Georgia Standards of Excellence Frameworks

Mathematics

GSE Second Grade

Unit 3: Understanding Measurement, Length, and Time

Georgia Department of Education

Richard Woods, Georgia's School Superintendent

"Educating Georgia's Future"

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Unit 3: Understanding Measurement, Length, and Time

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***Please note that all changes made to standards will appear in **red bold** type. Additional changes will appear in green.

OVERVIEW

In this unit students will:

- Know the following customary units for measuring length: inch, foot, yard
- Recognize the need for standard units of measure
- Use rulers and other measurement tools with the understanding that linear measure involves an iteration of units.
- Recognize that the smaller the unit is, the more iterations they need to cover a given length.
- Know the following metric units for measuring length: centimeter and meter
- Compare the relationship of one unit of measurement to another, within the same system
- Check by measuring to determine if estimates are accurate for length
- Determine the appropriate tool for measuring length; inch ruler and yardstick, centimeter ruler, and meter stick
- Tell time to the nearest five minutes (This should be part of your daily routine for the remainder of the year through Math Maintenance. For more information see the Grade Level Overview.)
- Understand the relationship of hours and days
- Understand the importance and usefulness of reasonable estimations
- Connect the whole-number units on rulers, yardsticks, meter sticks and measuring tapes to number lines showing whole-number units starting at 0
- Use these measuring tools to model different representations for whole-number sums and differences less than or equal to 100 using the numbers 0 to 100.
- Be able to represent the length of several objects by making a line plot

Second graders are transitioning from measuring lengths with informal units to measuring with these standard units: inches, feet, centimeters, and meters. The measure of length is a count of how many units are needed to match the length of the object or distance being measured. Students have to understand what a length unit is and how it is used to find a measurement. They need many experiences measuring lengths with appropriate tools so they can become very familiar with the standard units and estimate lengths. Use language that reflects the approximate nature of measurement, such as the length of the room is about 26 feet.

Chapter 8 in *Teaching Student Centered Mathematics K-3* by John A. Van de Walle focuses on measurement. Revisiting/Reading this chapter provides information about measurement and how young children learn measurement skills.

Have students measure the same length with different-sized units then discuss what they noticed. Ask questions to guide the discussion so students will see the relationship between the size of the units and measurement, i.e. the measurement made with the smaller unit is more than the measurement made with the larger unit and vice versa.

Insist that students always estimate lengths before the measure. Estimation helps them focus on the attribute to be measured, the length units, and the process. After they find measurements, have students discuss the estimates, their procedures for finding the measurements and the differences between their estimates and the measurements.

NUMBER TALKS

Between 5 and 15 minutes each day should be dedicated to "*Number Talks*" in order to build students' mental math capabilities and reasoning skills. Sherry Parrish's book *Number Talks* provides examples of K-5 number talks. The following video clip from Math Solutions is an excellent example of a number talk in action.
http://www.mathsolutions.com/videopage/videos/Final/Classroom_NumberTalk_Gr3.swf

During the Number Talk, the teacher is not the definitive authority. The teacher is the facilitator and is listening for and building on the students' natural mathematical thinking. The teacher writes a problem horizontally on the board in whole group or a small setting. The students mentally solve the problem and share with the whole group **how** they derived the answer. They must justify and defend their reasoning. The teacher simply records the students' thinking and poses extended questions to draw out deeper understanding for all.

The effectiveness of Numbers Talks depends on the routines and environment that is established by the teacher. Students must be given time to think quietly without pressure from their peers. To develop this, the teacher should establish a signal, other than a raised hand, of some sort to identify that one has a strategy to share. One way to do this is to place a finger on their chest indicating that they have one strategy to share. If they have two strategies to share, they place out two fingers on their chest and so on.

Number Talk problem possible student responses:

	Possible Strategy #1	**Possible Strategy #2**
29 + 8	29 can become 30 and take 1 from 8 reducing it to 7.	9 and 8 becomes 17 17 plus 20
54 + 86	50 + 80 + 10 =	Add 6 to 54 to get 60. Then 60 + 80 = 140

Number talks often have a focus strategy such as "making tens" or "compensation." Providing students with a string of related problems, allows students to apply a strategy from a previous

problem to subsequent problems. Some units lend themselves well to certain Number Talk topics. For example, the place value unit may coordinate well with the Number Talk strategy of "making ten." For additional information on Number Talks, see the Grade Level Overview.

STANDARDS FOR MATHEMATICAL PRACTICE

This section provides examples of learning experiences for this unit that support the development of the proficiencies described in the Standards for Mathematical Practice. The statements provided offer a few examples of connections between the Standards for Mathematical Practice and the Content Standards of this unit. The list is not exhaustive and will hopefully prompt further reflection and discussion.

1.	**Make sense of problems and persevere in solving them.** Students will determine what unit is best for measuring an item and follow through to find the exact measurement.
2.	**Reason abstractly and quantitatively.** Students will make correlations between comparing an item with two forms of measurements.
3.	**Construct viable arguments and critique the reasoning of others.** Students will compare and contrast measurements of each other's objects. Students will share estimates and discuss whether or not the estimates are reasonable based on their knowledge of measurement.
4.	**Model with mathematics.** Students will construct and use a ruler to measure different objects.
5.	**Use appropriate tools strategically.** Students will estimate measurements and decide the appropriate unit for getting the exact measurement.
6.	**Attend to precision.** Students understand that a ruler is a representation of units (not simply counting marks) and focus on the spaces between the marks for measurement.
7.	**Look for and make use of structure.** Students will use skip counting by 5's to help tell time.
8.	**Look for and express regularity in repeated reasoning.** Students will continue to use a number line and skip counting to help with telling time to the nearest 5 or 10 minutes and for finding the hour.

STANDARDS FOR MATHEMATICAL CONTENT

Measure and estimate lengths in standard units.

MGSE2.MD.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

MGSE2.MD.2 Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen. Understand the relative size of units in different systems of measurement. *For example, an inch is longer than a centimeter.* (Students are not expected to convert between systems of measurement.)

MGSE2.MD.3 Estimate lengths using units of inches, feet, centimeters, and meters.

MGSE2.MD.4 Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

Relate addition and subtraction to length.

MGSE2.MD.5 Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.

MGSE2.MD.6 Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2... and represent whole-number sums and differences within 100 on a number line diagram.

Work with time and money.

MGSE2.MD.7 Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.

Represent and Interpret Data.

MGSE2.MD.9 Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a **line plot**, where the horizontal scale is marked off in whole-number units.

MGSE2.MD.10 Draw a picture graph and a bar graph (with single- unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems

BIG IDEAS

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

- Standard units for measuring length (inch, foot, yard, centimeter, and meter).
- Measuring items with two different units makes it possible to determine the relationship of the two different units.
- Estimated lengths should be reasonably close to the actual measurement.
- Appropriate tools should be used to measure length.
- Tell time to nearest 5 minutes and using a.m. and p.m. using both analog and digital clocks.
- Create, read, and interpret a line plot graph.
- Use a number line to help solve problems using addition and subtraction.
- Use addition and subtraction within 100 to solve word problems about length.
- Represent lengths on a number line.
- Understand measurement is used to quantify a consistent duration and/or distance.
- The length of objects can be measured using customary units (inch, foot, and yard).
- The length of objects can be measured using Metric units (centimeter, meter).
- An inch or centimeter would be an appropriate unit to measure small items such as the length of a pencil or crayon.
- A yard or meter would be an appropriate unit to use when measuring the length of a large item, such as the length of the classroom or hallway.
- A ruler, yardstick, and a meter stick are special types of number lines (they show fractions, too).
- A ruler, yardstick, and a meter stick are tools used for linear measurement.
- Line plots are useful tools for collecting data because they show the number of things along a numeric scale.
- A number line has evenly spaced points corresponding to numbers.

ESSENTIAL QUESTIONS

- How can we decide on appropriate units of measurement (i.e. inch, foot, yard, centimeter, meter, seconds, minutes, hours, days)?
- Why is it important for us to know how to measure different objects using different tools of measurement?
- How can we tell if an estimate is reasonable?
- How does using a different unit change our measurement?
- Why do we need to be able to estimate a measurement or value?
- Why is it important for us to know how to measure different units of measurement?
- How does a line plot help me share my data?
- How can using a number line help us when we are solving math problems?
- Why is it important to be able to organize and graph data?

CONCEPTS/SKILLS TO MAINTAIN

Skills from 1st Grade:

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.

- Developing understanding of linear measurement and measuring lengths as iterating length units; and
- Reasoning about attributes of, and composing and decomposing geometric shapes.

Second Grade Year Long Concepts:

Organizing and graphing data as stated in MD.10 should be incorporated in activities throughout the year. Students should be able to draw a picture graph and a bar graph to represent a data set with up to four categories as well as solve simple put-together, take-apart, and compare problems using information presented in a bar graph.

Specifically, 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.

- Telling time to the nearest hours and half-hours
- Measurement – estimating, comparing, and ordering
- Basic geometric figures and spatial relationships

STRATEGIES FOR TEACHING AND LEARNING

(Information adapted from North Carolina DPI Instructional Support Tools)
Measure and estimate lengths in standard units.

MGSE2.MD.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

MGSE2.MD.2 Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen. Understand the relative size of units in different systems of measurement. *For example, an inch is longer than a centimeter.* (Students are not expected to convert between systems of measurement.)

MGSE2.MD.3 Estimate lengths using units of inches, feet, centimeters, and meters.

MGSE2.MD.4 Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

Instructional Strategies

It is important to note that in the Georgia Standards of Excellence, nonstandard measurement is explored after students have explored standard measurement. See below, from the work of Doug Clements:

> Another important issue concerns the use of standard or nonstandard units of length. Many curricula or other instructional guides advise a sequence of instruction in which students compare lengths, measure with nonstandard units (e.g., paper clips), incorporate the use of manipulative standard units (e.g., inch cubes), and measure with a ruler. This approach is probably intended to help students see the need for standardization. However, the use of a variety of different length units, before students understand the concepts, procedures, and usefulness of measurement, may actually deter students' development. Instead, students might learn to measure correctly with standard units, and even learn to use rulers, before they can successfully use nonstandard units and understand relationships between different units of measurement.
>
> Note that this trajectory of learning about measurement is one of the few areas in which Van de Walle and the Georgia Standards of Excellence do not align.

From the K-5 Measurement Progressions:

Second graders begin to use tools to measure with these standard units: inches, feet, centimeters, and meters. The measure of length is a count of how many units are needed to match the length of the object or distance being measured. Students have to understand what a length unit is and how it is used to find a measurement. They need many experiences measuring lengths with appropriate tools so they can become very familiar with the standard units and estimate lengths. Use language that reflects the approximate nature of measurement, such as the length of the room is about 26 feet.

In order for students to have a better understanding of the relationships between units, they need to use measuring devices in class. The number of units needs to relate to the size of the unit. They need to discover that there are 12 inches in 1 foot and 3 feet in 1 yard. Allow students to use rulers and yardsticks to discover these relationships among these units of measurements. Using 12-inch rulers and yardstick, students can see that three of the 12-inch rulers, which is the same as 3 feet since each ruler is 1 foot in length, are equivalent to one yardstick. Have students record the relationships in a two column table or t-charts. A similar strategy can be used with rulers marked with centimeters and a meter stick to discover the relationships between

centimeters and meters. Present word problems as a source of students' understanding of the relationships units of measurement.

Have students measure the same length with different-sized units then discuss what they noticed. Ask questions to guide the discussion so students will see the relationship between the size of the units and measurement, i.e. the measurement made with the smaller unit is more than the measurement made with the larger unit and vice versa.

Insist that students always estimate lengths before they measure. Estimation helps them focus on the attribute to be measured, the length units, and the process. After they find measurements, have students discuss the estimates, their procedures for finding the measurements and the differences between their estimates and the measurements.

Relate addition and subtraction to length.

MGSE2.MD.5 Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.

MGSE2.MD.6 Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2... and represent whole-number sums and differences within 100 on a number line diagram.

Instructional Strategies

Connect the whole-number units on rulers, yardsticks, meter sticks and measuring tapes to number lines showing whole-number units starting at 0. Use these measuring tools to model different representations for whole-number sums and differences less than or equal to 100 using the numbers 0 to 100.

Use the meter stick to view units of ten (10 cm) and hundred (100 cm), and to skip count by 5s and 10s.

Provide one- and two-step word problems that include different lengths measured with the same unit (inches, feet, centimeters, and meters). Students add and subtract within 100 to solve problems for these situations: adding to, taking from, putting together, taking apart, and comparing, and with unknowns in all positions. Students use drawings and write equations with a symbol for the unknown to solve the problems.

Have students represent their addition and subtraction within 100 on a number line. They can use notebook or grid paper to make their own number lines. First they mark and label a line on paper

with whole-number units that are equally spaced and relevant to the addition or subtraction problem. Then they show the addition or subtraction using curved lines segments above the number line and between the numbers marked on the number line. For 49 + 5, they start at 49 on the line and draw a curve to 50, then continue drawing curves to 54. Drawing the curves or making the ―hops‖ between the numbers will help students focus on a space as the length of a unit and the sum or difference as a length.

Work with time and money.

MGSE2.MD.7 Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.

Instructional Strategies

Second graders expand their work with telling time from analog and digital clocks to the nearest hour or half-hour in Grade 1 to telling time to the nearest five minutes using a.m. and p.m.

As students continue to practice telling time (orally and in writing) using both analog and digital clocks they should also be encouraged to use the terms a.m. and p.m. Teachers should help students make the connection between skip counting by 5s (MGSE2.NBT.2) and telling time on an analog clock.

Represent and Interpret Data.

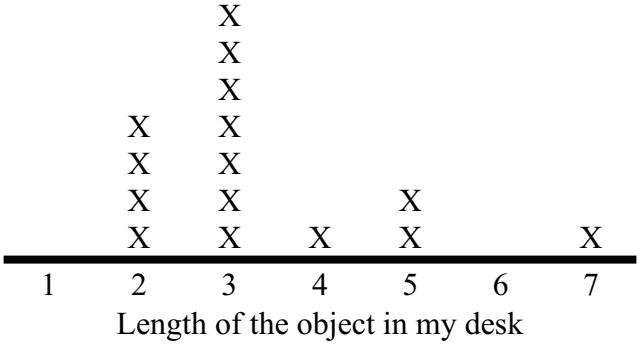
MGSE2.MD.9 Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units.

MGSE2.MD.10 Draw a picture graph and a bar graph (with single- unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.

Instructional Strategies

Standard MGSE2.MD.9 calls for students to represent the length of several objects by making a line plot. Students should round their lengths to the nearest whole unit.

Example: Measure objects in your desk to the nearest inch, display data collected on a line plot. How many objects measured 2 inches? 3 inches? Which length had the most number of objects? How do you know?



SELECTED TERMS AND SYMBOLS

The following terms and symbols are not an inclusive list and should not be taught in isolation. Instructors should pay particular attention to them and how their students are able to explain and apply them (**i.e. students should not be told to memorize these terms).**

Teachers should present these concepts to students with models and real life examples. Students should understand the concepts involved and be able to recognize and/or demonstrate them with words, models, pictures, or numbers.

For specific definitions, please reference the Georgia Standards of Excellence Glossary.

Link to Visual Vocabulary Cards: http://www.ncesd.org/Page/983

- **analog clock**
- **centimeter**
- **digital clock**
- **estimate**
- **foot**
- **hour**
- **inch**
- **line plot**
- **measuring tape**
- **meter**
- **meter stick**
- **minute**
- **number line diagram**
- **ruler**
- **standard unit**
- **yardstick**

Tasks

The following tasks represent the level of depth, rigor, and complexity expected of all second 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.

