Group Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Students will follow the directions below from the “How Many Paper Clips?” student recording sheet.

Part 1

Using a set of items,

- a. Remove the items from the bag and order them from lightest to heaviest.
- b. Record your results on the chart below.

Georgia Department of Education
 Common Core Georgia Performance Standards Framework
Third Grade Mathematics • Unit 7

- c. Write to explain how you decided on the order of the items. Also, be ready to report to the class how you decided on the order.

Order Items from Lightest to Heaviest	Order Items from Lightest to Heaviest Using the Balance Scale	Give the Weight in Paper Clips of Each Object

Part II

Using a balance scale,

- a. Explore the balance scale using the set of items.
- b. Using the balance scale, compare and then order the items in your set from lightest to heaviest.
- c. Record your results on the chart.
- d. If the order of your items changed, write to explain why any changes that were made. Be prepared to explain to the class why you made any changes to the order of your items.

Part III

Using paper clips,

- a. Use the paper clips to weigh each item in your set.
- b. Record the weight of each item in the chart below. Use a number and a label (“jumbo paper clips” or “regular paper clips”) for each item.
- c. Write below to explain what you noticed or learned during this task. Be prepared to share findings with the class.

FORMATIVE ASSESSMENT QUESTIONS

- If you were asked to compare the weight of items without a scale, how could you do it?
- In what ways can we determine how much an object weighs?
- What do you notice about the weights of the items in the set?
- Why is it important to know how much things weigh?
- Does the size of an object always determine how much it weighs?
 - ♦ Can you give examples of small objects that weigh more/less than expected?
 - ♦ Can you give examples of large objects that weigh more/less than expected?
- When would it be important for people to get the same weight when measuring?
 - ♦ How do we use weight at school? (Please remember, it is not appropriate to measure and/or display a student’s weight)
 - ♦ How do you use measures of weight at home?
 - ♦ How do your parents use measures of weight at work?
- What happens to measurement when you change units?

DIFFERENTIATION

Extension

Ask students to create a graph for the data collected for the weight of the objects.

Intervention

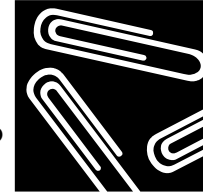
For the third part of the task, give intervention groups a smaller set of items and have them weigh each item twice, once with each size paper clip, and show a direct comparison in a two-column chart.

TECHNOLOGY CONNECTION

<http://public.doe.k12.ga.us/DMGetDocument.aspx/Grade%204%20Unit%203%20Creating%20Scales.pdf?p=6CC6799F8C1371F6CA1D4816B288AA4D386F6BD621BEA7BF4B4B9C6CFBBB4292&Type=D> Link to directions on how to make a balance scale and a spring scale using common materials.

Name _____ Date _____

How Many Paper Clips?



1. Using a set of items.
 - a. Remove the items from the bag and order them from lightest to heaviest.
 - b. Record your results on the chart below.
 - c. Write to explain how you decided on the order of the items.
Also, be ready to report to the class how you decided on the order.

Order Items from Lightest to Heaviest	Order Items from Lightest to Heaviest Using the Balance Scale	Give the Weight in Paper Clips of Each Object

2. Using a balance scale.
 - a. Explore the balance scale using the set of items.
 - b. Using the balance scale, compare and then order the items in your set from lightest to heaviest.
 - c. Record your results on the chart.
 - d. If the order of your items changed, write to explain why any changes that were made. Be prepared to explain to the class why you made any changes to the order of your items.
-
-

3. Using paper clips.
 - a. Use the paper clips to weigh each item in your set.
 - b. Record the weight of each item in the chart below. Use a number and a label (“jumbo paper clips” or “regular paper clips”) for each item.
 - c. Write below to explain what you noticed or learned during this task. Be prepared to share findings with the class.



CONSTRUCTING TASK: SETTING THE STANDARD

APPROXIMATE TIME: 1 Day

STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.MD.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.

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

In this task, students transition from non-standard to a standard unit of measure (grams). Then students use grams to measure the weight of fruit.

The emphasis of this unit should be placed on measurement. In the classroom, teachers should use the correct name (mass or weight) depending of the instrument used to make the measurement. (“Mass” is used when measuring with a balance scale; “weight” is used when measuring with a spring scale, which includes scales like a bathroom scale.) The correct term for this task is mass because students are using a balance scale.

As a review, ask students to share what they discovered during the previous task. To introduce this task, show a gram weight. Introduce its name and symbol and describe it as a standard unit of weight. Ask students to use the balance scale to compare 1 gram (1g) to both sizes of the paper clips used in the previous task. Show the other gram weights (5g, 10g, and 20g) and have students estimate and then measure how many paper clips would equal each weight. Ask students to share their findings.

While students work on the “Setting the Standard” student recording sheet, they may refer to their charts from the previous lesson for the weight in paper clips or measure each item again in paper clips.

When discussing the weight of the fruit, guide students to suggest making new units (100 g weights). These can be created using a zippered plastic bag and aquarium gravel. Let students show how these can be created. Students should determine that they will have to combine their weight sets to get a total of 100 grams on one side of the balance scale and then measure an equivalent amount of gravel to balance the scale. Provide the fruit and have students measure the fruit using the new and old weights. (A medium apple weighs about 200g.)

Some students may try to name this new unit 100 grams (100g). If so, encourage the use of metric roots and prefixes from prior knowledge to do so (see “Background Knowledge” below.) Finally, collect 10 of the 100g bags and place them in a large zippered plastic bag. Ask students to figure out how much this new unit weighs (1000 g). Guide students to the term kilogram meaning 1000 grams.

Students should have had experience measuring and comparing weight using a balance scale and understand the difference between standard and non-standard units in measurement.

The Metric prefixes are as follows:

Kilo	Hecto	Deka	Gram	Deci	Centi	Milli
1,000	100	10	1	1/10	1/100	1/1,000

Based on the chart above, 10 grams is 1 dekagram, 100 grams is 1 hectogram, and 1,000 grams is a kilogram. Also, one tenth of a gram is a decigram, one hundredth of a gram is a centigram, and one thousandth of a gram is a milligram. **Remember, in third grade students are only responsible to know and understand the relationship between kilogram and gram.** However, it is appropriate to use the correct label when creating 10 gram weights and 100 gram weights.

ESSENTIAL QUESTIONS

- What is the difference between a standard and non-standard unit of measurement?
- What units are appropriate to measure weight?
- How are units in the same system of measurement related?
- What strategies could you use to figure out the weight of multiple objects?
- What happens to a measurement when we change units?

MATERIALS

For each group

- Balance scale
- Set of small items (from previous task)
- Set of gram weights (1g, 5g, 10g, and 20g) *Common items weighing 1 gram- 1 lg paper clip, 1 dime, a business card, a dollar bill. 100 grams- 20 nickels (5 grams per nickel)*
- Paper clips (in two sizes from previous task)

For each student

- “Setting the Standard” student recording sheet
- Snack-size zippered plastic bag

For the class

- 5 lbs aquarium gravel
- Several pieces of fruit (apple, orange, banana)
- One 2-gallon zippered plastic bag (to create a 1 kilogram bag)

GROUPING

Small Group Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Students will follow the directions below from the “Setting the Standard” student recording sheet.