TASK TYPES

Scaffolding Task	Tasks that build up to the learning task.
Constructing Task	Constructing understanding through deep/rich contextualized problem solving tasks.
Practice Task	Tasks that provide students opportunities to practice skills and concepts.
Culminating Task	Designed to require students to use several concepts learned during the unit to answer a new or unique situation. Allows students to give evidence of their own understanding toward the mastery of the standard and requires them to extend their chain of mathematical reasoning.
Formative Assessment Lesson (FAL)	Lessons that support teachers in formative assessment which both reveal and develop students' understanding of key mathematical ideas and applications. These lessons enable teachers and students to monitor in more detail their progress towards the targets of the standards.
3-Act Task	A Three-Act Task is a whole-group mathematics task consisting of 3 distinct parts: an engaging and perplexing Act One, an information and solution seeking Act Two, and a solution discussion and solution revealing Act Three. More information along with guidelines for 3-Act Tasks may be found in the ***Guide to Three-Act Tasks*** on georgiastandards.org and the K-5 MGSE Mathematics Wiki.

Task Name	Task Type/ *Grouping Strategy*	Content Addressed	Standards	
Footprints	3-Act Task Whole Group	Linear Measurement	**MGSE2.MD.3** **MGSE2.MD.5**	Use reasoni same obje me
Make Your Own Ruler	Scaffolding Task Large group, Small Group	Linear Measurement	**MGSE2.MD.1** **MGSE2.MD.2**	Understa number lin number to also unde distanc Students wi endpoint to
Footprints on the Rug	Performance Task *Individual or Pairs*	Linear Measurement	**MGSE2.MD.2**	Describe th measure ne

My Big Feet	Scaffolding Task Large group, small group	Linear Measurement	**MGSE2.MD.1, MGSE2.MD.2 MGSE2.MD.3**	Understa measure ob will use mea
Snakes and Lizards	Constructing Task *Large Group, Small Groups*	Linear Measurement	**MGSE2.MD.1, MGSE2.MD.2 MGSE2.MD.3, MGSE2.MD.4**	Realize that object they unit compa their know app
Measurement Scavenger Hunt	Constructing Task *Large Group, Partners*	Linear Measurement	**MGSE2.MD.1, MGSE2.MD.2 MGSE2.MD.3, MGSE2.MD.4**	Apply unde on approp important object usi
Measurement Line Plot	Constructing Task *Small Groups*	Linear Measurement, Graphing	**MGSE2.MD.1 MGSE2.MD.9**	Apply un appropriate unders quantitativ
Kangaroo Jumps	Constructing Task *Large Group, Small Groups*	Linear Measurement	**MGSE2.MD.1, MGSE2.MD.5 MGSE2.MD.9, MGSE2.MD.10**	Apply mea set of data. U to be consis
Giant Measurements	Practice Task *Small Groups*	Linear Measurement	**MGSE2.MD.1, MGSE2.MD.2 MGSE2.MD.4**	Develop an
FORMATIVE ASSESSMENT LESSON (FAL)				This FAL w developmen
Solving Problems on a Number Line	Constructing Task *Small Groups*	Linear Measurement	**MGSE2.MD.1, MGSE2.MD.5 MGSE2.MD.6**	Relate a n how a num f
Number Line Clock	Constructing Task Small Group	Telling Time	**MGSE2.MD.7**	Apply un telling time to the near line clock
Missed Bedtime	Performance Task *Whole Group/Partners*	AM and PM, duration of time, problem solving	**MGSE2.MD.7**	Learn ho time understa defend the
Culminating Task: Measurement Olympics	Culminating Task *Partners*	Linear Measurement & Time	**MGSE2.MD.1, MGSE2.MD.2 MGSE2.MD.3, MGSE2.MD.4 MGSE2.MD.7**	Apply und length, partici
Culminating Task: Lizards, Lizards, Everywhere!	Culminating Task *Individual*	Linear Measurement, Graphing	**MGSE2.MD.1, MGSE2.MD.9**	Demonstrat nearest who a line plot g wri

If you would like further information about this unit, please view the Unit 3 Webinar on the Georgia DOE math wiki.

3 ACT TASK: Footprints

Adapted from MGSE Framework Task: Footprints on the Rug

APPROXIMATE TIME: ONE CLASS SESSION
In this task, students reason about measuring with units of difference sizes. Students will come to realize that the same item will have a different result when measured with different units.

STANDARDS FOR MATHEMATICAL CONTENT

MGSE2.MD.3 Estimate lengths using units of inches, feet, centimeters, and meters.

MGSE2.MD.5 Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them. Students are required to figure out a question to work through, the information they need to solve the problem, and then persevere until solving it.

2. Reason abstractly and quantitatively. Students are asked to make an estimate both high and low, as well as plot it on a number line.

3. Construct viable arguments and critique the reasoning of others. Students are given the chance to share and critique the questions and strategies of fellow classmates.

4. Model with mathematics. Students will use the information given to develop a mathematical model to solve their problems.

5. Use appropriate tools strategically. Students can use Base 10 blocks to aid in addition/subtraction strategies.

6. Attend to precision. Students will use clear and precise language when discussing their strategies and sharing their solutions with others.

7. Look for and make use of structure. Students will use their understanding of place value to help them add and subtract two digit numbers.

ESSENTIAL QUESTION

- Will we get the same answer if we measure a length in a different unit?

MATERIALS

- Footprint Picture
- Student Handout

GROUPING

Individual/Partner Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

In this task, students will view the picture and tell what they noticed. Next, they will be asked to discuss what they wonder about or are curious about. These questions will be recorded on a class chart or on the board and on the student recording sheet. Students will then use mathematics to answer their own questions. Students will be given information to solve the problem based on need. When they realize they don't have the information they need, and ask for it, it will be given to them.

Background Knowledge:

This task follows the 3-Act Math Task format originally developed by Dan Meyer. More information on this type of task may be found at http://blog.mrmeyer.com/category/3acts/. A Three-Act Task is a whole-group mathematics task consisting of 3 distinct parts: an engaging and perplexing Act One, an information and solution seeking Act Two, and a solution discussion and solution revealing Act Three. More information along with guidelines for 3-Act Tasks may be found in the ***Guide to Three-Act Tasks*** on georgiastandards.org and the K-5 MGSE Mathematics Wiki.

In this task, students will be shown a picture of two sets of footprints. Each set of footprints travel the same distance, but are different lengths. The main purpose of this task is to get students to think about and discuss why it may take one person 5 steps to get somewhere and another person 10 step. Once students can understand that different sized strides would take different amounts of steps, they can transition into comparing different units.

Students need multiple opportunities to measure using different units of measure. They should not be limited to measuring within the same standard unit. Students should have access to tools, both U.S. Customary and metric. The more students work with a specific unit of measure, the better they become at choosing the appropriate tool when measuring. Students measure the length of the same object using different tools (ruler with inches, ruler with centimeters, a yardstick, or meter stick). This will help students learn which tool is more appropriate for measuring a given object. They describe the relationship between the size of the measurement unit and the number of units needed to measure something. For instance, a student might say, "The longer the unit, the fewer I need." Multiple opportunities to explore provide the foundation for relating metric units to customary units, as well as relating within customary (inches to feet to yards) and within metric (centimeters to meters).

Example: A student measured the length of a desk in both feet and centimeters. She found that the desk was 3 feet long. She also found out that it was 36 inches long.
Teacher: Why do you think you have two different measurements for the same desk?
Student: It only took 3 feet because the feet are so big. It took 36 inches because an inch is a whole lot smaller than a foot.

Note to Teachers: This standard is not asking for conversion between units. The purpose of the standard is to get students to recognize that it will take more of a smaller unit (centimeters) to measure a length than it will of a larger unit (inch).

Common Misconceptions:

"Children must come to realize that errors provide opportunities for growth as they are uncovered and explained. Trust must be established with an understanding that it is okay to make mistakes. Without this trust, many ideas will never be shared." (Van de Walle, Lovin, Karp, Bay-Williams, Teaching Student-Centered Mathematics, Developmentally Appropriate Instruction for Grades Pre-K-2, 2014, pg. 11)

Students may arrive with the misconception that the footsteps would be the same. By the end of the task, students should be able to articulate that steps from an adult would be a greater length

than steps from a child because an adult's steps are longer than a child's steps.

Task Directions:

Act I – Whole Group - Pose the conflict and introduce students to the scenario by showing Act I picture. **(Dan Meyer** http://blog.mrmeyer.com/2011/the-three-acts-of-a-mathematical-story/**)**

"Introduce the central conflict of your story/task clearly, visually, viscerally, using as few words as possible."

1. Show picture of footprints to students.
2. Ask students what they noticed in the picture. The teacher records this information.
3. Ask students what they wonder about and what questions they have about what they saw. Students should share with each other first, and then the teacher records these questions (think-pair-share). The teacher may need to guide students so that the questions generated are math-related.
4. Ask students to estimate answers to their questions (think-pair-share). Students will write their best estimate, then write two more estimates – one that is too low and one that is too high so that they establish a range in which the solution should occur.

Anticipated questions students may ask and wish to answer:

- How many big footprints are there?
- How many little footprints are there?
- How long is the big footprint?*
- How long is the little footprint? *
- Why are there more little footprints? *
- Why are there less big footprints? *

*Main question(s) to be investigated

Act 2 – **Student Exploration** - Provide additional information as students work toward solutions to their questions. **(Dan Meyer** http://blog.mrmeyer.com/2011/the-three-acts-of-a-mathematical-story/**)**

"The protagonist/student overcomes obstacles, looks for resources, and develops new tools."

During Act 2, students use the main question(s) from Act 1 and decide on the facts, tools, and other information needed to answer the question(s). When students decide what they need to solve the problem, they should ask for those things. It is pivotal to the problem solving process that students decide what is needed without being given the information up front. Some groups might need scaffolds to guide them. The teacher should question groups who seem to be moving in the wrong direction or might not know where to begin.

The teacher provides guidance as needed during this phase. Some groups might need scaffolds to guide them. The teacher should question groups who seem to be moving in the wrong direction or might not know where to begin. Questioning is an effective strategy that can be used, with questions such as:

- What is the problem you are trying to solve?
- What do you think affects the situation?
- Can you explain what you've done so far?
- What strategies are you using?
- What assumptions are you making?
- What tools or models may help you?
- Why is that true?
- Does that make sense?

Additional Information for Act 2

- There are 10 blue (big) footprints
- There are 28 orange (little) footprints
- The little footprints are half the size of the big footprints.
- The big footprint is 10 inches long and 5 inches wide.
- The little footprint is 5 inches long and 2 ½ inches wide.

Important note: Although students will only investigate the main question(s) for this task, it is important for the teacher to not ignore student generated questions. Additional questions may be answered after they've found a solution to the main question, or as homework or extra projects.

Act 3 – Whole Group – Share solutions and strategies.

- Students to present their solutions and strategies and compare them.
- Reveal the solution.
- Lead discussion to compare these, asking questions such as:

- How reasonable was your estimate?
- Which strategy was most efficient?
- Can you think of another method that might have worked?
- What might you do differently next time?

Act 4, The Sequel - "The goals of the sequel task are to a) challenge students who finished quickly so b) I can help students who need my help. It can't feel like punishment for good work. It can't seem like drudgery. It has to entice and activate the imagination." Dan Meyer
http://blog.mrmeyer.com/2013/teaching-with-three-act-tasks-act-three-sequel/

- If the stride (space) between each adult footprint is 8 inches, how far did the adult walk?
- If the stride (space) between each child's footprints is 1 inch, how far did the child walk?

FORMATIVE ASSESSMENT QUESTIONS

- How reasonable was your estimate?
- What might you do differently next time?
- What worked well for you this time?
- What model did you use?
- What organizational strategies did you use?

DIFFERENTIATION

Extension

- Have students measure their foot sizes and compare it with the sizes in the picture.
- Create a line plot graph of foot sizes of students.

Intervention

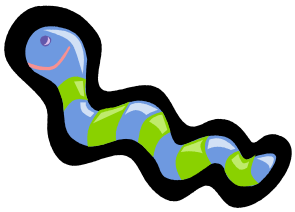
- Give students rulers to draw footprints to aid in creating a visual for actual foot sizes.

Name _____ Date _____

Footprints

What problem are you trying to figure out?		
What information do you already know?	What information do you need to solve the problem?	
Make an estimate.	Write an estimate that's too low.	Write an estimate that's too high.
Show your estimates on a number line:		
Show your work.		
What is your conclusion?		

Scaffolding Task: Make Your Own Ruler and Gummy Worm Stretch (Approximately 2 days) (Adapted from *Teaching Student-Centered Mathematics* by Van de Walle, Lovin, Karp, and Bay-Williams, pages 285-286 and K-5 Math Teaching Resources http://www.k-5mathteachingresources.com/2nd-grade-measurement-and-data.html)



In this task, students create their own rulers. They then use these rulers to measure and compare gummy worms.

STANDARDS FOR MATHEMATICAL CONTENT

MGSE2.MD.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

MGSE2.MD.4 Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

STANDARDS FOR MATHEMATICAL PRACTICE

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
4. **Model with mathematics.**
5. **Use appropriate tools strategically.**
6. **Attend to precision.**

BACKGROUND KNOWLEDGE

(from *Teaching Student-Centered Mathematics* by Van de Walle, Lovin, Karp, and Bay-Williams, pages 285-286) "One method to help children understand rulers is to have them make their own rulers… Children can eventually put numbers on their homemade rulers. To begin with, numbers can be written in the center of each unit as a way to pre-count the units. When numbers are written in the standard way, at the ends of the units, the ruler becomes a number line. This format is more sophisticated and should be carefully discussed with children – in particular why the number is at the end of the units.

Help children make the connection between their handmade rulers and the standards rulers by giving them a standard ruler and having them identify and discuss how the handmade and standard rulers are alike and how they are different."

COMMON MISCONCEPTIONS

(from *Teaching Student-Centered Mathematics* by Van de Walle, Lovin, Karp, and Bay-Williams, pages 285-286)

"Research indicates that when children see standard rulers with the number on the hash marks, they often incorrectly believe that the numbers are counting the marks rather than indicating the units or spaces between the marks."

This is particularly evident when students are asked to measure with a broken ruler. For example, a student measuring a 6 inch pencil that starts at 4 inches and ends at 10 inches incorrectly answers 7 inches. The student incorrectly answers 7 because they count the hash marks, including the first one at 4 inches, rather than the units between the hash marks.

Other Common Misconceptions:

(from *America's Choice: Mathematics Navigators*)

- Student begins measuring at the end of the ruler instead of at zero.
- When measuring with a ruler, student counts the lines instead of the spaces.
- Student begins measuring at the number 1 instead of at zero and does not compensate.
- Student counts intervals shown on the ruler as the desired interval regardless of their actual value.
- Student lacks "benchmarks" that allow her to estimate measures.

ESSENTIAL QUESTIONS

- What is a ruler?
- How is a ruler used to measure length?

MATERIALS

- blank paper rulers (black line master attached)
- inch sections in two colors (black line master attached)
- scissors
- glue
- standard inch rulers
- gummy worms

GROUPING

Whole group task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

TASK

Part I – Make Your Own Ruler

(Adapted from *Teaching Student-Centered Mathematics* by Van de Walle, Lovin, Karp, and Bay-Williams, page 285)

To make a ruler, give each student one 10 inch strip of paper as the base of the ruler black line master provided). The strip should be about half as wide as it is long in order for students to see which way their inch segments should be glued on.

Give each student 10 inch segments (black line master provided). Five should be of one color and 5 of another. They will later be glued on to the ruler in an AB pattern so that the inch delineations are clear to students.

After cutting out the segments have students use the segments to measure items in the classroom. Discuss why they need to place the segments end-to-end without gaps in order to accurately measure length. Ensure students line up the end of the segments with the end of the item being measured.

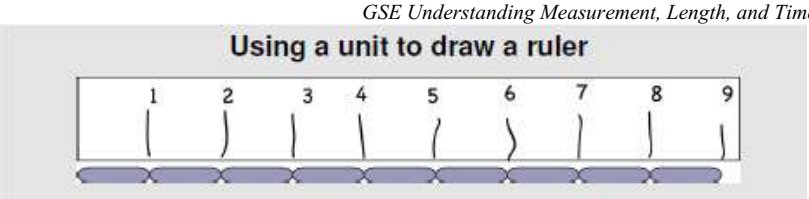
After students have had an opportunity to explore measuring with the segments, have students glue on the strips end-to-end so that there is no overlap and there are no gaps. Be sure to alternate the colors so that the length of the units stands out.

Note: This ruler is not to scale

Discuss how to measure using your homemade ruler. Ensure students line up the end of their ruler with the end of their object. Have students measure the same items with their homemade rulers. Discuss which method was easier, using the segments each time or using the ruler.

Have students compare their homemade ruler with a standard ruler. You can have your students write in the number of units. (Note: You may want to wait on writing in the numbers as you can extend this activity by connecting several rulers to make a yard stick. See extension activities.)

An alternate way to make a ruler is to simply mark off inch increments on a strip of paper using inch units as guides.



Georgia Standards of Excellence Progression for Geometric Measurement

http://commoncoretools.files.wordpress.com/2012/07/ccss_progression_gm_k5_2012_07_21.pdf

Part II Gummy Worm Stretch!

(Adapted from K-5 Math Teaching Resources http://www.k-5mathteachingresources.com/2nd-grade-measurement-and-data.html)

Discuss how to measure using your homemade ruler. Ensure students line up the end of the gummy worm with the end of their ruler.

1. Measure the length of a gummy worm using your ruler.

2. Stretch your gummy worm as far as you can without it breaking.

3. Measure the stretched gummy worm.

4. What is the difference in length between the original and stretched gummy worm?

5. Record your findings.

- Close the task by helping students create an inch "benchmark" in their mind. Have them find part of their hand which is approximately an inch. (Example: the distance from my first to 2nd knuckle on my index finger in about 1 inch.) This will be different carefully? Would our rulers be a reliable tool?
- How can I remember the length of an inch using an inch benchmark?

DIFFERENTIATION

Extension

- Challenge students to find other ways to measure their un-stretched gummy work. What if they started at the 4th unit? Would the gummy worm be getting longer? How can they prove that the gummy worm is still the same size?

- Have students use their 10 inch rulers to measure items longer than 10 inches. Have students discover that their ruler can be used to measure one part, the end can be marked, and the ruler can be picked up to measure another part.
- Students can use the same procedures to make centimeter rulers or to make longer rulers
- After the activity, student rulers can be added together to make yard sticks. Students can mark off every 12 inches and cut their yard stick off at 36 inches.
- Students can add the length of their gummy worms either un-stretched or stretched together.
- Students can compare the length of their gummy worm to the length of other students' gummy worms.

Intervention

- Cutting and gluing precisely is important in this activity, some students may need support cutting out their ruler and segments, placing the segments end-to-end, and gluing their ruler together.
- Likewise, students may have difficulty lining up their ruler with the end of the item being measured. Working in pairs may help. One student can hold the item and the other can hold the ruler

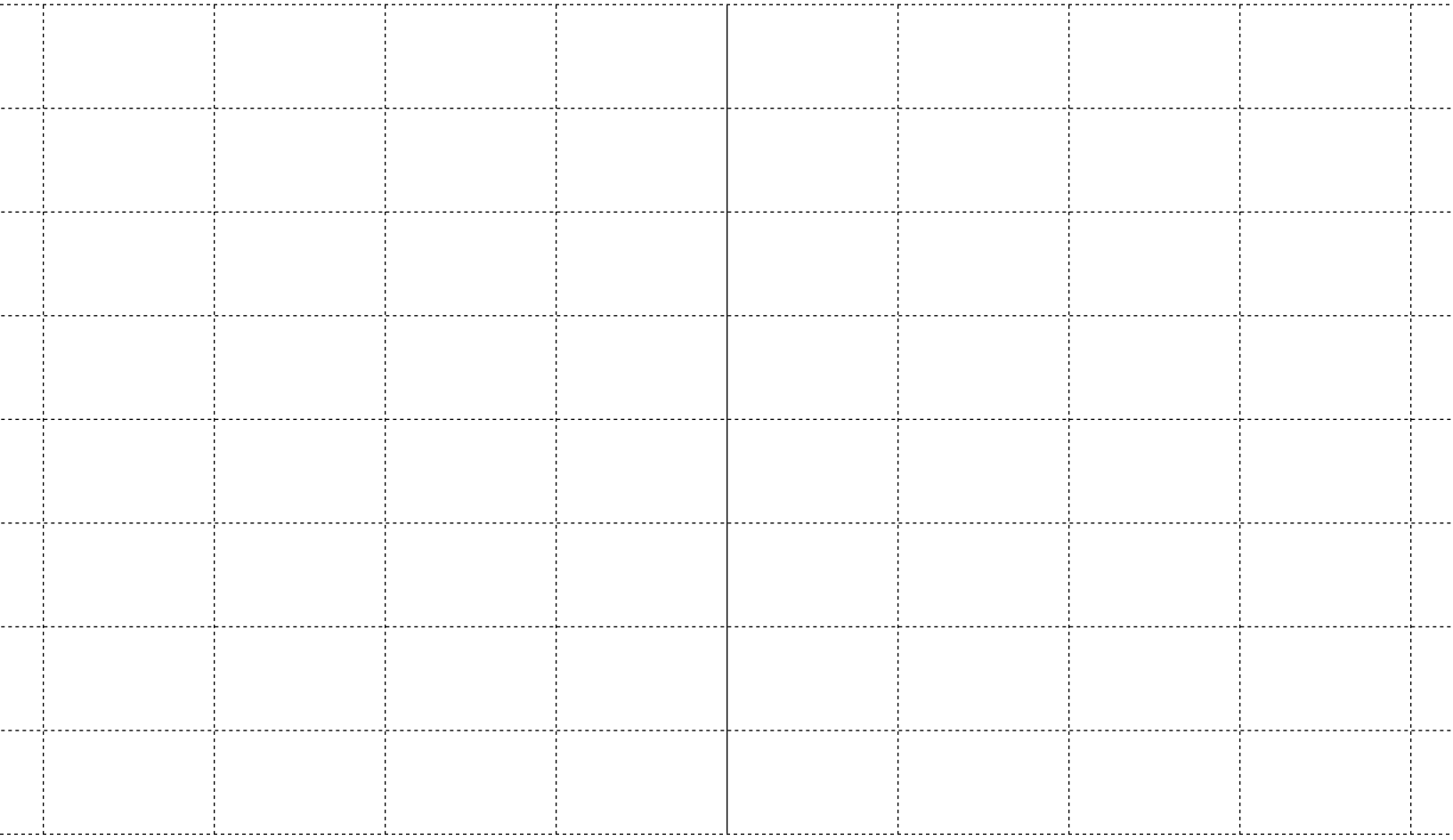
Estimating in inches becomes easier when students have a "benchmark" inch in their minds.

FORMATIVE ASSESSMENT QUESTIONS

- What would happen if we measured using segments, but we did not put the segments end to end?
- What would happen to your ruler if you did not attend to precision when we create our homemade rulers?

Cut or glue 10 Inch Rulers: Each student needs 1 ruler.

Sections: Print the sections out on two colors of paper or card stock. Each student needs 5 blocks of each of the 2 colors.



Performance Task: Footprints on the Rug

(Approximately 1 to 2 days)

Adapted from http://www.noycefdn.org/documents/math/MARS/MARS2004/ tft2004gr2-footsteps.pdf

In this task, students reason about measuring with units of difference sizes. Students will come to realize that the same item will have a different result when measured with different units.

STANDARDS FOR MATHEMATICAL CONTENT

MGSE2.MD.2. **Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen. Understand the relative size of units in different systems of measurement. *For example, an inch is longer than a centimeter.* (Students are not expected to convert between systems of measurement.)**

STANDARDS FOR MATHEMATICAL PRACTICE

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
2. **Reason abstractly and quantitatively.**
5. **Use appropriate tools strategically.**
6. **Attend to precision.**

BACKGROUND KNOWLEDGE

Students need multiple opportunities to measure using different units of measure. They should not be limited to measuring within the same standard unit. Students should have access to tools, both U.S. Customary and metric. The more students work with a specific unit of measure, the better they become at choosing the appropriate tool when measuring.

Students measure the length of the same object using different tools (ruler with inches, ruler with centimeters, a yardstick, or meter stick). This will help students learn which tool is more appropriate for measuring a given object. They describe the relationship between the size of the measurement unit and the number of units needed to measure something. For instance, a student might say, “The longer the unit, the fewer I need.” Multiple opportunities to explore provide the foundation for relating metric units to customary units, as well as relating within customary (inches to feet to yards) and within metric (centimeters to meters).

Example: A student measured the length of a desk in both feet and centimeters. She found that the desk was 3 feet long. She also found out that it was 36 inches long.

Teacher: Why do you think you have two different measurements for the same desk?

Student: It only took 3 feet because the feet are so big. It took 36 inches because an inch is a whole lot smaller than a foot

Note to Teachers: This standard is not asking for conversion between units. The purpose of the standard is to get students to recognize that it will take more of a smaller unit (centimeters) to measure a length than it will of a larger unit (inch).

COMMON MISCONCEPTIONS

Students may arrive with the misconception that 6 of Dad's steps and 6 of Aaron's steps would be the same. By the end of the task, students should be able to articulate that 6 steps from Dad would be a greater length than 6 steps from Aaron because Dad's steps are longer than Aaron's steps.

ESSENTIAL QUESTION

Will we get the same answer if we measure a length in a different unit?

MATERIALS

- Inch ruler or inch squares
- Centimeter ruler or centimeter Squares
- Items to measure
- Footsteps on the Rug Task Sheet
- Measurement with Different Units

GROUPING

Individuals or Pairs

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

In this task, students will come to realize that the same item will have a different result when measured with different units.

Part I

Provide students with a copy of the *Footprints on the Rug* task sheet. Have them work independently or in pairs to wrestle with the task and how they will explain the concept.

Pull the whole class together to discuss the task. Some students will have gotten the answers incorrect. Either they did not specifically answer the questions about the "whole" rug or they may still have difficulty reasoning that Dad will need to take fewer steps. After the discussion, allow students to go back and revise their work based on their new understanding.

Part II

Use inch squares and centimeter squares to measure classroom items. Record the measurements and findings on the Measuring with Different Units sheet.

DIFFERENTIATION

Extension

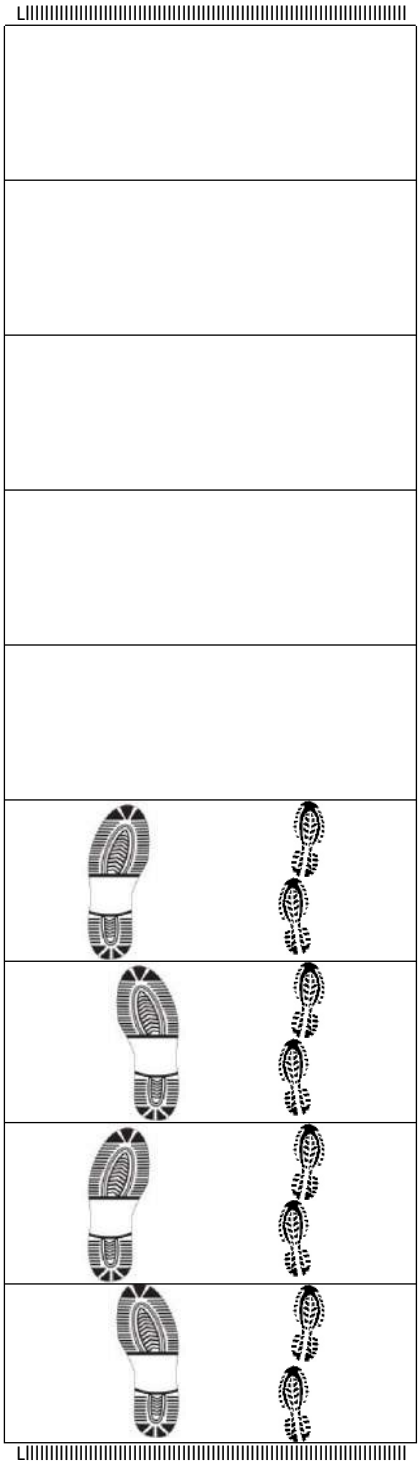
- Have students research the 10 tallest buildings in the world. How tall are they in meters? How tall are they in feet?

Intervention

- This concept may be quite difficult for some students to understand. You may need to physically walk out the steps with a teacher and a student to see how the difference in foot length works in real life.

Name _____ Date _____

Footprints on the Rug



Look at the footsteps on the rug.

Dad measures the rug by counting his steps. Aaron measures the rug by counting his steps.

1. How many steps does Dad need to take to walk across the whole rug? _____

2. How many steps does Aaron need to take to walk across the whole rug? _____

3. Who has to take more steps to walk across the whole rug? _____

Why?

_____

4. If Dad and Aaron each took 6 steps, who would walk farther? _____

Explain how you know.

_____

_____

Name _____ Date _____

Measuring with Different Units

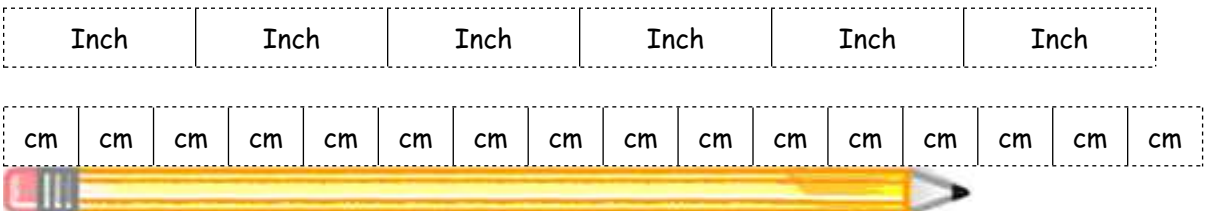
Use a rule or the strips below to measure items to the nearest inch and the nearest centimeters.

Items	Length in Inches	Length in Centimeters
Ex: Pencil	5 in	13 cm

Why do you need more centimeters than inches to measure the same thing? _____

_____

_____



Scaffolding Task: My Big Feet

Approximately 1 Day
(This task was adapted from "How Big is a Foot?" http://illuminations.nctm.org)
In this task, students reason about the importance of standard units of measure. Students learn to measure with a 12 inch ruler.

STANDARDS FOR MATHEMATICAL CONTENT

MGSE2.MD.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

MGSE2.MD.2 Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen. Understand the relative size of units in different systems of measurement. *For example, an inch is longer than a centimeter.* (Students are not expected to convert between systems of measurement.)

MGSE2.MD.3 Estimate lengths using units of inches, feet, centimeters, and meters.