1. Find the weight of each object using paper clips and 1 gram (1 g) weights. Record the weights in the chart below.
2. Place a piece of fruit in your balance scale. Talk with your group about how you would measure the fruit using standard units. Record your thoughts below.
3. Create a three-column chart similar to the one above. Label the first column **Fruit Name**, the second column **Paper Clips**, and the third column **Grams (g)**. Find the weight of each piece of fruit and record it in your chart.

Item Name	Measurement in Paper Clips	Measurement in Grams (g)

FORMATIVE ASSESSMENT QUESTIONS

- What is the difference between a standard and non-standard unit of measurement?
- How can you use gram weights and a balance scale to measure the weight of an object?
- Ask what happens when the unit is too small to measure an object?
- What is the difference between units in the same system of measurement?
- How can you figure out the weight of multiple objects?

DIFFERENTIATION

Extension

- Ask students to find the weight of the objects using different units, such as hectograms and dekagrams.
- Ask students to estimate how many apples would be needed to make one kilogram? How many bananas? How many oranges?

Intervention

- Make the relationship between kilogram and gram (1kg = 1,000g) explicit.
- Add the second chart to the student recording sheet, allowing the student to focus on measurement, not creating a chart.

Fruit Name	Non-Standard Unit Paper Clips	Standard Unit Grams (g)

Name _____ Date _____

Setting the Standard



1. Measure each item using paper clips in the balance scale, like you did in the “How Many Paper Clips?” task. Then measure each item using grams (g). Record the measures in the chart below.

Item Name	Measurement in Paper Clips	Measurement in Grams (g)

2. Place a piece of fruit in your balance scale. Talk with your group about how you would measure the fruit using standard units. Record your thoughts below.

3. Create a three-column chart similar to the one above. Label the first column **Fruit Name**, the second column **Non-Standard Unit – Paper Clips**, and the third column **Standard Unit – Grams (g)**. Find the weight of each piece of fruit and record it in your chart.

CONSTRUCTING TASK: MAKING A KILOGRAM

APPROXIMATE TIME: 1 Day

STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.MD.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.



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

In this task, students will be involved in a kinesthetic activity that helps them experience how heavy a kilogram is and develop a conceptual understanding of a kilogram. Students will then use that experience to estimate the weight of everyday items.

To introduce this task, pass a one kilogram weight around to the students. Ask each student to hold the one kilogram and to try to remember how heavy it feels.

Students should empty and refill their bags at least three times, even if they were very close to one kilogram on their first or second attempt. Also, using mathematical words to describe whether the bag weighs more than, less than, or equal to a kilogram is an important part of this activity. Make sure the students don't skip this step.

Students should have had experience using a spring scale and understand that a kilogram is a standard unit of weight measurement.

ESSENTIAL QUESTIONS

- About how heavy is a kilogram?
- What around us weighs about a kilogram?
- How can you figure out the weight (in kilograms) of multiple objects?

MATERIALS

- “Making a Kilogram” student recording sheet
- 1 kilogram weight (a liter of water weighs about one kilogram)
- Cloth or paper bags (one per student)
- Sand, aquarium gravel, blocks, cubes, beans, etc. for students to use when filling bags
- Spring scale

Comments

You will need a lot of material (sand, aquarium gravel, blocks, cubes, and/or beans) if every student is going to create their own kilogram. A kilogram weighs about 2.2 pounds so you will need at least 50 pounds of material for 20 students. In order to allow students to experiment when creating one kilogram, there should be more than one kilogram of material per student. If you do not have enough material, students may work in pairs or triplets to create a kilogram. This can also be done with empty student backpacks, with classroom items as filler to create the 1 kilogram weight.

GROUPING

Whole Group/Individual Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Students will follow the directions below from the “Making a Kilogram” student recording sheet.

Part I

Think about how heavy the kilogram your teacher gave you felt. Now create a bag that you think will weigh about 1 kilogram. Do not use a scale to create your bag! After you have made your 1 kilogram bag, weigh your bag using the scale provided.

- Does your bag weigh less than a kilogram?
- More than a kilogram?
- Exactly one kilogram?

Part II

Determine if your bag weighs more than, less than, or equal to one kilogram. Record your results in the chart below.

	Actual Weight of My Bag	More Than, Less Than, or Equal to one Kilogram
Attempt #1		My bag weighs _____ a kilogram.
Attempt #2		My bag weighs _____ a kilogram.
Attempt #3		My bag weighs _____ a kilogram.

1. Do you think a kilogram weighs more than or less than a pound? Explain your thinking.

FORMATIVE ASSESSMENT QUESTIONS

- How can you use your kilogram bag to measure weight?
- Why is it important to have a standard unit of weight?
- What items in your bedroom could be measured using kilograms?
- How can you figure out the weight (in kilograms) of multiple objects?

DIFFERENTIATION

Extension

- Sometimes it is helpful to have some referents for weights. Ask students to create a poster of common everyday objects that weigh a specific amount. (Be careful about weights indicated on a product package as that will *not* include the weight of the container, which may be significant in some situations. This would be a good discussion to have with students.)

Intervention

- Have students work in pairs to accomplish this task.

TECHNOLOGY CONNECTION

<http://www.mathsisfun.com/measure/metric-mass.html> Provides some background on metric measures and lists items that weigh about one kilogram.

Name _____ Date _____

Making a Kilogram



Think about how heavy the kilogram your teacher gave you felt. Now create a bag that you think will weigh about 1 kilogram. Do not use a scale to create your bag! After you have made your 1 kilogram bag, weigh your bag using the scale provided.

- Does your bag weigh less than a kilogram?
- More than a kilogram?
- Exactly one kilogram?

1. Determine if your bag weighs more than, less than, or equal to one kilogram. Record your results in the chart below.

	Actual Weight of My Bag	More Than, Less Than, or Equal to one Kilogram
Attempt #1		My bag weighs _____ a kilogram.
Attempt #2		My bag weighs _____ a kilogram.
Attempt #3		My bag weighs _____ a kilogram.

2. Do you think a kilogram weighs more than or less than a pound? Explain your thinking.

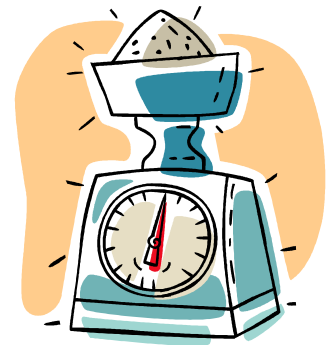
3. Look at the actual weights of your bag. What could you do if you wanted to determine the weight of three bags with the same exact weight? Explain your thinking.

CONSTRUCTING TASK: WORTH THE WEIGHT

APPROXIMATE TIME: 2 Days

STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.MD.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.



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

In this task, students will experiment with gram and kilogram weights. They will select objects to weigh, estimate their weight, and then use a spring scale to determine the actual weight.

Before beginning this task, you may want to review the previous task in which students made kilogram weights from bags and material such as aquarium gravel.

This task can be broken into two parts or the class can be broken into groups and the students can rotate through each part of the task.

Students need to be familiar with the terms gram and kilogram, metric units used to measure the mass of an object. One kilogram is equal to 1,000 grams. One gram weighs about as much as a large paper clip or a packet of sweetener, and one kilogram is the weight of a textbook or liter of water, and is equal to about 2.2 pounds.

ESSENTIAL QUESTIONS

- How are grams and kilograms related?
- What around us weighs about a gram? About a kilogram?
- What happens to a measurement when we change units?
- How can I use operations to figure out more about how much things weigh?