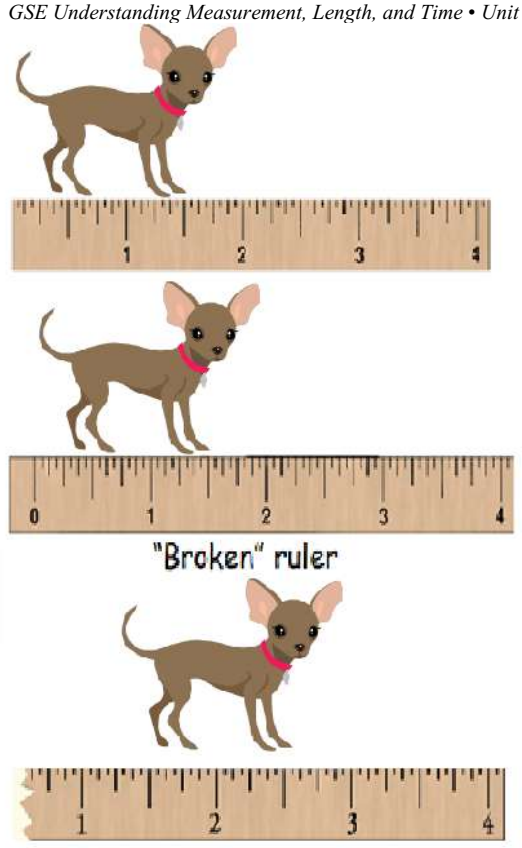
STANDARDS FOR MATHEMATICAL PRACTICE

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

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.**
5. **Use appropriate tools strategically.**
6. **Attend to precision.**
8. **Look for and express regularity in repeated reasoning.**

BACKGROUND KNOWLEDGE

Students are first introduced to standard linear measurement in second grade; therefore they will need many experiences to learn how to use the ruler correctly. It is important to show students how to accurately use the ruler when it begins at 0, as well as when it begins at the end of the ruler. It is important to expose students to both types and give them practice with both types of rulers. Research tells us that students see rulers with hash marks as counting numbers instead of the units (or spaces) between the marks. This is what will be helpful as they are exposed to experiences like the "broken" ruler. It is important for students to develop an understanding of length (measure) even when the starting point varies. Students should begin to understand that a ruler is a representation of a consistent row of units.



ESSENTIAL QUESTIONS

- Why do we need to be able to estimate a measurement or value?
- Why is it important for us to know how to measure different units of measurement?

MATERIALS

- *How Big Is a Foot?* by Rolf Myller or similar book
- Butcher paper: about 6' x 3' piece for each group
- Pencils or markers
- Rulers

GROUPING

Small Groups

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I

Tell students the story of the king who wants his carpenter to make a bed for his queen, but it's a challenge to make sure the bed is the right size and to figure out what to measure it with.
Create a list of questions the apprentice would have to answer in order to be able to make the bed. Discuss the things that have to happen in order to measure a bed.
For example:

- Is it for an adult or a child?

- Is it for 1 person or 2 people?
- Is the person big or small?
- Do they sleep diagonally or vertically? (The bed has to be longer than the person is tall and wider than the person is, etc.).
- What would you estimate is the length and the width of your bed at home, what would you use to find this out? How did you come up with your estimate?
- What other questions would you want to ask?

Read the book, *How Big Is a Foot?* or similar book to the students. Tell students that they will have the chance to explore some of the things that happened in the story with their classmates. Ask students to explain why the bed created by the apprentice was not what the King expected.

Part II

Have students work in pairs to create a bed using a 12 inch ruler. This is a good time to demonstrate how to appropriately measure. Expose students to rulers that begin at zero and rulers that leave a small space before zero. This is not to mislead students, but rather to keep them from creating misconceptions that all rulers begin at the edge. See the Background Knowledge portion for further explanation.

Each group will create a bed that is 6 feet long and 3 feet wide. Once each has created their bed, hang all the beds at the front of the room to compare.

FORMATIVE ASSESSMENT QUESTIONS

- How do we line up our rulers to measure correctly?
- Why is it important for us to know how to measure different objects using different tools of measurement?
- How can we tell if an estimate is reasonable?
- Why do we need to be able to estimate a measurement or value?
- Why is it important for us to know how to measure different units of measurement?
- Is there a time when you could use a nonstandard unit of measure?

DIFFERENTIATION

Extension

- Students could create a bed using yardsticks to measure without given dimensions. How many yards long should the bed be? How many yards wide?
- Students could calculate the number of inches long a bed with a length of six feet would be? How many inches wide would a bed be that is 3 feet wide?

Intervention

- Have students use multiple copies of a foot to measure. Some students struggle with keeping the ending point while they move their unit of measurement. This causes inaccurate measuring. If students have multiple copies, or multiple rulers, they would be able to hold one in place while they moved the other.

Constructing Task: Snakes and Lizards

(Approximately 2-3 Days)

In this task, students reason about using standard units. They measure items in inches, feet, and yards.

STANDARDS FOR MATHEMATICAL CONTENT

MGSE2.MD.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

MGSE2.MD.2 Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen. Understand the relative size of units in different systems of measurement. *For example, an inch is longer than a centimeter.* (Students are not expected to convert between systems of measurement.)

MGSE2.MD.3 Estimate lengths using units of inches, feet, centimeters, and meters.

MGSE2.MD.4 Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

STANDARDS FOR MATHEMATICAL PRACTICE

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
3. **Construct viable arguments and critique the reasoning of others.**
5. **Use appropriate tools strategically.**
6. **Attend to precision.**

BACKGROUND KNOWLEDGE

(Information adapted from Mathematics Georgia Standards of Excellence State Standards and Model Curriculum, Ohio Department of Education Teaching)

Students should have experience measuring the length of the same object using different tools (ruler with inches, ruler with centimeters, a yardstick, or meter stick). This will help students learn which tool is more appropriate for measuring a given object. They describe the relationship between the size of the measurement unit and the number of units needed to measure something. For instance, a student might say, "The longer the unit, the fewer I need."

Estimation helps develop familiarity with the specific unit of measure being used. To measure the length of a shoe, knowledge of an inch or a centimeter is important so that one can approximate the length in inches or centimeters. Students should begin practicing estimation with items which are familiar to them (length of desk, pencil, favorite book, etc.).

Some useful benchmarks for measurement are:

- First joint to the tip of a thumb is about an inch
- Length from your elbow to your wrist is about a foot
- If your arm is held out perpendicular to your body, the length from your nose to the tip of your fingers is about a yard

ESSENTIAL QUESTIONS

- How can we decide on appropriate units of measurement (i.e. inch, foot, and yard)?
- Why is it important for us to know how to measure different units of measurement?
- How do I know if an estimate is reasonable?
- Why do we need to be able to estimate a measurement or value?

MATERIALS

- *Twelve Snails to One Lizard* by Susan Hightower or similar book
- Class set of twelve-inch rulers
- 6-8 yard sticks
- Ribbon for making snakes, iguanas, and snails (it is recommended to not use yarn as it stretches and can complicate the lesson as the students measure items)

GROUPING

Large Group, Small Groups

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I

Read *Twelve Snails to One Lizard* by Susan Hightower or similar book to the class. Have the children measure items such as the ones in the story using a nonstandard type of measurement unit like the student's feet. For example, have everyone measure the length of the classroom using their feet (or review from prior tasks where this was discussed). Ask questions such as "Did all of you get the same measurement? Why or why not? Can you explain why this happened? Is there a way to measure our classroom and not get so many different answers? Is there a tool we can use besides our own feet?" At this point, you would want to refer back to the previous task, *My Big Foot.* Discuss the story and identify the problem and solution.

Part II

Students measure the distance across the room and record their measurements. They will hopefully ask which measurement to use for this distance. Invite student discussion on the appropriate unit (foot and yard) to use and why. Help to guide the discussion of why inch would not be the best unit for this measurement. After measurements are completed, groups will share their findings. Let students discuss/argue rationale for foot and yard as better choices for measurement of the classroom.

Part III
Use ribbon to make snakes that are exactly thirty six inches long (one yard), iguanas that are twelve inches long (1 foot) and snails that are exactly one inch long. Teacher should make yard sticks available or have a measuring table where students could use pre-marked place on table to measure and cut their ribbon. The group will create one of each animal and explain the relationship of the three. This may be done through a journaling activity or chart that the group creates. The teacher should be sure to provide conversations about the standard measurement vocabulary of inch, foot and yard.

Please note: Encourage the groups to show how many snails it takes to equal one snake to avoid inaccurate measurements.

Students should answer questions (using math journal) such as:

- Which is the shortest unit of measurement? Longest?
- How many snails does it take to equal the length of an iguana? How many iguanas does it take to equal the length of a snake?

Part IV
(This portion should be done on the next day to allow the student to fully comprehend the unit comparisons)

As a class, generate a list of items that the students think are one inch, one foot and one yard in length. Then give each student a twelve inch ruler and divide class into groups of three students. Students should locate an item that is approximately one inch long, an item that is one foot long and an item that is one yard long. (All three students must work together to measure a yard by putting their three twelve inch rulers together). Then have students find items that are shorter and/or longer than one inch, one foot, and one yard. Bring students back together and discuss the items they located in these measurements. Facilitate discussion on comparisons of the items and their measurements.

Part V
Students should choose one item that is longer than their snake or 1 yard. Measure the object and record the measurements. The measurements should be done to nearest whole unit. At this point students are not using fractional notation so they should only be using whole units, however, this does not mean that discussion of fractional parts should be prohibited. Descriptions should include at least 2 ways to record the measurement. For example: yards and inches, feet and inches, or all inches.

FORMATIVE ASSESSMENT QUESTIONS

- How did you determine which instrument (inch cube, ruler, yard stick) to use to measure?
- What are things you would measure in inches, feet, and yards?

DIFFERENTIATION

Extension

- Have students measure other items and make comparisons. Write about the comparisons in their math journal using comparison symbols >, <, =.

Intervention

- Provide students with a piece of adding machine tape that is one inch, one foot, and one yard, so they can visually see the difference in each unit of measurement. Then have them use the inch piece to determine how many inches it takes to make a foot. Do the same for how many feet are in a yard. By using adding machine tape, students can see the measurements more clearly. They may choose to mark it on the paper in different colors or cut the paper.

Name _____ Date _____

Snakes and Lizards

Measurement	1 inch	1 foot	1 yard
Approximately			
Longer			
Shorter			

Constructing Task: Measurement Scavenger Hunt

(Approximately 2 Days)

In this task, students measure items in the room and their bodies with ribbons cut to specified lengths and with centimeters and inches.

STANDARDS FOR MATHEMATICAL CONTENT

MGSE2.MD.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

MGSE2.MD.2 Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen. Understand the relative size of units in different systems of measurement. *For example, an inch is longer than a centimeter.* (Students are not expected to convert between systems of measurement.)

MGSE2.MD.3 Estimate lengths using units of inches, feet, centimeters, and meters.

MGSE2.MD.4 Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

STANDARDS FOR MATHEMATICAL PRACTICE

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

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.**
6. **Attend to precision.**

BACKGROUND KNOWLEDGE

Students should begin to understand that a ruler is a representation of a consistent row of units. Students should have experience measuring the length of the same object using different tools (ruler with inches, ruler with centimeters, a yardstick, or meter stick). This will help students learn which tool is more appropriate for measuring a given object. They describe the relationship between the size of the measurement unit and the number of units needed to measure something. For instance, a student might say, "The longer the unit, the fewer I need." Multiple opportunities to explore provide the foundation for relating metric units to customary units, as well as relating within customary (inches to feet to yards) and within metric (centimeters to meters). The more students work with a specific unit of measure, the better they become at choosing the appropriate tool when measuring.

Estimation helps develop familiarity with the specific unit of measure being used. To measure the length of a shoe, knowledge of an inch or a centimeter is important so that one can

approximate the length in inches or centimeters. Students should begin practicing estimation with items which are familiar to them (length of desk, pencil, favorite book, etc.).

For additional information on measurement read chapter 8 in *Teaching Student Centered Mathematics K-3* by John A. Van de Walle.

Using the table for this task is optional because students need to learn to independently draw and record their work for three reasons:

- Standard of Mathematical Practice 2: Reason abstractly and quantitatively
- Standard of Mathematical Practice 3: Construct viable arguments and critique the reasoning of others.
- Standard of Mathematical Practice 4: Model with Mathematics

MISCONCEPTIONS

Students may try to combine customary and metric systems of measurement. Be explicit that customary units stay with customary units and metric units stay with metric units. One trick that may be helpful to emphasize the difference in the units is to use a British or other foreign accent when talking about the metric system. This helps the students understand that the metric system is used by other places in the world while only the US used the customary system.

ESSENTIAL QUESTIONS

- How can we decide on appropriate units of measurement (i.e. inch, foot, yard, centimeter, and meter)?
- Why is it important for me to know how to measure different objects using different units of measurement?

MATERIALS

- Ribbons (It is recommended to not use yarn as it stretches and can complicate the lesson as the students measure items. Also, use different colors for customary and metric units).
- Rulers with inches and centimeters markers
- Scissors
- *Inch by Inch* by Leo Lionni or similar book
- *Optional: measuring tapes*

GROUPING

Large Group, Partner

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I

Gather students together and ask questions such as: Where have you seen a worm? What did it look like? Does anyone know what an inch worm is? What does it look like? How long is it? What is an inch? Can anyone show me something that is about one inch long, wide, or thick? What are some ways to measure length? Make a chart or list on the board with student responses. Tell students that you are going to read a story about an inch worm who likes to measure different things. Read a book such as *Inch by Inch* by Leo Lionni.

Part II

Students will work with a partner to cut ribbons into the following lengths: 5 inches, 5 centimeters, 10 inches, 10 centimeters. Students will measure various objects in room and record in a math journal (sample recording table is provided)

****Having the students create their recording sheet would better provide them practice with the standards for mathematical practice. See Background Knowledge for further explanation. ****

Strings	Equal to	Less than	Greater Than	Not Equal/but close
Ribbon 1 (5 cm.)				
Ribbon 2 (5 in.)				
Ribbon 3 (10 cm.)				
Ribbon 4 (10 in.)				

Allow the children to estimate, measure, and record data for each string with their partner. As the groups are working, look to see that the children are correctly measuring and recording. *After they have completed their chart, students will need to reflect on how they measured and estimated.* Students should use math vocabulary in their writing about this activity. Partners will then share findings with the class by creating a poster with their strings, measurements, and recording chart and present it to the class.
Teachers can create a chart similar to one shown on the right to show all of the information described above.

Part III

Have each student estimate the length and/or height of body parts. This information should be recorded in inches and centimeters on individual student task sheets.

- Thumb
- Index finger
- Arm
- Hand
- Foot
- Leg
- Head (Circumference and the height)
- Body (length)

Students should work in pairs to measure their body parts using ribbon. This will allow students to accurately measure round items (such as your head) and the use the ruler to measure the ribbon. Students record their data on their task sheet. After students have measured, bring them together as a class. Have students record their findings on a large class chart. Discuss results of student findings. Students then graph data from one interesting example. Closure should include review the concepts of inch and foot, centimeter and meter, and the relationships. The teacher could close this task by holding up different objects and asking students to estimate the object's length in both systems of measurement.

FORMATIVE ASSESSMENT QUESTIONS

- What unit of measurement are you using? Why?
- When you measure using a ruler or tape measure, how do you place the item so you can get the most accurate measurement?

DIFFERENTIATION

Extension

- Use the web site and choose the level of difficulty http://onlineintervention.funbrain.com/measure/index.html
- Have students create a scavenger hunt within your classroom and have students guess what they can find that is of a particular length.
- Have students find and measure objects that are of a certain length.
- Home activity: Measure, graph, and compare someone at home.

Intervention

- Have students' only measure items that can be measured using the ruler. This will keep students from having to use the ribbon.

Name _____ Date _____

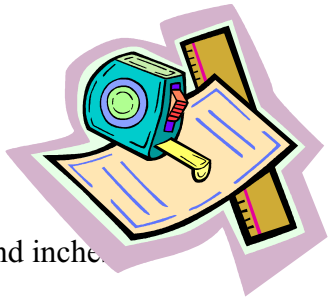
Measurement Scavenger Hunt

Body Part	Estimate (inches)	Actual Measurement (inches)	Estimate (centimeters)	Actual Measurement (centimeters)
Thumb				
Index finger				
Arm				
Hand				
Foot				
Leg				
Body (length)				

What is different about your measurements and your partner's?

_____

_____



Constructing Task: Measurement Line Plot

(Approximately 1 Day)
In this task, students create 2 line plots by measuring items in centimeters and inche

STANDARDS FOR MATHMATICAL CONTENT

MGSE2.MD.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

MGSE2.MD.9 Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units.

STANDARDS FOR MATHEMATICAL PRACTICE

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
4. **Model with mathematics.**
6. **Attend to precision.**
7. **Look for and make use of structure.**

BACKGROUND KNOWLEDGE

(Information quoted from Van de Walle and Lovin, Teaching Student-Centered Mathematics: Grades K-3, page 321)

"Bar graphs or picture graphs are useful for illustrating categories of data that have no numeric ordering- for example, colors or TV shows. When data are grouped along a continuous scale, they should be ordered along a number line. Examples of such information include temperatures that occur over time, height or weight over age, and percentages of test takers scoring in different intervals along the scale of possible scores."

Line plots are useful tools for collecting quantitative data because they show the number of things along a numeric scale. They are made by simply drawing a number line then placing an X above the corresponding value on the line that represents each piece of data. Line plots are essentially bar graphs with a potential bar for each value on the number line. This standard calls for students to represent the length of several objects by making a line plot. Students should round their lengths to the nearest whole unit.

ESSENTIAL QUESTION

- How does a line plot help me share data?

MATERIALS

- Ruler
- Paper

GROUPING

Small Group or Partners

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

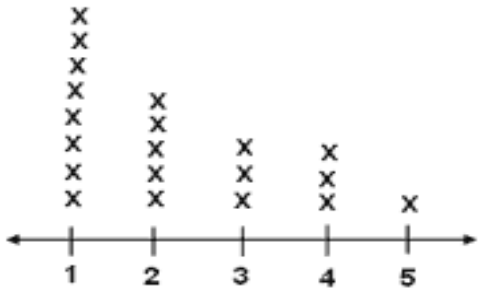
Gather the students on the classroom rug and discuss previous lessons on measuring. Ask a child to remind the class about using a ruler and the correct way to measure items. For this task the students will be measuring 10 items that are smaller than their ruler. Pair up the students and have them go about the classroom and measure 10 items that are smaller than their ruler. **For this task they will be measuring each of the 10 items in inches *and* in centimeters so they can create two separate line plots.** They should record the item and its measurement on paper or in their math journal.

After the groups have made their list of 10 items, have them all join you back on the classroom rug. Randomly call on some groups to give you some examples of items they measured. List these items on chart paper and record their measurement both in centimeters and in inches. After listing some ask them if they know how to graph these measurements. Accept both yes and no responses and any ideas they have. After getting some ideas from the students, share with them what a line plot graph is and its purpose.

As a group, model how to create a line plot graph using their inch measurements. See graphic below for help. To make a line plot, a number line is drawn and an X is made above the corresponding value on the line for every corresponding data element. After graphing the inch measurements lead the students back to their partners to create their separate line plot graph using their centimeter measurements.

After the students have created their centimeter line plot graphs, give them time to share their graphs with another group. Let them list the similarities and differences in their graphs in their math journals.

Sample Line Plot Graph: **Items Measured in Inches**



FORMATIVE ASSESSMENT QUESTIONS

- What numbers did you use on your line plot graph? Why?
- What can you tell me about the information on your graph?
- Why does the shape of the data look the same on both the inch and the centimeter plots?

DIFFERENTIATION

Extension

- Let some students measure using centimeters. This might lead them to make their line plot graph quite large in terms of the measurements.
- Have students find items larger than a foot.

Intervention

- Give the students a recording sheet that already has a number line on it so that they can label the numbers and put the X for each measurement.

Constructing Task: Kangaroo Jumps

(Approximately 2 Days)

In this task, students measure their jumps and create a class line plot of their measurements.

STANDARDS FOR MATHEMATICAL CONTENT

MGSE2.MD.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

MGSE2.MD.5 Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.

MGSE2.MD.9 Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units.

MGSE2.MD.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put together, take-apart, and compare problems using information presented in a bar graph.

STANDARDS FOR MATHEMATICAL PRACTICE

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
2. **Reason abstractly and quantitatively.**
6. **Attend to precision.**
7. **Look for and make use of structure.**

BACKGROUND KNOWLEDGE

(Information quoted from Van de Walle and Lovin, Teaching Student-Centered Mathematics: Grades K-3, page 322)

Students should begin to understand that a ruler is a representation of a consistent row of units. Students should have experience measuring the length of the same object using different tools (ruler with inches, ruler with centimeters, a yardstick, or meter stick). This will help students learn which tool is more appropriate for measuring a given object. They describe the relationship between the size of the measurement unit and the number of units needed to measure something. For instance, a student might say, “The longer the unit, the fewer I need.” Multiple opportunities to explore provide the foundation for relating metric units to customary units, as well as relating within customary (inches to feet to yards) and within metric (centimeters to meters). The more students work with a specific unit of measure, the better they become at choosing the appropriate tool when measuring.

Estimation helps develop familiarity with the specific unit of measure being used. To measure the length of a shoe, knowledge of an inch or a centimeter is important so that one can approximate the length in inches or centimeters. Students should begin practicing estimation with items which are familiar to them (length of desk, pencil, favorite book, etc.).

For additional information on measurement see chapter 8 in Teaching Student Centered Mathematics by John A. Van de Walle.

One way to organize the data collected within this task is to use a bar graph or a line plot. Bar graphs are widely used and many students find them easy to read. One type of graph that students may have less exposure to is a line plot graph.

"*Line plots* are useful *counts* of things along a numeric scale. To make a line plot, a number line is drawn and an X is made above the corresponding value on the line for every corresponding data element. One advantage of a line plot is that every piece of data is shown on the graph. It is also a very easy type of graph for students to make. It is essentially a bar graph with a potential bar for every possible value. A simple example is shown in Figure 11.6." Van de Walle, *Teaching Student Centered Mathematics, K-3 pg. 322*

ESSENTIAL QUESTIONS

- How can we decide on appropriate units of measurement (i.e. inch, foot, and yard)?
- Why is it important for me to know how to measure different objects using different tools of measurement?
- Why is it important to be able to organize and graph data?

MATERIALS

- Rulers with inches and feet, centimeters and meter
- Student task sheet
- A book on kangaroos (optional)

GROUPING

Large Group, Small Groups (four)

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I

Read a book about kangaroos (or another jumping animal) to the students. Afterwards, explain to them, "Today we will do some jumping like the kangaroo!" Have someone demonstrate a kangaroo jump.

Explain to the students they are going to measure their jumps from a standing position five times. Place the students in groups of four. Ask children to record their information on the task sheet chart. They will need to decide on the unit of measurement (centimeters, inches, feet, or meter) and fill that in on the task sheet. Students will come up with the rules for the jumping. (Do they start with toes on the starting line? Are they going to measure to the heel or the toes of the foot once they have landed? Will there be a practice jump or will the first jump count?)The distance jumped can be marked with a piece of chalk or tape. Children will record their information on the task sheet. Students should estimate jump distance before measuring the distance.

Students might start out using a unit of measurement and then decide they want to change their unit. They might come to ask you, as the teacher, if this is ok. You can use this at your closing of the lesson letting that group share why they asked that and what they changed to for the task. You can allow them to change the unit BUT they need to be questioned about how they will record that data on the graph. (Watch them discuss this as you might see them convert the measurements or start all over). Either choice is another great thing to discuss at closing.

It is imperative that you allow this mathematical discussion to take place between them as a group and you simply listen and watch. As indicated by the Mathematical Practice Standards, this type of mathematical discourse should be the goal of every task.

Students order their jumps from longest to shortest on the back of the task sheet. After students have completed their chart, lead them in a discussion about how measuring in various units is different, which is more practical for this experiment, why they think this way, and how many inches are in a foot, centimeters are in a meter?

Part II

Students will work together in their group to create a line plot to display the information from their jumps**.** After groups have created their graphs demonstrating their data for their jumps, they should create 3-5 questions that can be answered using the line plot. The teacher may ask students to trade graphs with another group and answer questions created. Students' graphs and questions should be presented to the class. Guide students in discussion about comparisons between graphs.

FORMATIVE ASSESSMENT QUESTIONS

- How do I know if an estimate is close to the actual measurement?
- Why do we need to be able to estimate a measurement or value?
- How do you organize the data from your jumps?
- How do you use a line plot? What can you tell using your line plot?

DIFFERENTIATION

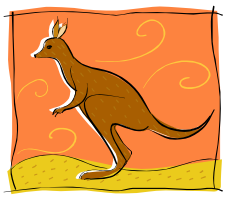
Extension

- Challenge students to add up all the jumps together to see how far the group jumped. Challenge them to tell how many inches it would be all together, and how many feet it would be.
- As a group, create two line plots, one of the longest jump everyone did and another one of the shortest jump everyone did.
- Write questions that can be answered by the data in your line plot.

Intervention

- Students can lay rulers in a line to measure the jumps if they are having a difficult time measuring lengths that are longer than one foot.
- Students can also use measuring tapes to help them measure distances longer than a foot.

Kangaroo Jumps!



Name _____ Date _____

Now let's look at the data.

Jump #	Unit _____	Estimate before jumping	Actual Measurement of jump
1			
2			
3			
4			
5			

1. My estimate for Jump 1 was: _____. The actual jump measured: _____. Write a number sentence comparing the estimate and the actual jump.

_____

2. My actual jump for Jump 3 measured: _____. My actual jump for Jump 5 measured: _____. Write a number sentence comparing your two jumps.

_____

Practice Task: Giant Measurements

(Approximately 2-3 Days) In this task, students build "giants" from butcher paper to meet certain length specifications. They then compare their giant to another giant.

STANDARDS FOR MATHEMATICAL CONTENT

MGSE2.MD.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

MGSE2.MD.2 Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen. Understand the relative size of units in different systems of measurement. *For example, an inch is longer than a centimeter.* (Students are not expected to convert between systems of measurement.)

MGSE2.MD4 Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

STANDARDS FOR MATHEMATICAL PRACTICE

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
4. **Model with mathematics.**
5. **Use appropriate tools strategically.**
6. **Attend to precision.**

BACKGROUND KNOWLEDGE

(Information quoted from Van de Walle and Lovin, Teaching Student-Centered Mathematics: Grades K-3, pages 228-230)

"Length is usually the first attribute students learn to measure. Be aware, however, that length measurement is not immediately understood by young children. At the kindergarten level, children should begin with direct comparisons of two or more lengths.

It is important to compare lengths that are not in straight lines. One way to do this is with string or rope. Students can wrap string around objects in a search for things that are, for example, as long around as the distance from the floor to their belly button or as long as the distance around one's head or waist. Body measures are always fun.

The temptation is to carefully explain to students how to use these units to measure and then send them off to practice measuring. This approach will shift students' attention to the procedure (following your instruction) and away from developing an understanding of measurement using units."

ESSENTIAL QUESTIONS

- How can I determine appropriate tools of measurement?
- Why is it important for me to know how to measure different objects using different tools of measurement?

MATERIALS

- *Jim and the Beanstalk* by Raymond Briggs or similar book
- Butcher paper
- Index cards
- Crayons, markers, colored pencils
- Ribbon
- Measurement tools

GROUPING

Small Groups

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I
Read a book like *Jim and the Beanstalk* by Raymond Briggs to the class. Discuss giants, the concept of size for humans and for giants, and how they might be different. As a class, make a chart of estimations on what the giant's height might be, how big his waist might be, and how long the length of his foot might be. It would be helpful to refer back to body measurements portion of the ***Measurement Scavenger Hunt*** task. Estimations of the giant's measurements could be done in both inches and centimeters so children could see that the number of centimeters would be much larger than the number of inches.

Part II
Students will work in groups of 3-4 to create the different giant body parts based on feet and yard measurements. Students should use butcher paper to create giant's body parts.

Use these measurements for giant:

- Head- 2 feet across (height of head to be determined by group*)
- Neck-1 foot across
- Body/Torso-1 yard long (width to be determined by group*)
- Arms-2 yards long (width to be determined by group*)
- Legs-3 yards, 5 inches long (width to be determined by group*)
- Hands (with fingers) - 1 foot long
- Feet (with toes) – 2 feet, 1 inch long

*Note that only one attribute is given for each body part. It is important that the other attribute (height or width) varies per group so that students can compare giants in Part 3.

Once all groups have cut, colored and decorated their giant body parts, piece them together to create a class giant. Allow groups to check other groups' measurements.

PART III

Once students have completed their giants, they should partner up with another group to compare the height of the head, the width of the body, and the width of the arms and legs. Students should list the differences between the measurements. Students may encounter the need to change units (i.e., something originally measured in feet needs to now be measured in inches in order to state the difference). Allow students to work through this on their own.

Teachers may choose to have students construct a table to compare each group's measurements, or they may find it more beneficial for students to write sentences comparing the two groups' giants (e.g. *The blue group's giant's head is 36 inches tall. Our giant's head is 18 inches tall. The blue giant is 18 inches taller than ours*). Teachers may also leave the options open so that students can gain practice in organizing and representing data.

**Note: This is the only time MD4 is explicitly addressed. If you choose to omit this part of the task, ensure that you are able to meet MD4 elsewhere.*

FORMATIVE ASSESSMENT QUESTIONS

- Is it possible to record all of our giant's measurements in one unit? *Some parts have been measured in feet, while others were measured in yards.*
- Would it be possible to use just one of the units?
- Can I compare measurements if the unit is not the same?

DIFFERENTIATION

Extension

- Give students different measurements and have them construct giants in groups. Students could make a giant's foot from construction paper and discover how many foot lengths it takes to go to various locations in the school and graph the results. They could then compare the giant's foot to their foot in an organized table.
- Have the students write their observations about the size of the giant in their journal. Encourage them to list comparisons between the size of the giant and themselves, items in the classroom, etc.

Intervention

- Students could use modified measurements that aren't as large. Perhaps their measurements are of the sizes no longer than 2 feet.

Formative Assessment Lesson

Formative Assessment Lesson

At this point in the unit, you should administer a Formative Assessment Lesson (FAL). The measurement FAL can be found on www.georgiastandards.org under the Professional Learning tab or on the Formative Assessment page of the K-5 Math Wiki.

Formative Assessments Lessons (FALs)

Link to FAL Card Sets: http://www.reneeyates2math.com/field-test-new-elementary-fals.html

What is a Formative Assessment Lesson (FAL)? The Formative Assessment Lesson is designed to be part of an instructional unit typically implemented approximately two-thirds of the way through the instructional unit. The results of the tasks should then be used to **inform** the instruction that will take place for the remainder of the unit.

Formative Assessment Lessons are intended to support teachers in formative assessment. They both reveal and develop students' understanding of key mathematical ideas and applications. These lessons enable teachers and students to monitor in more detail their progress towards the targets of the standards. They assess students' understanding of important concepts and problem solving performance, and help teachers and their students to work effectively together to move each student's mathematical reasoning forward.

What does a Formative Assessment Lesson look like in action? Videos of Georgia Teachers implementing FALs can be accessed HERE.

Constructing Task: Solving Problems on Number Line

Approximately 1 Day Adapted from www.k-5mathteachingresources.com
In this task, students solve measurement word problems given in the same units.

STANDARDS FOR MATHEMATICAL CONTENT

MGSE2.MD.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

MGSE2.MD.5 Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.

MGSE2.MD.6 Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2… and represent whole-number sums and differences within 100 on a number line diagram.