MATERIALS

- “Worth the Weight, Part 1 – Grams” student recording sheet
- “Worth the Weight, Part 2 – Kilograms” student recording sheet
- Large paper clip
- Gram weight
- Balance
- 1 kg reference weights
- Spring scales

GROUPING

Small Group Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Comments

One liter bottles filled with water weigh about one kilogram. Alternatively, fill bags with sand, aquarium gravel, or dried beans. Students can use these “reference weights” to compare weights when looking for items that weigh one kilogram.

Part I

To introduce this part of the task, hold up a large paper clip and explain that it weighs about one gram. Pass some large paper clips around to the students so that they can get an idea of how much a gram is. Involve the class in a discussion about what might be appropriate to measure in grams. After asking the class for a few suggestions, students will list things in the classroom they think they could weigh using grams. Ask students to record their items in the table on their student recording sheet, “Worth the Weight, Part 1 – Grams.”

For each item on their chart, students should hold the item to estimate its weight first, measure its weight using a spring scale, and write down the actual weight of each item.

When students are finished, hold a class discussion about what objects are appropriate to weigh in grams and what students learned from this part of the task.

Students will follow the directions below from the “Worth the Weight, Part 1 - Grams” student recording sheet.

Georgia Department of Education
Common Core Georgia Performance Standards Framework
Third Grade Mathematics • Unit 7

Think about how heavy a paper clip is. Now find five objects that you think should be weighed using grams. Do not use a scale to check yet! After you have found five objects:

- Write the name of the objects in the chart below.
- Make an estimate for each item and record it in the chart below.
- Weigh each item using the scale provided and record it in the chart below.

Object	Estimated Weight (g)	Actual Weight (g)
1.		
2.		
3.		
4.		
5.		
6.		

1. How did you make your estimates?
2. Why are the items you chose appropriate to measure in grams?
Be ready to share your thinking with the class.

Part II

To introduce this part of the task, pass the kilogram referents around to the students. Ask the class for a few suggestions of classroom items for which kilograms would be an appropriate unit of measure.

For each item on their chart, students should first hold the item to estimate its weight (more than, less than, or about 1 kilogram), measure its weight using a spring scale, and write down the actual weight of each item.

When students are finished, hold a class discussion about what objects are appropriate to weigh in grams and what students learned from this part of the task.

Students will follow the directions below from the “Worth the Weight, Part 2 - Kilograms” student recording sheet.

You and your partner are going on a kilogram scavenger hunt! Use one of the reference weights to get an idea of how heavy one kilogram is. Then find items around the room that weigh less than, about, and more than one kilogram.

1. List the items in the table below.
2. Predict whether each item is more than, less than, or about 1 kilogram.
3. Weigh each item with a spring scale.
4. Record the weight in the last column.

Remember: 1 kg = 1,000 grams

Georgia Department of Education

C

Object	Prediction (check the correct box below)			Actual Weight (g)
	Less Than 1 Kilogram	More Than 1 Kilogram	About 1 Kilogram	
1.				
2.				
3.				
4.				
5.				
6.				

Look at the table. Write what you found about your understanding of a kilogram. Be prepared to discuss your findings with the class.

On the back of this sheet, list at least five items for which kilograms would be appropriate as the unit of measure.

FORMATIVE ASSESSMENT QUESTIONS

- Why is it important to associate items with a weight?
- When would you use grams and kilograms in your everyday life?
- What are your predictions for which objects will weigh about a gram? Why?
- What are your predictions for which objects will weigh about a kilogram? Why?

DIFFERENTIATION

Extension

- Have students find ten items around their house that they would measure using grams or kilograms. Encourage them to find five items for grams, and five items for kilograms. Have them estimate how much each item weighs.
- Have students estimate how many kilograms five different people weigh (family members, neighbors, friends, babysitters, etc.).

Intervention

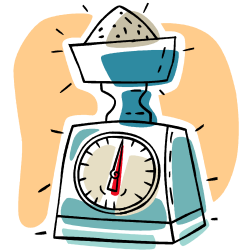
- Each week, have a ten minute discussion about units of weights. Ask students to choose an item from the classroom, discuss the appropriate unit to use to measure the weight, and then estimate the weight of the object. In math journals, have students keep a reference list of how much different items weigh using grams and kilograms. This can be used as a reference throughout the year.

TECHNOLOGY CONNECTION

<http://gadoe.georgiastandards.org/mathframework.aspx?PageReq=MathHunt> Is a link to a classroom video of this task. Teachers may want to view this video to see how one teacher implemented this task in his classroom.

Name _____ Date _____

Worth the Weight
Part 1 - Grams



Think about how heavy a paper clip is. Now find five objects that you think should be weighed using grams. Do not use a scale to check yet! After you have found five objects:

- Write the name of the objects in the chart below.
- Make an estimate for each item and record it in the chart below.
- Weigh each item using the scale provided and record it in the chart below.

Object	Estimated Weight (g)	Actual Weight (g)
1.		
2.		
3.		
4.		
5.		
6.		

1. How did you make your estimates?

2. Why are the items you chose appropriate to measure in grams?

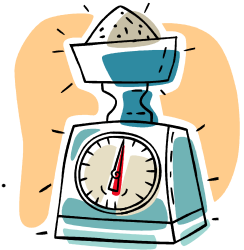
3. Choose one of your objects from the list above. **Using only the actual weight**, determine the weight of five of those items **WITHOUT** using a scale. Explain how you did it using pictures, numbers, and words.

Name _____ Date _____

Worth the Weight

Part 2 - Kilograms

You and your partner are going on a kilogram scavenger hunt! Use one of the reference weights to get an idea of how heavy one kilogram is. Then find items around the room that weigh less than, about, and more than one kilogram.



1. List the items in the table below.
2. Predict whether each item is more than, less than, or about 1 kilogram.
3. Weigh each item with a spring scale.
4. Record the weight in the last column.

Remember: 1 kg = 1,000 grams

Object	Prediction (check the correct box below)			Actual Weight (g)
	Less Than 1 Kilogram	More Than 1 Kilogram	About 1 Kilogram	
1.				
2.				
3.				
4.				
5.				
6.				

1. Look at the table. Write what you found about your understanding of a kilogram? Be prepared to discuss your findings with the class.

2. Choose one of your objects from the list above. **Using only the actual weight,** determine the weight of twelve of those items **WITHOUT** using a scale. Explain how you did it using pictures, numbers, and words.
3. On the back of this sheet, list at least five items for which kilograms would be appropriate as the unit of measure.



CONSTRUCTING TASK: FILL IT UP!

APPROXIMATE TIME: 2 Days

STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.MD.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.

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

According to Van de Walle (2006) “*volume* typically refers to the amount of space that an object takes up” whereas “*capacity* is generally used to refer to the amount that container will hold” (p. 265). To distinguish further between the two terms, consider how the two are measured. Volume is measured using linear measures for each dimension (ft, cm, in, m, etc) while capacity is measured using liquid measures (L, mL, qt, pt, g, etc). However, Van de Walle reminds educators, “having made these distinctions [between volume and capacity], they are not ones to worry about. The term *volume* can also be used to refer to the capacity of a container” (p. 266).

Van de Walle, J. A. & Lovin, L. H. (2006). *Teaching students-centered mathematics: Grades 3-5*. Boston: Pearson Education, Inc.

Students should have experience with basic capacity and conservation. Students will also need to be familiar with using liquid measuring tools (e.g. graduated cylinders).

ESSENTIAL QUESTIONS

- What is the tool best to use when measuring liquid volume?
- What connection can you make between the volumes and your everyday life?
- Does volume change when you change the measurement material? Why or why not?

MATERIALS

For each student:

- “Fill It Up” student recording sheet
- “Fill It Up, Measuring Stations” student recording sheet

For each group:

- a large pan or sheet of plastic (for spillage)
- a large graduated cylinder (1 liter)
- 2 different large containers (jar, bottle, bucket, pot, etc.)
- 1 bowl of water (may be colored for visual effect),
- 1 funnel

GROUPING

Small Group Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

In this task, students estimate and compare liquid volume. The unit of focus is the liter. Students will make connections to everyday items to build understanding of liquid volume and the liter.

Comments

Remember that the goal is for the students to develop a concept of liquid volume. According to Van de Walle (2006), “Children often confuse “holds more” with “taller” or “fatter,” even though these may be misleading attributes. This is why a variety of container shapes not only adds interest but also can contribute to student understanding. (p.239)

Task Directions

Students will follow the directions below from the “Fill It Up” student recording sheet and the “Fill It Up Measuring Stations” recording sheet.

This task has four parts.

Part I:

Introduction, Discussion, Connections

The teacher will facilitate a conversation with the students about liquid volume. Discussion about the meaning of the concept and how it is measured should take place. The students and the teacher will make connections, cite examples, and clarify misconceptions. This would be a great opportunity to begin an anchor chart. The teacher should then show the class a container that measures one liter. Students should give examples of other containers that hold a liquid volume of about 1 liter to add to the anchor chart.

Part II

Exploring, Estimating, Comparing

In small groups, complete the mini activities below:

**Adapted from Teaching Student-Centered Mathematics, Van de Walle, Lovin, (2006)*

Capacity Sort

Provide a collection of labeled containers with one marked as the “target.” The task is to sort the collection into those that hold more than, less than, or about the same as the “target” container. Provide a recording sheet on which each container is listed and a place to circle or write, “holds more,” “holds less,” and “holds about the same.” List the choices twice for each container. The first choice is to record a guess made by observation. The second is to record what was found. (Beans, rice, liquid, or other fillers can be used to test estimates.)

Liquid Volume Line Up!

Given a series of five or six labeled containers of different sizes and shapes, order them from least capacity to most. Explain your thinking with your group members.

Notes for the teacher:

- Make sure that at least one of the containers measures 1 liter
- This can be quite a challenge, but let them “grapple” with it! Do not provide answers!
- Allow students to compare their findings with other groups.

Part III

Investigating, Estimating, Measuring

In small groups, students will explore, estimate, and measure liquid volume. Each group should have the following:

- a large plastic box or sheet of plastic (for spillage)
- a large graduated cylinder (1 liter)
- 2 different large containers (jar, bottle, bucket, pot, etc.)
- 1 bowl of water (may be colored for visual effect),
- 1 funnel

Using the funnel, have the students fill each of the containers until they believe that they have reached a liter. Once they have reached their estimate, allow them to pour the liquid from each container into the graduated cylinder. Ask the students to pay careful attention to what happens.

Part IV

Reflection

Once students have completed their work station task, ask students to complete the “Fill It Up” student recording sheet, and compare their estimations. Ask students to share their findings and to justify their findings by describing the process they followed.

FORMATIVE ASSESSMENT QUESTIONS

- What is an efficient way to measure liquid capacity?
- When estimating liquid capacity, what do you need to consider?
- How much is a liter?

- What other containers have you seen in your everyday life with a capacity of one liter?
- Does the shape of the container change the amount of liquid it can hold? Why or why not?

DIFFERENTIATION

Extension

- Ask students to compare the relationships between the containers and the amount of liquid they can hold. Several things may come to light in this discussion.
 - The amount of liquid used to fill two containers can be the same, even though the shape of the containers may be different.
 - Having a benchmark to look at helps to make more accurate measurements.

Intervention

- Have an adult work with a small group of students who need support using a graduated cylinder.
- Have students complete the task using only one container.



Name _____ Date _____

Fill It Up!

You will explore, estimate, and measure liquid volume. Your group should have the following:

- a large pan or sheet of plastic (for spillage)
- a large graduated cylinder (1 liter)
- 2 different large containers (jar, bottle, bucket, pot, etc.)
- 1 bowl of water (may be colored for visual effect),
- 1 funnel

Directions:

1. Look at your two containers. Estimate how much liquid it would take to fill each container to one liter.
2. Talk with your group members about how much liquid it would take to reach your goal of 1 liter.
3. Take turns filling each container until you believe that you have reached a liter. Use a funnel if you need to.
4. Once your group has reached their estimate, take turns pouring the liquid from the each container into the graduated cylinder.
5. Observe, discuss, and record what happens on the chart below. How close was your estimate?

Fill it Up! Recording Table		
Type of Container	What happens when the liquid is poured into the graduated cylinder?	How close was your estimate to an actual liter?

Questions For Reflection:

1. When estimating liquid capacity, what do you need to consider?
2. About how much liquid is there in a liter?
3. What other containers have you seen in your everyday life that have a capacity of one liter?
4. Does the shape of the container change the amount of liquid it can hold? Why or why not?

CONSTRUCTING TASK: MORE PUNCH, PEASE!

APPROXIMATE TIME: 1-2 Days



STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.MD.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.

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.

ESSENTIAL QUESTIONS

- How can estimating help me to determine liquid volume of something?
- What are some ways I can measure the liquid volume of something?

MATERIALS

- “More Punch, Please!” student recording sheet
- “More Punch Please!” recipe items
- a 1 liter container
- construction paper

GROUPING

Small Group/Partner Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Students will explore and solve problems involving liquid volume.

Part I

Exploring, Estimating, Comparing

With your students, complete the activity below:

**Adapted from Teaching Student-Centered Mathematics, Van de Walle, Lovin, (2006)*

Tape two sheets of construction paper. Make a tube shape (cylinder) of one by taping the two long edges together. Make a shorter, fatter tube from the other sheet by taping the short edges together. When placed upright, which cylinder holds the most, or do they have the same capacity?

Part II

Investigating and Measuring

For this part of the task, students work with liquid volume to determine the amount of punch needed for a class party. Students can make simulated punch with colored water, or actual punch with real ingredients.

Students will follow the directions below from the “More Punch, Please!” student recording sheet.

We are making punch for a 3rd grade party. 30 students will attend the party. Make enough punch for everyone at the party. The recipe for the punch is as follows

Party Punch

* serves 10 students

Ingredients:

2 liters of fruit punch

$\frac{1}{2}$ liter of lemon – lime flavored carbonated beverage
(or ginger ale)

1 liter of sherbet

Directions:

Place sherbet in punch bowl. Pour in fruit punch and lemon-lime soda.

Part III

Reflection and Problem Solving

Answer the following questions about the punch for the party. Show all work and explain how you know your answers are accurate. Use pictures, numbers, and words.

1. How much liquid will be used for one batch?
2. How much of each ingredient needs to be purchased to serve punch at the party? Rewrite the recipe to serve 30 students.
3. How much liquid will be used in all for the entire party of 30 students? Show your work below.
4. Is there enough for students to receive seconds? Why or why not?

FORMATIVE ASSESSMENT QUESTIONS

- How many batches of the recipe will you need? How do you know?
- How much sherbet will you need to buy? How do you know?
- How much fruit punch do you need? How do you know?
- How much Lemon-Lime soda do you need? How do you know?
- What would you need to do to the recipe if more students came to the party?