STANDARDS FOR MATHEMATICAL PRACTICE

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
2. **Reason abstractly and quantitatively.**
6. **Attend to precision.**

BACKGROUND KNOWLEDGE

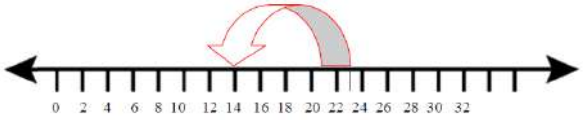
(Information adapted from Mathematics Georgia Standards of Excellence State Standards and Model Curriculum, Ohio Department of Education Teaching)

This standard applies the concept of length to solve addition and subtraction word problems with numbers within 100. Students should use the same unit in these problems.

Example: In P.E. class, Kate jumped 14 inches. Mary jumped 23 inches. How much farther did Mary jump than Kate? Write an equation and then solve the problem.

Student 1
My equation is 14 + ___ = 23 since I am trying to find out the difference between Kate and Mary's jumps. I used place value blocks and counted out 14. Then I added blocks until I got to 23. I needed to add 9 blocks. Mary jumped 9 more inches than Kate.

Student 2
My equation is 23 – 14 = ___. I drew a number line. I started at 23. I moved back to 14 and counted how far I moved. I moved back 9 spots. Mary jumped 9 more inches than Kate.



ESSENTIAL QUESTIONS

- Why is it important for us to know how to measure different objects using different tools of measurement?
- How can using a number line help us when we are solving math problems?

MATERIALS

- Measurement Problems Sheet
- Ruler
- Empty Number Lines
- Websites for Empty Number Lines
  - http://www.helpingwithmath.com/resources/oth_number_lines.htm
  - http://www.helpingwithmath.com/resources/oth_number_lines02.htm
  - http://www.math-salamanders.com/blank-number-lines.html

GROUPING

Small Groups

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Using the number line and referencing the ruler as a number line itself, the students should work in groups to solve the math problems. The problems for this task should be cut apart and given to pairs to solve. As the students solve these problems the teacher should be taking note of how the students are solving the problems on the number line and the strategies they use so these can be shared at the closing of the lesson. The students should also write a problem for another group to solve. It should be explained to them that after they write the problem they should also solve their own problem to make sure they know the correct answer. These problems provide the students with some real life examples of problems that use units of measure as their context.

Although students may have other strategies with which they can solve these problems, the standard MD6 specifically calls for number line representations.

FORMATIVE ASSESSMENT QUESTIONS

- What range of numbers did you use on your number line? Why?
- How do you know you solved the problem correctly? Explain to me how you labeled the number line.

DIFFERENTIATION

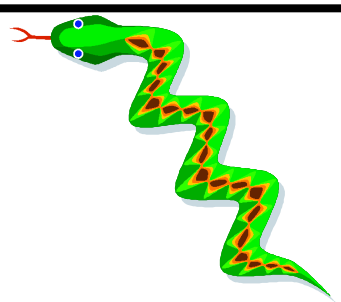
Extension

- Students could create their own multistep story problems.

Intervention

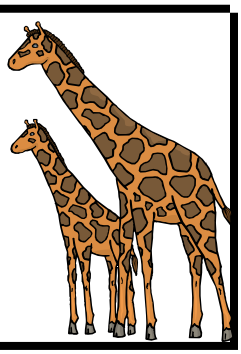
- Revisit "Where Am I on the Number Line?" from Unit 1 and "Roll Away" from Unit 2.

A snake was 35 inches long. Now it is 57 inches long. How much did the snake grow?



A ribbon was 50 cm long. After I cut some off 37 cm was left. How much did I cut off?

A baby giraffe was 61 inches tall. Another young giraffe was 98 inches tall. How much shorter was the baby giraffe?

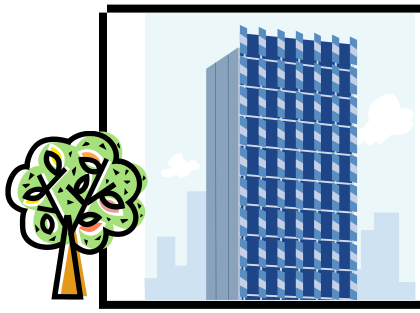


A beaver is 15 inches long. It grows 23 inches. How long is the beaver now?

(Information adapted from k-5 Math Teaching Resources, www.k-5mathteachingresources.com)

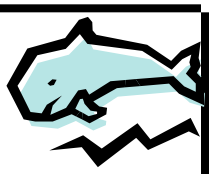
Malik was making a rain stick in art. He decided to paint it three different colors. He painted the bottom 13 inches red, the middle 12 inches yellow, and the top 9 inches green. How tall is the rain stick?

Ben is 48 cm tall. Mike is 13 cm taller than Ben. How tall is Mike?



A building is 60 meters tall. A tree near the building is 12 meters tall. How much taller is the building than the tree?

A whale is 78 feet long. A rhinoceros is 13 feet long. What is the difference in length between the whale and the rhinoceros?



Scaffolding Task: Building a Number Line Clock

(Adapted from

http://maccss.ncdpi.wikispaces.net/file/view/Taking+Time+to+Understand+Time.pdf and http://bridges1.mathlearningcenter.org/media/Bridges_Gr2_OnlineSupplement/B2SUP-D5_MeasureTime_0310.pdf)

In this task, students create a number line counting by 5s. They then create a clock from the number line in order to understand how to read the minute hand to the nearest 5 minutes.

STANDARDS FOR MATHEMATICAL CONTENT

Measurement and Data: Work with time and money.

MGSE2.MD.7 - Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.

STANDARDS FOR MATHEMATICAL PRACTICE

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
2. **Reason abstractly and quantitatively.**
6. **Attend to precision.**
7. **Look for and make use of structure.**

BACKGROUND KNOWLEDGE

Second Grade students extend their work with telling time to the hour and half-hour in 1st grade in order to tell (orally and in writing) the time indicated on both analog and digital clocks to the nearest five minutes. Teachers help students make connections between skip counting by 5s and telling time to the nearest five minutes on an analog clock.

COMMON MISCONCEPTIONS

- the hour hand is the minute hand and vice versa.
- the hour numeral is also the minute numeral.

ESSENTIAL QUESTION

How does the minute hand of the clock work?

MATERIALS

- 12 strips of 5 blocks (color print out included – or have students color them)
- Tape
- White board
- White board pen
- Large minute hand
- Blank clock face

GROUPING

Whole group

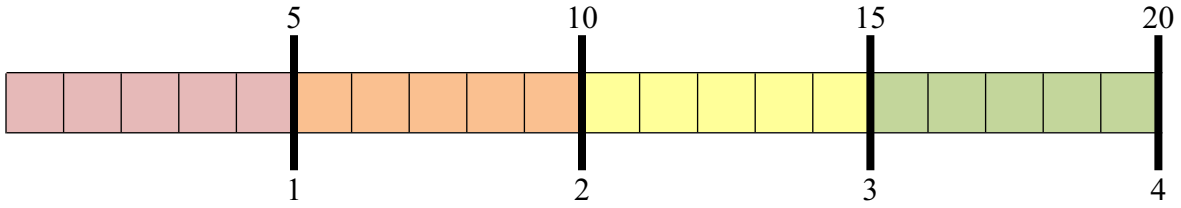
TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

In this task students make a connection between a number line counting by 5s and the minute hand on a clock.

TASK

Facilitate students creating a number line on the board using 12 five segment strips. Color strips are included, or have students color their own.

After each segment ask "*How many groups of 5 do we have on the board?" Ask, "How many cubes do we have on the board?*



Continue this process until all 12 segments are on the board. Discuss how the two sets of numbers are connected.

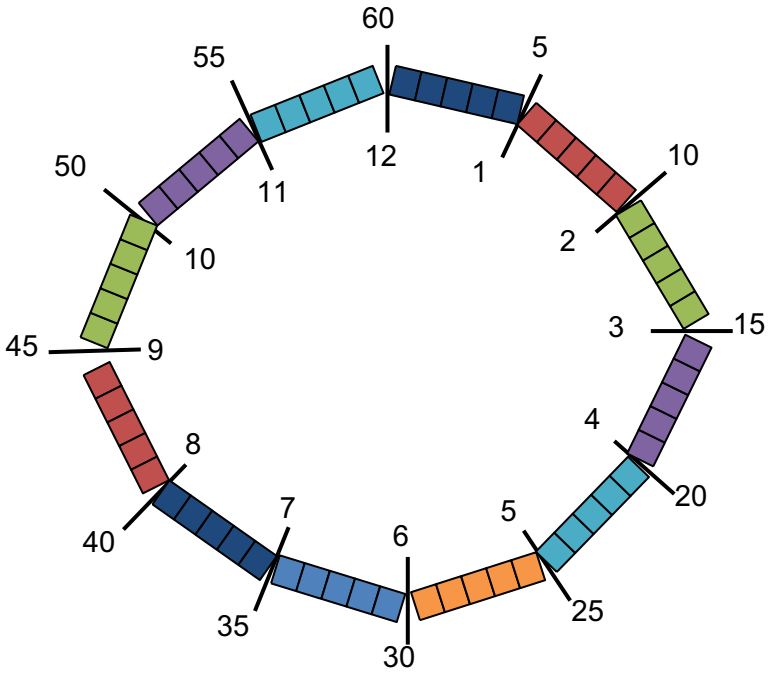
a. Ask questions like how many groups of five make up thirty?
b. Point to the twenty-fifth block and ask students to count up to that block.

Show students a clock face. Ask, "How many numerals are on the face of a clock?" Explain that the minute hand on a clock counts by 5s.

Ask, "How is the number line we created similar to the clock?" and "Could we use this line to help us tell time?"

Have students help to move the strips to create a circle similar to a clock.

This creates a transitional clock that outlines both the number of groups of cubes or hours, and the total number of cubes, or minutes.
Put a minute hand on the clock.



Model how to tell time with the minute hand. Ask students where the minute hand would say 45 after the hour or 20 minutes after the hour.

Have students put the numbers on their blank clock and practice identifying times to the nearest 5 minutes.

FORMATIVE ASSESSMENT QUESTIONS

- How do we tell time to the nearest 5 minutes?
- How can our number line help us tell time?
- How did you determine how many minutes had passed?
- Does it help to write numbers that you would use if you skip count by 5 around the clock?

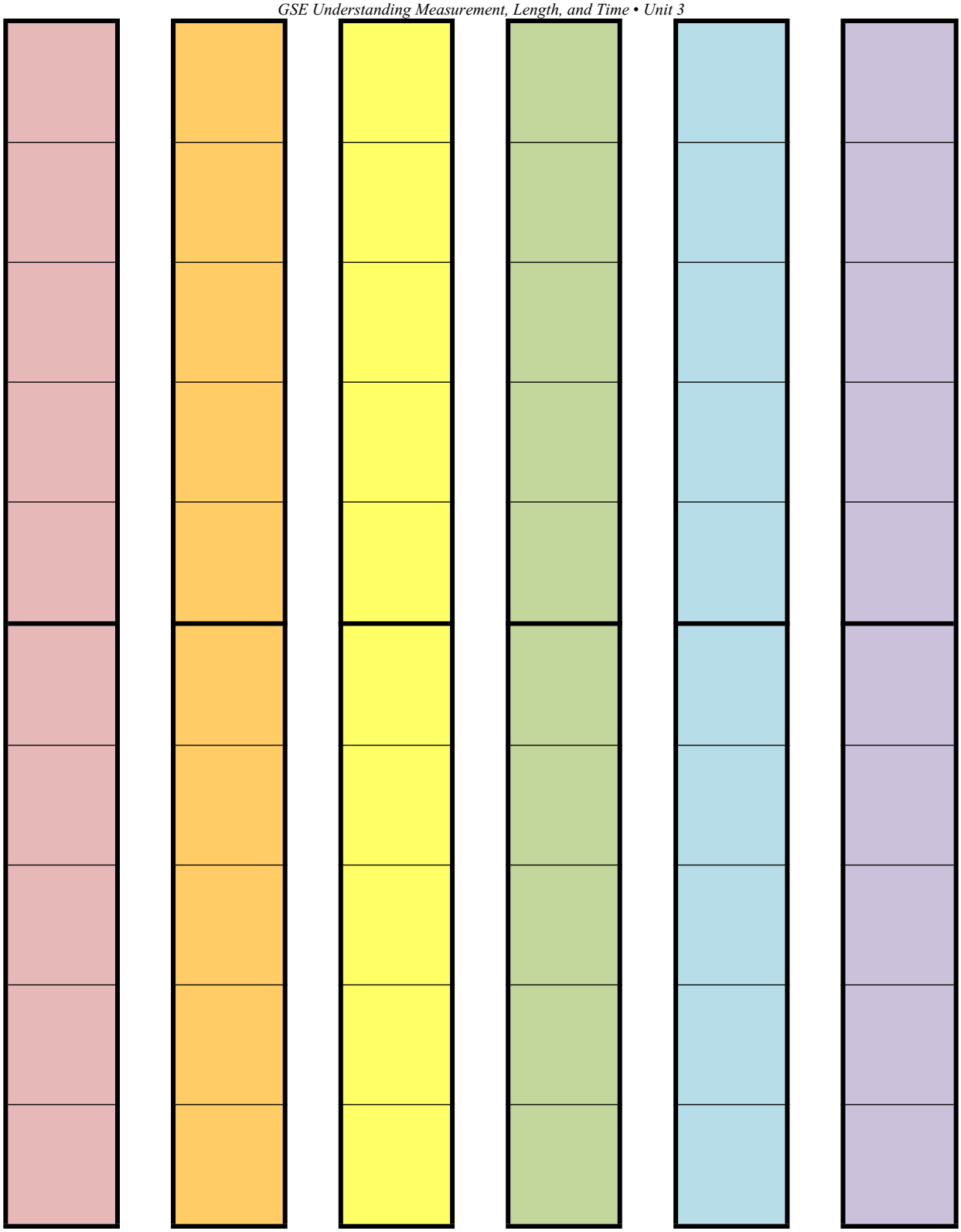
DIFFERENTIATION

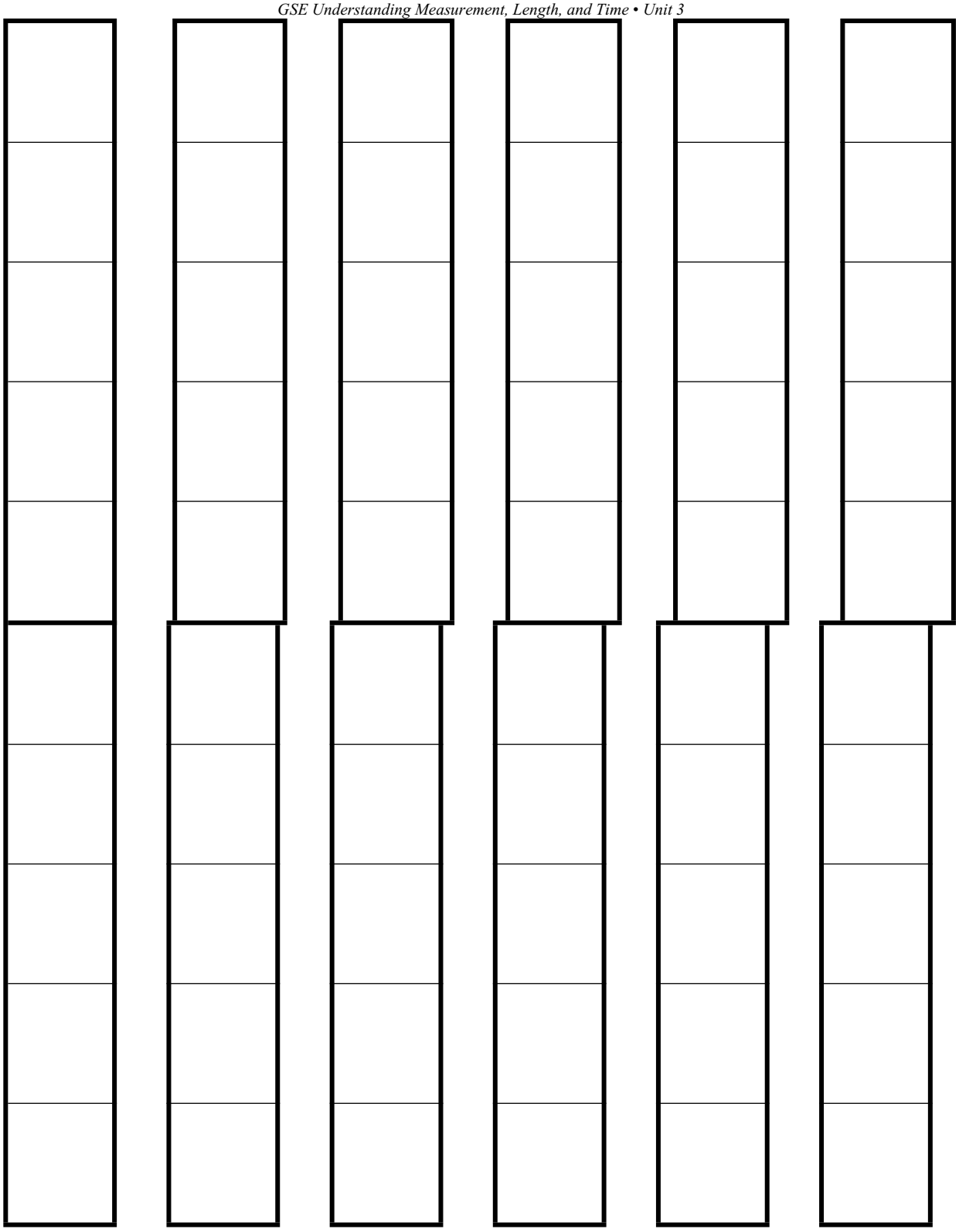
Extension

- Some students may be ready to tell time to the nearest minute.

Intervention

- Some students may have a great deal of difficulty understanding that the numbers on the clock represent both the hour and the minute.
  To address this difficulty, help students create a clock on two paper plates with lift up flaps so they can see the relationship between the hour and minute hands.

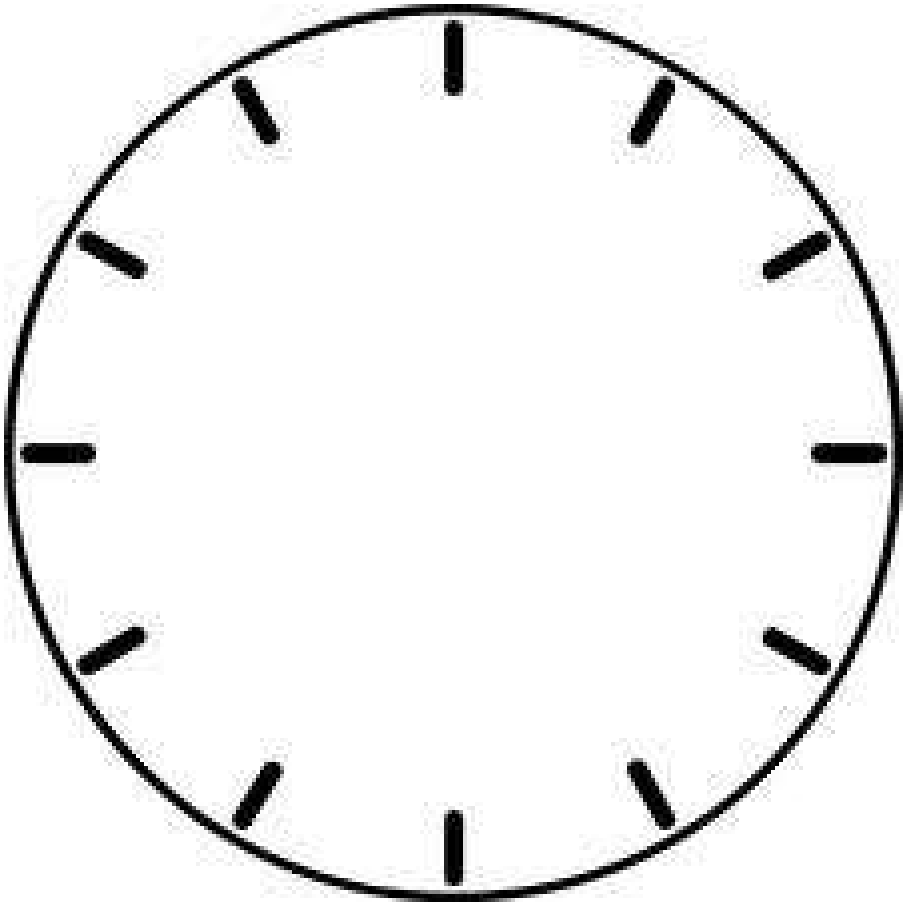




Name_____ Date_____

Practice Counting Minutes

On the inside of the clock write the hours. On the outside of the clock write the time of the minute hand.



Performance Task: Missed Bedtime

Approximately 1-2 days

In this task, students will create a time matching game. They then solve a word problem using reasoning about time.

STANDARDS FOR MATHEMATICAL CONTENT

MGSE2.MD.7. Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.

STANDARDS FOR MATHEMATICAL PRACTICE

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

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.**
6. **Attend to precision.**

BACKGROUND KNOWLEDGE

Students will need to have an understanding of the duration of time, the differences between AM and PM, and have had experiences solving problems for this task. Students should understand the importance of explaining their thinking and be able to express all of their thoughts on their task sheet through pictures, diagrams, words, and numbers.

ESSENTIAL QUESTIONS

- How can counting by five help me to determine time in an hour?
- What does telling time to the nearest five minutes mean?
- How can I determine the number of hours in a day?

MATERIALS

- Time Memory cards
- Class set of Judy Clocks or Geared Clocks
- "Time for Bed!" Student Task Sheet
- *It's About Time!* By Stuart J. Murphy, or another similar book about time

GROUPING

Small group, large group, individual

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Part I

Students will create a time match game. The teacher should prepare 5 or more pages of the pre-made set of clock cards for the children to program with different times. Each pair of students should have the same number of digital clock cards as analog clock cards. Stress the importance of programming each pair of cards with the same time (preferably with times other than on the hour or half hour.) It is important to check the clock cards before students begin playing the match game.

Student Directions

- You and a partner will use the stack of clocks to play a memory game.
- Lay all the cards face down on the floor in an array.
- Player number 1 turns over two cards and will say the time shown on each card as it is turned over. An appropriate statement might be, "The analog clock shows 5:20. The digital clock shows 8:10."
- If both cards revealed by the first player match then the cards are picked up by the player and two more cards may be turned over.
- If the cards turned over do not match then the cards are turned face down and it becomes the second player's turn.
- Continue the game until all cards have been picked up.
- The person with the most sets of cards at the end of the game wins.

FORMATIVE ASSESSMENT QUESTIONS

- What time is it on this clock? How do you know?
- Explain to me how to tell time.
- The hour hand is in between two numbers on a clock, how do I know what time it is?

Part II. Time for Bed

Gather students together in a common area. Read *It's About Time!* by Stuart J. Murphy or another similar book about time. Discuss and model scenarios from the story by asking students to identify a time during the day (am or pm), show it on an analog clock and write it on the board as they would see it on a digital clock, and name an event that would occur during that time.

Present the following problem on a Smart board, chart paper, document cam or overhead projector:

Julie was very grumpy at school because she had little sleep last night. She told her teacher that she went to bed long after her bed time of 8 p.m. What time could Julie have gone to bed? Show the time on an analog clock and explain why you think it is the time Julie went to bed.

Discuss how this problem can be solved (using a clock, making a chart, drawing a number line, etc.) Discuss different plans for solving the problems. Allow students to share strategies such as draw a diagram, make a list, guess and check, find a pattern, create a chart, work backwards, etc.

Have students work with a partner to carry out a plan. The teacher should ask student pairs about their plan including if the plans make sense, etc. Ask questions such as: What led you to choose this particular plan? How do you know your plan makes sense? Tell me about these numbers, what do they represent? Hours, minutes, seconds, or something else?

Observe students as they work. Have the students record strategies and solutions on their paper.

They should use pictures, words, and numbers to explain the solutions and justify their thinking.

After ample work time, have students share their ideas. Discuss the similar plans and the unique plans. This is an open-ended question and will have different combinations of responses. Include discussion of how each solution works.

FORMATIVE ASSESSMENT QUESTIONS

- What is your plan to solve this problem?
- How did drawing pictures help you solve this problem?
- Can you write a number sentence or use words to communicate your thinking?
- What do the numbers represent in this problem?
- What did you have to know in order to solve this problem?

FURTHER EXPLORATION

For students that need explicit practice distinguishing between a.m. and p.m., the activity A.M. or P.M.? On p. 5.15 of this site may be useful.
http://catalog.mathlearningcenter.org/files/pdfs/SecB2SUP-D5_MeasureTime-201304.pdf

DIFFERENTIATION

Extension

- Students can use clock times to create a story about a day on the farm, at the beach or somewhere else. This can also be linked to writing by creating a story of taking on another animal/character's point of view, such as the ladybug.

- Present this problem to the students:

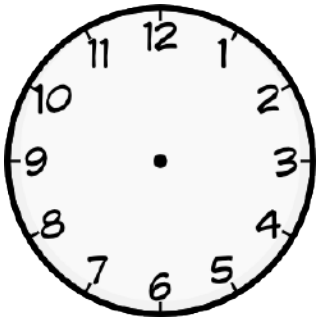
  Julie was very grumpy at school because she had little sleep last night. She told her teacher that she went to bed long after her bed time. What time do you think is her bedtime? Why? What time could Julie have gone to bed? Show the time on an analog clock and explain why you think it is the time Julie went to bed.

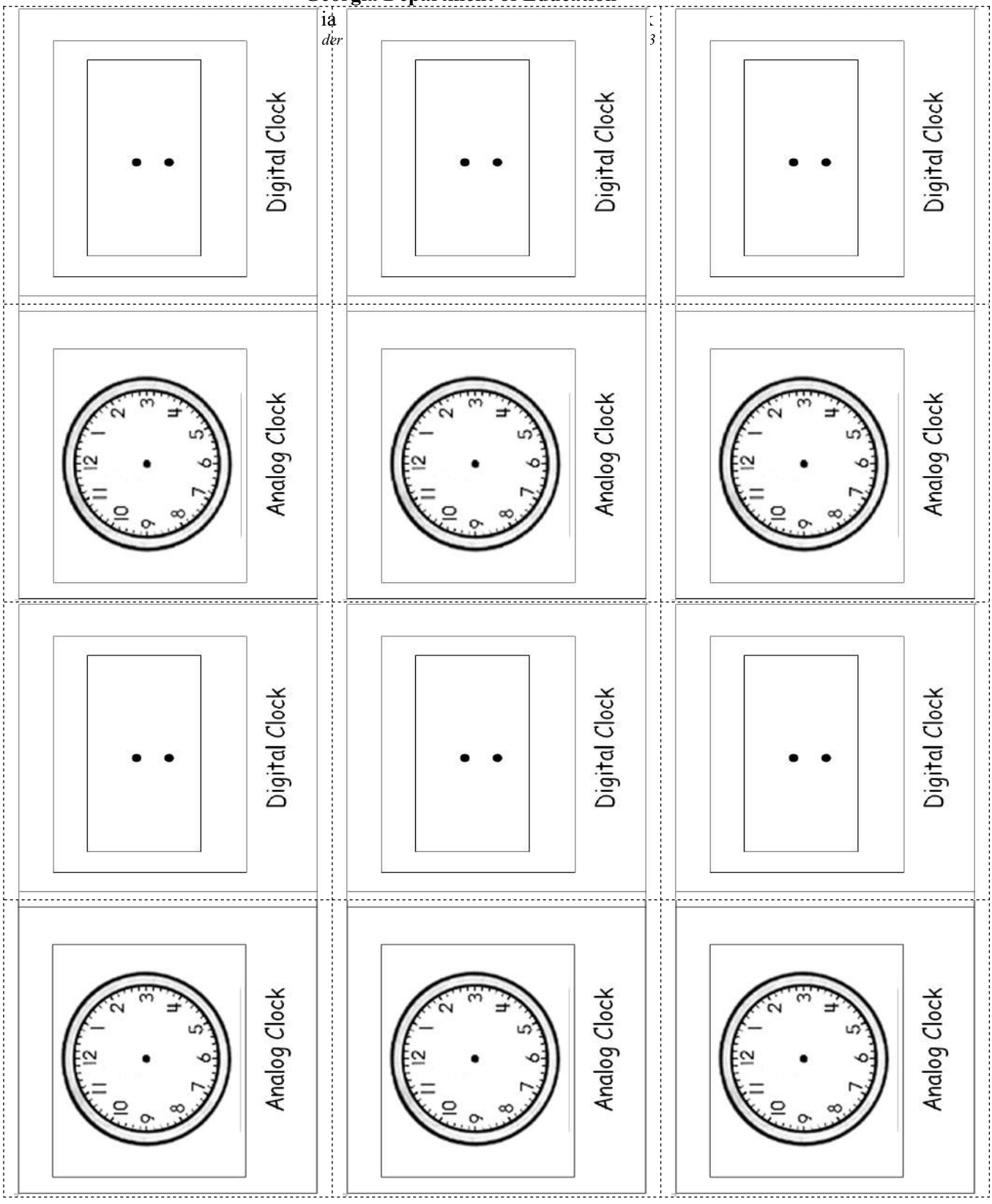
Intervention

- Allow students to use Judy Clocks or other commercially made clocks to model the time that is on the analog clock, so they can see the hands clearly. These clocks are great because they show how the hour hand and minute hand work together. They will also be able to see that when the minute hand is pointing to a number, they count by 5s to locate the minute. Students could also model the time that is on the digital clock using the Judy clock, so they will know what the analog clock will look like.
- A website that provides a CRCT computerized format of analog clocks is located at http://www.fi.edu/time/journey/JustInTIme/min-quiz.html .This quiz could be used as quick assessment of telling time.
- More telling time activities with lesson plans and games are located at http://www.fi.edu/time/journey/JustInTime/contents.html. This site offers practice on telling time to the hour, half hour, and five minute intervals.
- Provide students with this problem that attaches a unit to the problem:

Name_____

Julie was very grumpy at school because she had little sleep last night. She told her teacher that she went to bed long after her bed time of 8 p.m. What time could Julie have gone to bed? Show the time on an analog clock and explain why you think it is the time Julie went to bed.





Name_____ Date_____

Missed Bedtime

Julie was very grumpy at school because she did not get enough sleep last night. She told her teacher that she went to bed long after her bed time of 8 p.m. What time could Julie have gone to bed? Show the time on an analog clock and explain why you think it is the time Julie went to bed.

Performance Task: Measurement Olympics

In this task students participate in a series of measurement events.

STANDARDS FOR MATHEMATICAL CONTENT

MGSE2.MD.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

MGSE2.MD.2 Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen. Understand the relative size of units in different systems of measurement. *For example, an inch is longer than a centimeter.* (Students are not expected to convert between systems of measurement.)

MGSE2.MD.3 Estimate lengths using units of inches, feet, centimeters, and meters.

MGSE2.MD.4 Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

MGSE2.MD.7 Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.

STANDARDS FOR MATHEMATICAL PRACTICE

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
2. **Reason abstractly and quantitatively.**
5. **Use appropriate tools strategically.**
6. **Attend to precision.**

BACKGROUND KNOWLEDGE

(Information adapted from Mathematics Georgia Standards of Excellence State Standards and Model Curriculum, Ohio Department of Education Teaching)

These standards call for students to estimate the lengths of objects using inches, feet, centimeters, and meters. Students should make estimates after seeing a benchmark unit, such as the length of one inch, before making their estimate.