DIFFERENTIATION

Extension

- Encourage students to find a different punch recipe and to rewrite the recipe to serve other numbers of students (50, 100).
- Ask students to determine what size drink is typical (they can consider the type of cup being used, whether ice will be available, and other factors that may influence the amount of punch served to each student). Once students have collected data, they can display the data, choosing the most effective data display.

Intervention

- Allow students to make only one batch.
- Facilitate a teacher guided group.

Name _____ Date _____

More Punch, Please!

We are making punch for a third grade party. 30 students will attend the party. The recipe below will serve 10 students.



Party Punch Recipe (Serves 10)

Ingredients:

- 1 liter of sherbet
- 2 liters of fruit punch
- $\frac{1}{2}$ liters of lemon-lime flavored carbonated beverage (or ginger-ale)

Directions:

- Place sherbet in punch bowl.
- Pour in fruit punch.
- Pour in lemon-lime soda.
- Stir, and serve chilled.

Answer the following questions about the punch for the party. Show all work and explain how you know your answers are accurate. Use pictures, numbers, and words.

1. How much liquid will be used in all for one batch? Show your work below.

- 2. How much of each ingredient needs to be purchased to serve punch at the party?
 Rewrite the recipe to serve 30 students.**

Party Punch	
Serves 10	Serves _____
1 liter of sherbet	_____ Liters Sherbet
2 liters of fruit punch	_____ Liters of Punch
½ liters of lemon-lime flavored carbonated beverage (or ginger-ale)	_____ Liters of Lemon-Lime

- 3. How much liquid will be used in all for the entire party of 30 students? Show your math thinking below.**

- 4. Is there enough punch for students to receive seconds? Why or why not?**

CONSTRUCTING TASK: THE DATA STATION

Adapted from North Carolina’s Core Essentials Mathematics Program

APPROXIMATE TIME: 3-5 Days



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.

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.

BACKGROUND




Students should have opportunities reading and solving problems using scaled graphs before being asked to draw one. The following graphs all use five as the scale interval, but students should experience different intervals to further develop their understanding of scale graphs and number facts. While exploring data concepts, students should **Pose** a question, **Collect** data, **Analyze** data, and **Interpret** data (PCAI). Students should be graphing data that is relevant to their lives

Example:

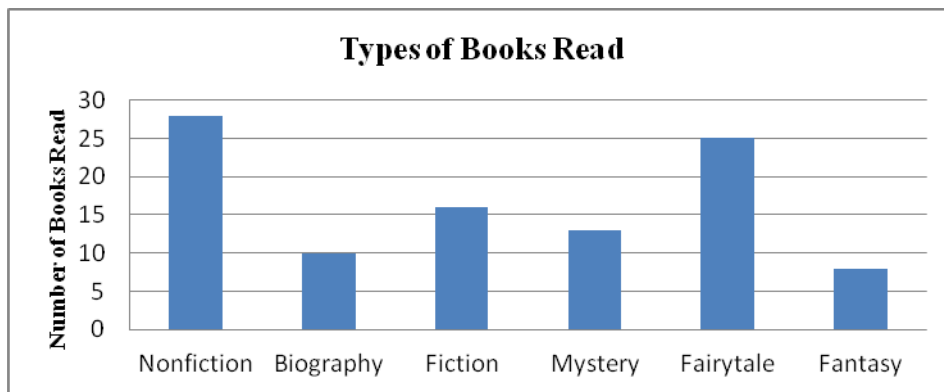
Pose a question: Student should come up with a question. What is the typical genre read in our class?

Collect and organize data: student survey

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

Single Bar Graphs: Students use both horizontal and vertical bar graphs. Bar graphs include a title, scale, scale label, categories, category label, and data.



Analyze and Interpret data:

- How many more nonfiction books were 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 [Return to Contents](#) 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?

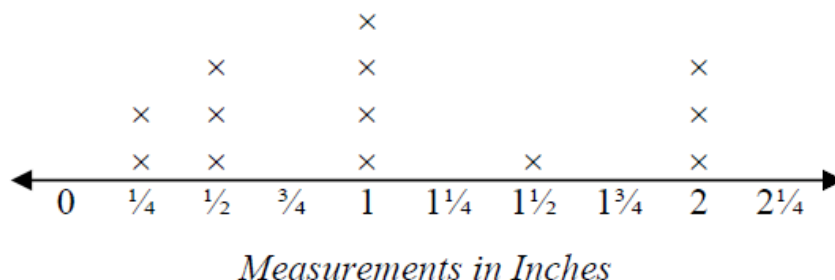
Students in second grade measured length in whole units using both metric and U.S. customary systems. It is important to review with students how to read and use a standard ruler including details about halves and quarter marks on the ruler. Students should connect their understanding of fractions to 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 $\frac{1}{2}$ or $\frac{1}{4}$ of an inch, display data collected on a line plot. How many objects measured $\frac{1}{4}$? $\frac{1}{2}$? etc. ...

Objects on My Desk



ESSENTIAL QUESTIONS

- How are tables, bar graphs, and line plot graphs useful ways to display data?
- How can you use graphs to answer a question?
- How can surveys be used to collect data?
- How can surveys be used to gather information?
- How can data displayed in tables and graphs be used to inform?

MATERIALS

- Math Journals (or paper)
- Connecting Cubes
- Newspapers
- Pennies
- Droppers
- Lima Beans
- Manipulatives/cut outs (to help students create models for their problems)

GROUPING

Students may be grouped individually, in pairs, or in small groups at the teacher's discretion.

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

PART I (Whole group activity)

Allow students to collect the sizes of shoes worn by their classmates. As a class (perhaps on chart paper), make a table to organize the data. Have a class discussion that allows the class to think critically about the relationship between data collection, analysis, and representation.

Some sample points for the students to ponder are:

- How can we organize our data?
- What type of graph should we choose to display the information? Why?
- Is there another way we can represent this data?

- What does a graph tell us about data?
- What kinds of questions can we ask about the graphs we just created?

PART II (Small group activity)

Allow students to work in small groups to complete this task.

How many connecting cubes can you fit along the side of your shoe?

- Working in small groups, display your data on an appropriate graph.
- Discuss what your data means. Create questions about your findings that can be answered using your graph.
- *Challenge:* Try to represent this data using a different type of graph. Talk about how your new graph differs from your first one.

PART III (Partner activity)

Allow students to work in small groups to complete this task.

Penny Power!

- With a partner, predict the number of drops of water that will fit on a penny.
- Share your prediction with your partner.
- Establish rules for dropping water on the penny.
- Use a dropper to find out how many drops of water will fit on the penny.
- Construct a graph to display your data.
- Compare your graph with the graph of another group.
- Write about the similarities and differences.

DIFFERENTIATION

Extension Activities

- How much sleep?
 - Collect data for the number of hours your classmates sleep each night.
 - Make a line plot graph to illustrate.
 - Compare your graphs with others.
 - Do most students sleep more than nine hours? How do you know?
- Weather Watcher!
 - Over a two week period, look at the weather data in the newspaper.
 - Compare the high and low temperatures in your town/city to the high and low in the city of your choice.
 - Make two line plots to compare these.
 - What statements can you make about the data?



Intervention Activities

- Explore Data!

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- Cut out examples of graphs from the newspapers.
- What information is being shown?
- How would you classify these data displays?
- ...And the Survey Says!
 - Choose a question and survey at least twelve classmates. Collect your data and make graphs. Don't forget labels! When finished your teacher will ask you questions about your data and graphs.
 1. Which of these pets do you prefer?
 - Cat
 - Bird
 - Hamster
 - Dog
 2. Which sport do you like best?
 - Basketball
 - Swimming
 - Soccer
 - Football
 3. Which is your favorite fast food restaurant?
 - McDonald's
 - Burger King
 - Wendy's
 - Chick Fil A



PRACTICE TASK: “THE MAGIC NUMBER!”

APPROXIMATE TIME: 1 Day

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.

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.

MCC.3.NBT.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

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.
6. Attend to precision.
8. Look for and express regularity in repeated reasoning.

ESSENTIAL QUESTIONS

- How can graphs be used to compare related data?
- How can data displayed in tables and graphs be used to inform?
- How can data displays be used to describe events?

MATERIALS

- Two Number Cubes
- Recording Sheet (below)
- Chart paper

GROUPING

3-4 players

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

PART I

1. Each player needs to pick a sum between 2 and 12 and write it at the top of their recording sheet. (below) This is your “magic” number. No two students in the group should choose the same number.
2. Players will take turns rolling the pair of number cubes. A total of 20 rolls will happen.
3. After each roll, each player will record the sum of the two dice on the recording sheet.
4. Each time a player’s “magic number” is rolled, he or she gets a point. At the end of 20 turns, the player with the most points wins the game!
5. After the game, each group should complete the “After the Game” activities.

PART II

After the Game (Individual activity)...

1. On a piece of chart paper, create a bar graph for the results of the game as a group. *Consider the sum only.*
2. On a piece of chart paper, create make a pictograph for the results of the game as a group. *Consider the sum only.*
3. Write 3 questions that can be answered from your graph.
4. Ask your questions of other groups and discuss!

FORMATIVE ASSESSMENT QUESTIONS

1. What strategies are you using to help you add quickly and accurately?
2. What plan will you use to create your bar graph?
3. What should you consider when creating your pictograph?
4. What types of questions should you create for your classmates?
5. Is there a way you could use your data to create a line plot graph?

DIFFERENTIATION

Extension

- Have students repeat the activity and change the Magic Number. Explain why.
- Have students try to figure out a way to turn their graph into a line plot. Allow the students who were able to create line plots share their graph and strategies with their classmates.

Intervention

- Allow students to use dot dice instead of number cubes.
- Allow students to use number lines and manipulatives to help them add the numbers.
- Allow students to make graphs in small groups of with a partner.

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My “Magic Number” is: _____

Roll	Digit on First Die	Digit on Second Die	Sum	Points
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

CONSTRUCTING TASK: IT'S IN THE DATA

APPROXIMATE TIME: 2-3 Days



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.

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.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

This is a two day task. Students will collect, record, and display data using tables, line plot graphs, and bar graphs.

This task could be introduced by reading *Lemonade for Sale* by Stuart J. Murphy, or a similar book that incorporates the use of bar graphs.

ESSENTIAL QUESTIONS

- How are tables, bar graphs, and line plot graphs useful ways to display data?
- How do I decide what increments to use for my scale?
- How can graphs be used to display data gathered from a survey?
- How can graphs be used to compare related data?

MATERIALS

- “It’s in the Data Part II” student recording sheet
- Plain paper

- Large container of small objects – buttons, blocks, marbles, or Unifix cubes, or similar object
- Chart Paper and Markers
- Ruler/tape measure
- Paper, markers, crayons, rulers and other supplies needed to create graphs
- *Lemonade for Sale* by Stuart J. Murphy, or a similar book

GROUPING

Small Group Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I

Line plot graphs (sometimes called dot plots) are an excellent way to display data in an easy and quick manner. Line plot graphs in third grade are used to record measurement data to the nearest $\frac{1}{4}$ inch.

Students should use the following questions to generate measurement data for a line plot graph:

- How tall are your classmates to the nearest $\frac{1}{4}$ inch?
- What is the arm span of your classmates to the nearest $\frac{1}{4}$ inch?
- How long are your classmates' hands from the tip of their finger to their wrist to the nearest $\frac{1}{4}$ inch?

Once students have created their own line plot graph, they can discuss what the data tells them in their small groups and then a class discussion can be held where student groups are able to share their thinking.

Part II

To begin this task, ask students to predict how many items (buttons, blocks, marbles, Unifix cubes, or whichever material was chosen for this task) they can hold in a handful. Have each student record a prediction and the predictions of their groupmates on the “How Many in a Handful?” student recording sheet. If students have a difficult time determining a reasonable estimate, they can be shown how a group of five or ten of the items looks. Then students can think about how many groups of five or ten they think they could hold in a handful.

After students have recorded their predications, ask them to each grab a handful and count the number of items. (There may need to be some discussion about how a handful should be taken. May students scoop up the items or must they reach in and pull the items up? Should any items that fall after the hand is out of the bucket count, or should only the items that stay in the hand be counted? Should students be required to shake off excess items before removing their hands from the bucket?) Students may want to do a trial run and talk about what makes a handful before actual handfuls are measured.

Students will follow the directions below from the “How Many in a Handful?” student recording sheet.

Look at the objects you will be using to find out “How Many in a Handful.”

1. Of the students in your group, who do you think can hold the most?
2. Of the students in your class, who do you think can hold the most?
3. Each student in your group should predict how many objects they can hold in one handful. Record the predictions in the table below.

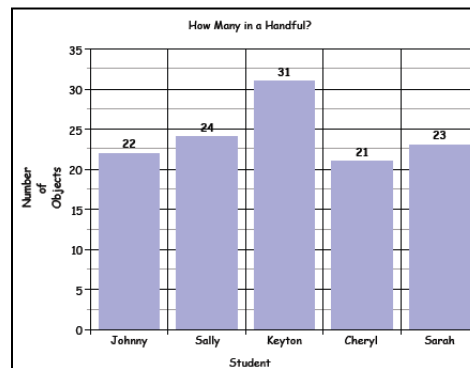
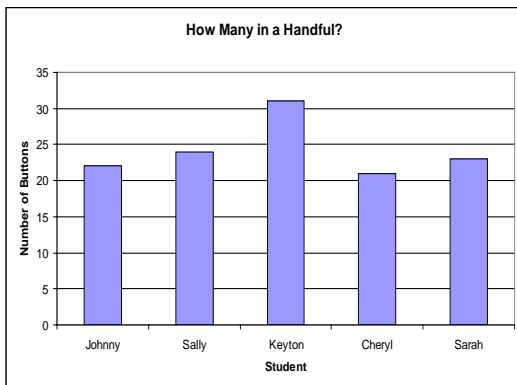
Number of Objects in a Handful

Student Name	Prediction	Actual

4. Each student in your group should take a handful of objects. Count how many objects can be held in a handful. Record the results in the table above.
5. How close was your estimate to your actual handful? How do you know?
6. Whose estimate in your group was closest to the actual number of objects in a handful?
7. Using the data in the table above, create a bar graph to display the data. Be prepared to share your group data with the class.

Create a Bar Graph - Using the actual handful data collected, each student will create a bar graph to represent the data for their group. Groups should then be given the opportunity to talk about what their graphs show about the handfuls of the group members, and then share this information with the class. The bar graph (below, left) was created using Excel; alternatively, students can use the Create A Graph website (below, right).