Example: Look at your ruler to see how long one inch is. Now, estimate the length of this paper in inches.

This task will encourage students to tell (orally and in writing) and write time after reading analog and digital clocks. Time should be to 5 minute intervals, and students should also use the

terms a.m. and p.m. Teachers should help students make the connection between skip counting by 5s (MGSE2.NBT.2) and telling time on an analog clock.

ESSENTIAL QUESTIONS

- Why is it important for us to know how to measure different objects using different tools of measurement?
- How do we read a clock to determine the time (hours and minutes)?

MATERIALS

- Rulers
- Cotton Balls
- Second Timers
- Internet Access (Optional)
- Recording Sheet
- Olympic Game Directions (Laminated- Optional)
- Elastic from a material store
- M&Ms or connecting cubes

GROUPING

Partners

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Divide the class into partners. The teacher may need to adjust activities according to the student ability levels. Discuss the events with the students as a whole class. Explain that prior to finding the true measurements, students must record their estimate. Below is a description of each event. Have the directions cards and the materials at each station as the Olympics start!
ENJOY THE OLYMPICS!

Cotton Ball Shot Put
Teacher should provide a starting line for students to throw the cotton ball and rulers

- Place feet on starting line. Throw the Cotton Ball Shot. (ONLY ONE THROW!)
- Estimate the distance (using inches) that you "put" the shot. Record that number on the recording sheet.
- Measure the actual distance from the starting line to the position of the cotton ball. Record that amount on the recording sheet.
- What is the difference between the estimate and actual measurement? Subtract the lowest number from the highest number. That will be your score for the event.

Big Foot Contest

- Look at the members that are in your group. Select the person who you believe has the longest foot.

- Make an estimate about how long you think their foot is (using centimeters/inches.)
- Record your estimate on your recording sheet.
- Measure the foot of the person selected in your group (using centimeters.)
- What is the difference between the estimate and actual measurement? Subtract the lowest number from the highest number. That will be your score for the event.

Length Layout

Teacher should provide a small package of M&Ms or connecting cubes to each student and a foot long ruler

- Select connecting cubes bag or open the pack of M&Ms.
- Estimate how many M&Ms you believe it would take to make one foot laying them one beside the other. Record your estimate on the recording sheet.
- Lay the M&Ms out next to the ruler. Get as close to 12 inches as possible.
- Count to see how many M&Ms it took. Record the number as the actual measurement.
- What is the difference between the estimate and actual measurement? Subtract the lowest number from the highest number. That will be your score for the event.

Time Barrier

(Information adapted from k-5 Math Teaching Resources, www.k-5mathteachingresources.com)

1. Work with a partner. Sit side by side with a divider standing between you.
2. Player 1: Make different times on each clock on your grid without letting your partner see your work.
3. Player 1: Give clear instructions to your partner on how to complete the clocks to match your grid. For example, you might say, "Write 3 o'clock on the clock in the center of your grid."
4. Player 2 tries to make his or her clocks match the directions from Player 1.
5. Remove the divider and look at the two completed grids to see how closely they match. Give yourself points for the clocks that match.
6. Switch roles and play again.

The Big Stretch

Provide students with a piece of elastic or a stretchy plastic animal from a discount store. The elastic can be cut into various lengths and students can choose the elastic they want to measure. You will also need to provide a ruler with inches in this area. The elastic should not be more than 8 inches long.

- Pick one piece of elastic (this is the piece you will be working with for this race.)
- Stretch the elastic as far as you can. Estimate how long you think the elastic is when it is stretched. Record that number as your estimate.
- Stretch the elastic again and have a friend measure the elastic as it is stretched using inches. Record that measurement as the actual measurement.
- What is the difference between the estimate and actual measurement? Find the difference between the two that will be your score for the event.

After each student has finished each race, add the score up. The person in the class with the **LOWEST** score is the winner, because that means their estimates and actual measurements were close. If you want to have teams total their scores together and award the team with the lowest score, this is an option as well.

FORMATIVE ASSESSMENT QUESTIONS

- At what events do you feel you were good?
- Which event did you struggle with the most?
- What do you think you could have improved upon?
- What tools are you good at using?
- How close were your measurement estimations?
- How could you improve if you did the events again?

Cotton Ball Shot Put

Materials:

- Starting line
- Cotton Ball
- Ruler
- Recording Sheet

1. Place feet on starting line – Throw the "Cotton Ball Shot." (ONLY ONE THROW!)

2. Estimate the distance (using inches) that you put the "shot" – Record that number on the recording sheet.

3. Measure the distance from the starting line to the position of the cotton ball. Record that amount on the recording sheet.

4. What is the difference between the estimate and actual measurement? Subtract the lowest number from the highest number. That will be your score for the event.

Big Foot Contest

Materials:

- Centimeter Ruler
- Recording Sheet

1. Look the members that are in your group. Select the person who you believe has the longest foot.

2. Make an estimate about how long you think their foot is (using centimeters).

3. Record your estimate on your recording sheet.

4. Measure the foot of the person selected in your group (using centimeters).

5. What is the difference between the estimate and actual measurement? Subtract the lowest number from the highest number. That will be your score for the event.

Length Layout

Materials:

- Small package of M&M's Candy or connecting cubes
- Foot Ruler

1. Open the pack of M&M's.

2. Estimate how many M&M's you believe it would take to make one foot laying them one beside the other. Record your estimate on the recording sheet.

3. Lay the M&M's out next to the ruler. Get as close to 12 inches as possible.

4. Count to see how many M&M's it took. Record the number as the actual measurement.

5. What is the difference between the estimate and actual measurement? Subtract the lowest number from the highest number. That will be your score for the event.

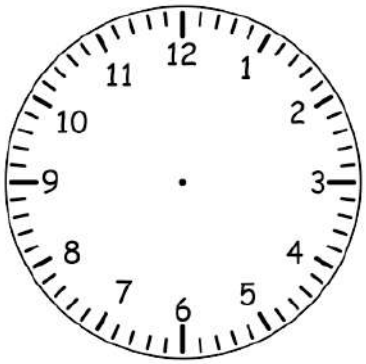
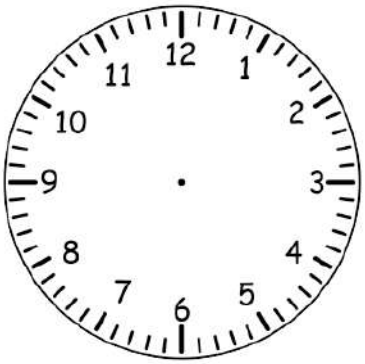
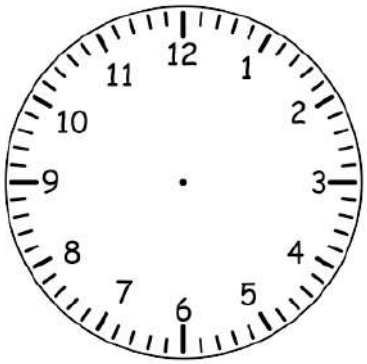
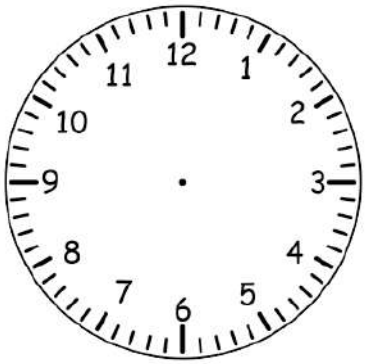
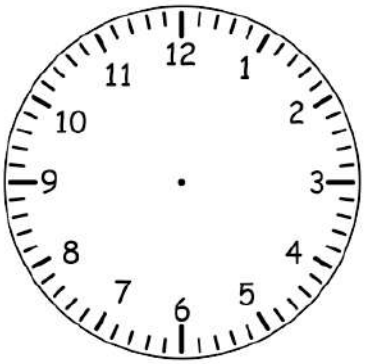
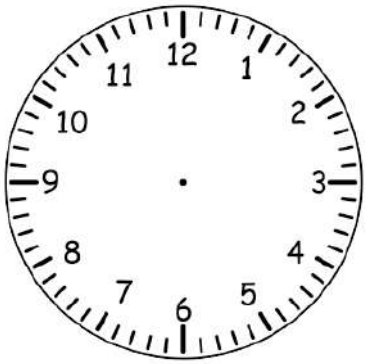
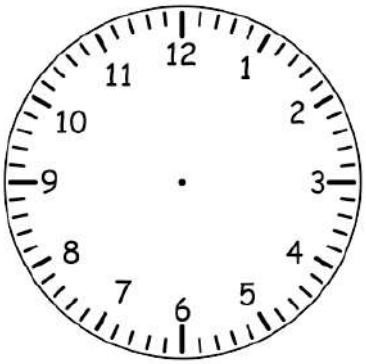
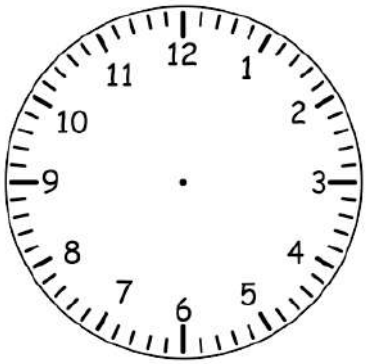
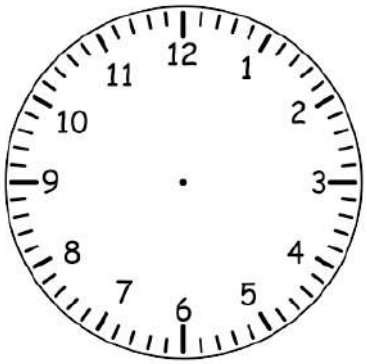
Time Barrier

Materials:

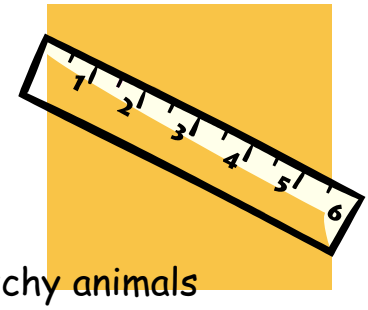
- Instructional clocks with hands that move
- Time Barrier Grid sheet

1. Work with a partner. Sit side by side with a divider standing between you.
2. Player 1: Make different times on each clock on your grid without letting your partner see your work.
3. Player 1: Give clear instructions to your partner on how to complete the clocks to match your grid. For example, you might say, "Write 3 o'clock on the clock in the center of your grid."
4. Player 2 tries to make his or her clocks match the directions from Player 1.
5. Remove the divider and look at the two completed grids to see how closely they match. Give yourself points for the clocks that match.
6. Switch roles and play again.

Time Barrier Grid

 :	 :	 :
 :	 :	 :
 :	 :	 :

The Big Stretch



Materials:

- Pieces of elastic cut various lengths or stretchy animals
- Ruler with inches

1. Pick one piece of elastic (or animal.) This is the piece you will be working with for this "race".

2. Stretch the elastic as far as you can. Estimate how long you think the elastic is when it is stretched. Record that number as your estimate.

3. Stretch the elastic again and have a friend measure the elastic as it is stretched using inches. Record that measurement as the actual measurement.

4. What is the difference between the estimate and actual measurement? Subtract the lowest number from the highest number. That will be your score for the event.

Name _____ Date _____

Measurement Olympics Recording Sheet

Olympic Game	Estimate	Actual	Write the equation and difference.
Cotton Ball Shot Put			
Big Foot Contest			
Length Layout			
All Right Relay			
Time Barrier			
The Big Stretch			
Individual Olympic Score!			

Performance Task: Lizards, Lizards, Everywhere!

In this task, students measure lizards in centimeters and use the data to create a line plot.

STANDARDS FOR MATHEMATICAL CONTENT

MGSE2.MD.1. Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

MGSE2.MD.9 Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units.

STANDARDS FOR MATHEMATICAL PRACTICE

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below.

1. **Make sense of problems and persevere in solving them.**
5. **Use appropriate tools strategically.**
6. **Attend to precision.**
7. **Look for and make use of structure.**

BACKGROUND KNOWLEDGE

(Information quoted from Van de Walle and Lovin, Teaching Student-Centered Mathematics: Grades K-3, pages 323, 325)

"Line graphs and line plots do show trends or tendencies that cannot be shown in bar graphs, and students should be encouraged to use them when appropriate."

"When data are depicted on a number line, such as in a line plot or histogram, the idea of data that are spread out or grouped together takes on a numeric meaning as well. For example, in a measure of the heights of boys and girls in inches, we might notice that girls' heights are spread over a wider range than the boys'. The boys' heights may cluster around a particular height."

ESSENTIAL QUESTIONS

- Why is it important to be able to organize and graph data?
- How do you know what type of graph to use?
- Why is it important for us to know how to measure different objects using different tools of measurement?

MATERIALS

- Lizards Recording Sheet
- Centimeter Ruler
- Paper

GROUPING

Individual

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

This is a culminating task for the standards in the unit of measuring and using a line plot graph.

The students will be given a recording sheet that has graphics of lizards on it. Using a centimeter ruler the students will measure each lizard in centimeters. After measuring each lizard in centimeters, the students will then use that data to create a line plot graph that displays the lizard population at the zoo.

Students will be required to create the line plot graph, label all parts of the graph, and also add sentences about the graph they created.

FORMATIVE ASSESSMENT QUESTIONS

- Can you show me how you measured this (teacher points) lizard with your ruler?
- Explain to me how to use a ruler.
- How do you build a line plot graph?
- Where do the numbers on the number line of a line plot graph come from?
- What do you notice about your line plot graph?
- What do you think might challenge others when creating a line plot graph?

Name: _____ Date _____

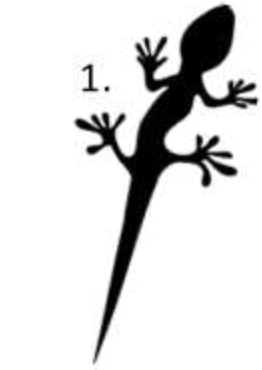
Lizards, Lizards, Everywhere!

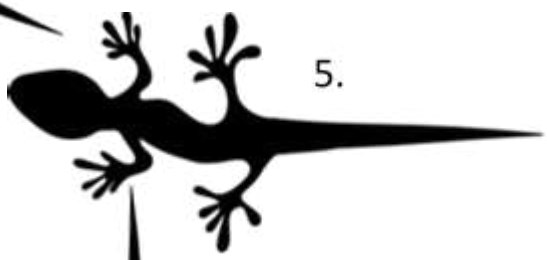
The zoo has many new lizards. Please help collect some data on their lizard population. Measure the lizards to the nearest whole **centimeter**.

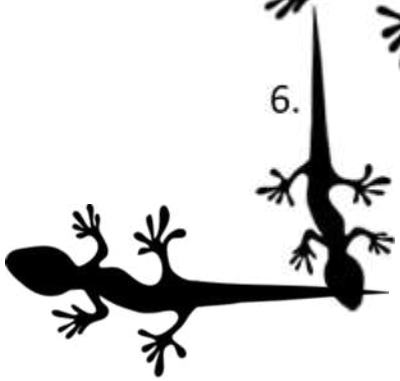
Lizard 1	_____	cm	Lizard 9	_____	cm
Lizard 2	_____	cm	Lizard 10	_____	cm
Lizard 3	_____	cm	Lizard 11	_____	cm
Lizard 4	_____	cm	Lizard 12	_____	cm
Lizard 5	_____	cm	Lizard 13	_____	cm
Lizard 6	_____	cm	Lizard 14	_____	cm
Lizard 7	_____	cm	Lizard 15	_____	cm
Lizard 8	_____	cm			

Create a line plot to display the data.

What do you notice about your line plot? What question/s can be answered by analyzing your line plot?







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