<http://nces.ed.gov/nceskids/createagraph/default.aspx?ID=3525a186ca2b4d3e8589a61cbefa47ac>.



FORMATIVE ASSESSMENT QUESTIONS

Creating a bar graph

- What information can you gather from your graphs?
- What decisions can you make from your data?
- How will you label the horizontal and vertical axes? How do you know?
- How will you label the scale on your vertical axis? How do you know?
- How did you choose the increments (1, 5, or 10) used to label the scale on the vertical axis? How would the graph be different if different increments were used?

- What does the graph show you about the data? What do you notice?

Creating a line plot graph

- What values need to be included on the number line? How do you know?
- Where is the data clumped? Where are the gaps in the data?
- What similarities do you see between a line plot and a bar graph?
- How is this line plot different from a bar graph?

DIFFERENTIATION

Extension

- Ask students to create a line plot graph for their group data. Have students to discuss similarities and differences between their line plot graph and the class line plot.
- What are the advantages/disadvantages of a line plot as opposed to a bar graph?

Intervention

- In a small group or individually, discuss with students the choices they can make regarding the increments used on the bar graph's vertical axis. In most cases, bar graphs should start at zero. Ask students to think about how easy the data will be to read if the scale is labeled with increments of 1, 2, 5, or 10. Also, ask students to consider what will fit on the paper.

TECHNOLOGY CONNECTION

- <http://nces.ed.gov/nceskids/createagraph/default.aspx> "Create A Graph" by the National Center for Education Statistics is a web-based program which allows students to create a bar graph.
- <http://www.amblesideprimary.com/ambleweb/mentalmaths/grapher.html> Limited in its use but very simple to use – most labels can be renamed.
- <http://ellerbruch.nmu.edu/classes/cs255w03/cs255students/nsovey/P5/P5.html> Provides instructions to create a line plot graph as well as features to look for in a line plot graph.

Name _____ Date _____



It's in the Data?
 Part 2

You will be finding handful data for a different object. Record the data for each student in your class in the table below.

Student Name	Number of Objects in a Handful		Student Name	Number of Objects in a Handful

Use the data in the table above to create a line plot graph on a separate sheet of paper. Think about the following questions before you create your graph.

- What values will you use to label your number line? (What is the largest handful, what is the smallest handful?)
- How will you label your line plot graph? (Title, number line label)
- How will you be sure you record the data on the line plot graph accurately? (Be sure to include the data for each student in your class, use each piece of data only once.)



CULMINATING TASK: FIELD TRIP TO THE ZOO!

APPROXIMATE TIME: 3 days

STANDARDS FOR MATHEMATICAL CONTENT

MCC. 3.MD.1 Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

MCC.3.MD.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.

MCC.3.MD.7 Relate area to the operations of multiplication and addition.

MCC.3.MD.8 Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

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.

ESSENTIAL QUESTIONS

- How is elapsed time used in the world around me?
- What does it mean to determine time to the minute?
- How is perimeter measured?
- Why is it important to know how to figure out the area of a figure?
- How do we use weight measurement?
- Why is it important to be able to measure liquid volume?
- What strategies can I use to help figure out elapsed time, area, perimeter, weight, and liquid volume?

MATERIALS

- “Field Trip to the Zoo” student recording sheet
- Blank Paper
- Model materials (if needed)
- Clocks (if needed)
- Geoboards, grid paper, area models (if needed)

GROUPING

Small Group/Partner Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

This task has three parts. In this task, students will use thinking and problem solving skills to plan a field trip to the zoo that includes a class picnic. For part 1, students must use elapsed time to plan the field trip schedule. While at the zoo (part 2), students will go on a “scavenger hunt” where they will determine the perimeter of the animals’ home, and how much mulch and grass it takes to cover certain living areas. At the picnic (part 3), students will determine how much food each student will get by weight and how much picnic punch each classmate will receive.

Comments

This task is appropriate for small group or partner work. While this task may serve as a summative assessment, it also may be used for teaching and learning. It is important that all elements of the task be addressed throughout the learning process so that students understand what is expected of them. Uses for this task include but are not limited to:

- Peer Review
- Display for parent night
- Placement in student portfolio

Because the focus of this task is on measurement, it would be appropriate to allow students to use manipulatives and math tools for this task.

Background Knowledge

Students should understand and have had experience with elapsed time, area, perimeter, basic units of weight measurement (gram, kilogram), liquid volume (liters) and their relationships. Also, students should be able to solve problems in multiple ways and justify their thinking.

NOTE: Keep in mind that students will not have to write everything out. However, they should give enough information to justify their answers.

Task Directions

Students will follow the directions below from the “Fieldtrip to the Zoo” student recording sheet.

Your class wants to take a trip to the zoo. Your teacher has agreed to take the class. However, your teacher insists that you must apply what

you have learned in this math unit to your trip. So, he/she has assigned three tasks for this trip. They are:

Part I: Trip Schedule (Small Groups)

You must create a trip schedule for everyone to follow while on the trip. Here are the guidelines:

- Your schedule should begin at 8:00 AM
- Your schedule should end when your class returns to the school at 2:30 PM.
- Be sure to include 33 minutes of travel time to and from the zoo.
- Include time for a one hour picnic.
- You may select all other activities of your choice (visit reptile house, play at the petting zoo, watch the animal stunt show, meet the zookeepers, watch lions, souvenir shop, etc).

Part II: Exploring the Zoo...a Scavenger Hunt! (Partner Groups)

While at the zoo, your team will participate in a scavenger hunt! Your goal is stop by different habitats where the animals live. Your team will either determine the distance around the animals' living spaces, or how much material (mulch, grass, woodchips) it takes to cover their zoo habitat. Use the models and clues below to help you! (see student recording sheet)

Part III: The Class Picnic! (Small Groups)

Now, it's time to take a break! Let's have a class picnic! Our school cafeteria sent a big cooler with everything we need to have our picnic. **There are 20 students in our class.** We just need to decide how much of each food item and picnic punch each person gets! (see student recording sheet)

FORMATIVE ASSESSMENT QUESTIONS

- Why is understanding time to the minute and elapsed time important in completing this task? (part 1)
- What strategies are you using to organize your thinking about this task?
- How did you know when it is appropriate to determine perimeter?
- How do you know when it is appropriate to determine the area?
- What strategies are you using to figure out how much food and picnic punch each student gets?

DIFFERENTIATION

Extension

- Part 1: Have students create more than 1 schedule with different sets of activities on them.
- Part 2:
 - Have students create their own scavenger hunt.

- Increase dimensions.
- Part 3:
 - Change the portion sizes and have students figure out new amounts.
 - Increase the class size (i.e. 35 students)

Intervention

- Part 1:
 - Give students clocks and number lines as aides.
 - Choose and fill in the activities for the students
 - Fill in other parts of the schedule
- Part 2:
 - Allow students to use geoboards, grid paper, or area models for help.
 - Decrease the dimensions.
 - Give students tactile models
- Part 3:
 - Use tactile models to help students.
 - Decrease the class size (i.e. 10 students)
 - Facilitate a teacher-guided group.

TECHNOLOGY CONNECTION

http://www.thefutureschannel.com/dockets/realworld/teaching_zoo/ This FUTURES video is a great introduction to this task. Students see how important accurate measurements using both metric and standard weights are important in a zoo.

Field Trip to the Zoo! Part I



Name _____ Date _____

Your class wants to take a trip to the zoo. Your teacher has agreed to take the class. However, your teacher insists that you must apply what you have learned in this math unit to your trip. For your trip, you must complete this task and answer the questions that follow. Good luck!

Field Trip Schedule

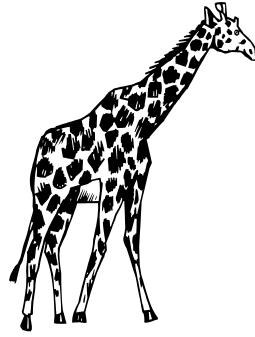
You must create a trip schedule for everyone to follow while on the trip. You may use the table below to help you with your plan. Here are the guidelines:

- Your schedule should begin at 8:00 AM
- Your schedule should end when your class returns to the school at 2:30 PM.
- Be sure to include 33 minutes of travel time to and from the zoo.
- Include time for a one hour picnic.
- You may select all other activities of your choice (visit reptile house, play at the petting zoo, watch the animal stunt show, meet the zookeepers, watch lions, souvenir shop, etc).

Name of Activity	Start Time	End Time	Elapsed Time
Leave our school, ride to the zoo	8:00		33 minutes
Leave the zoo, ride back to our school		2:30	33 minutes

Questions for Reflection

1. Which activity took the most time?
2. Which activity took the least amount of time?
3. Choose two activities and combine them. How much time do they take altogether?
4. How much time did the field trip take?
5. Why is understanding time to the minute and elapsed time important in completing this task?

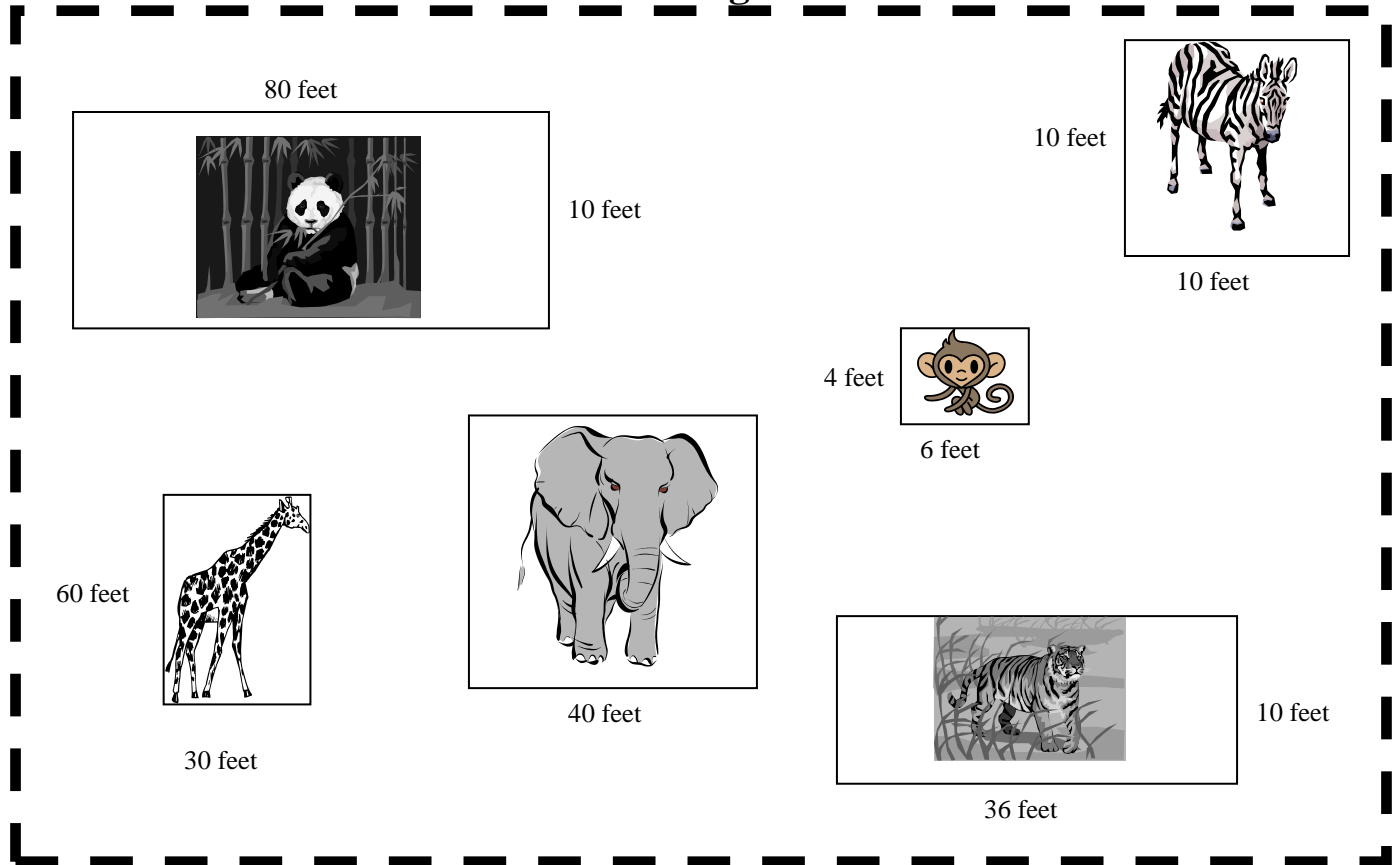


Exploring the Zoo...The Scavenger Hunt! Part II

Name _____ Date _____

While at the zoo, your team will participate in a scavenger hunt! Your goal is stop by different habitats where the animals live. Your team will either determine the distance around the animals' living space, or how much material (mulch, grass, woodchips) it takes to cover their zoo habitat. Use the models and clues below to help you.

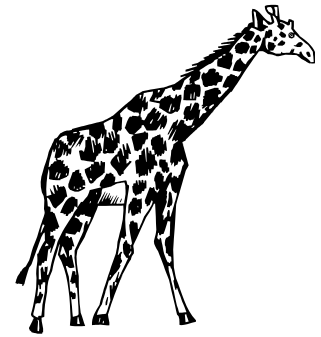
The Zoo of Georgia



1. The zoo keeper needs to take fresh food and water to a herd of animals that live in a cage that has an area of 160 feet. Where should he take it?
2. The grounds crew needs to cover a certain animal pen with 100 square feet of fresh sod. Where should they go?
3. Take a visit to the animals that live in an area that is 180 feet around. Where will you go?
4. Certain animals like to graze in an area that's covered with 800 square feet of grass. Where is this place?

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5. A certain animal pen is 40 feet in perimeter. Where is this pen located?
6. Certain animals live in their habitat that has an area of 360 square feet. Which animals live in this habitat?
7. Can you find the habitat that's enclosed in 92 feet of fencing?
8. What animals like to play in an enclosed space of 24 feet?



The Class Picnic! Part III

Name _____ Date _____

Now, it's time to take a break! Let's have a class picnic! Our school cafeteria sent a big cooler with everything we need to have our picnic. **There are 20 students in our class.** We just need to decide how much of each food item and picnic punch each person gets. This is what Miss Sally, the lunch lady, packed for us:

- 10 kilograms of mini sub sandwiches
- 1,000 grams of Baked potato chips
- 2,000 grams of apples
- 400 grams of trail mix
- 10 liters of picnic punch

Using this information, your job is to determine how much of each item every student gets. Every student should get a complete lunch. Show how you figured it out with pictures, numbers, and words below.