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Grade Level: Grade 4
Content Area: Math
STEM Connection: Computer Science - Robotics
Approximate Time to Complete: Five Class Periods

Lesson Title and Description: 4th Grade - Measurement & Data - Relative Sizes of Measurement

Computer Science and Digital Literacy Standards AND/OR NYSSLS Engineering Standards:

NYS K-12 Computer Science and Digital Fluency Standards 4-6.IC.5
Explain how computer systems play a role in human decision-making.

New York State Learning Standards:
NY-4.MD.1 Know relative sizes of measurement units: ft., in.; km, m, cm
(e.g., An inch is about the distance from the tip of your thumb to your first knuckle. A foot is the length of two-dollar bills. A meter is about the height of a kitchen counter. A kilometer is 2 ½ laps around most tracks.)
4.MD.3 Apply the area and perimeter formulas for rectangles in real world and mathematical problems.

Student Learning Objectives: Students will be able to show the known size of measurement, in regard to distance or length, of given objects, by using a robot to move the length of that object.

Culturally Responsive-Sustaining Education Framework:

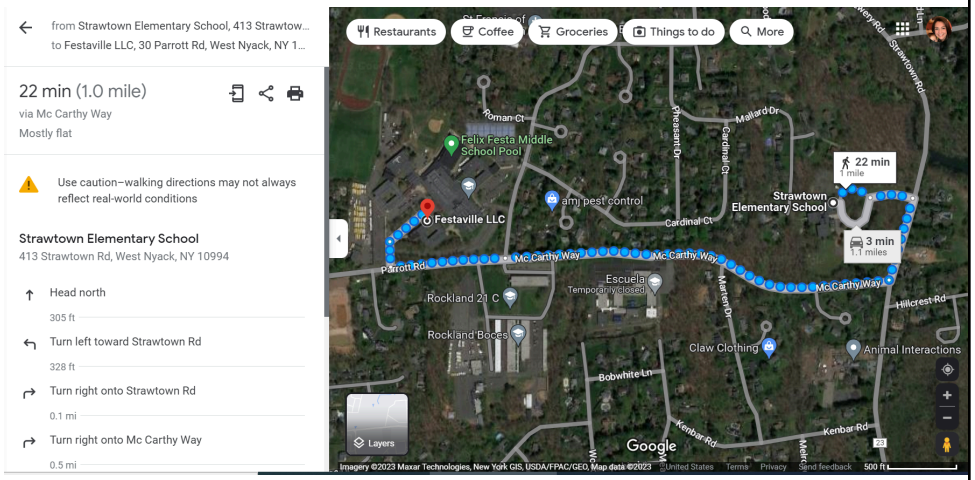
1. Student Choice: Students will have a choice as to what they want to measure with their robot.
2. Welcoming: Students will be invited to join their team with warmth and respect.
3. Affirming: Students will be listened to; their concerns, questions, and engagement will be celebrated and respected.
4. Cultural identities: Students will be asked to bring in one item, or just the length of said item, from home that they can measure in the classroom with the robots.

Deep Learning: Choice - Students will be able to choose objects they care about, or things that they see every day. They will be able to apply their knowledge by moving their bodies physically and engaging in their learning.

5E Instructional Sequence

Teacher and Student Activities How are you facilitating student understanding? How are the students building understanding?	**Resources** What resources will you and the students use?
Elicit and Engage: Describe you will capture the students' attention, activate prior knowledge, and stimulate student thinking.	
Day 1: Students will be introduced to the Sphero Indi Robots. **Objective: Students will learn about Sphero Indi Robots by using them in small groups to complete given tasks.** Teacher will model how to take them out. Teacher will model how to turn them on. Teacher will display what each color code tells the robot to do. Teacher will model how to use the colored coding mats to give the Indi robot directions. Students will take out the robot in pairs. Students will turn on the robots. Students will use the given display to code the robots to move: - straight line, - box, zig zag, - under a desk, - around a student	1. Indi Robots + accessories. 2. Large space on the floor. 3. Worksheet 4. Ruler, Yard Stick,

- create your own!	
Explore: Describe how you will give students an opportunity to think, plan and organize collected knowledge.	
Day 2: Students will explore the estimation of how big objects are. Objective: Students will deepen their knowledge of units of measurement by engaging with visuals (eg: video - Item #2, worksheets, Anchor chart - Item #1) and explore the classroom to find things to measure. Teacher will display Measuring Units Anchor Chart (Item #1). (Differentiated for students in a Self Contained Classroom.) Students will hold up a silent symbol for recognizing or KNOWING each of the words on the Anchor Chart. (ex: "Hold up a 1 if you've heard of an inch? Hold up a 2 if you know how big an inch is? Show me with your fingers/hand." etc.) Teacher will play the following video. Inches, Feet and Yards Song | Measurement Song | Customary Units Students will be directed to walk around the classroom to look for something that is an inch. - Repeat this with a foot and a yard. As a group, discuss how far away a mile is compared to their current location. Example from Strawtown Elementary School:	1. Indi Robots + accessories. 2. Large space on the floor. 3. Anchor Chart - Item #1 4. Video - Item #2



Students will think about the questions:
What is a mile away? - Can you use Indi Robots to go this far?
What is an inch long? - Can you use Indi Robots to go this far?
What is a yard long? - Can you use Indi Robots to go this far?
What is a cm long? - Can you use Indi Robots to go this far?
What is a foot long? - Can you use Indi Robots to go this far?
What is a meter long? - Can you use Indi Robots to go this far?

Explain: Describe how you will involve students in an analysis and explanation of their experiences. Use reflective activities to help students clarify and modify their understandings and make meaning.

Day 3: Students will explore the estimation of how big objects are.

Objective: Students will be able to measure the distance that an Indi robot will go off of one green mat, two green mats, etc.

Activity: Exploring Relative Sizes of Units (20 minutes):

1. Divide the class into small groups and distribute one Sphero Indi robot per group.
2. Instruct students to use the measuring tape to measure the distance the robot can travel in different units of measurement (ft., in., m, cm, km).

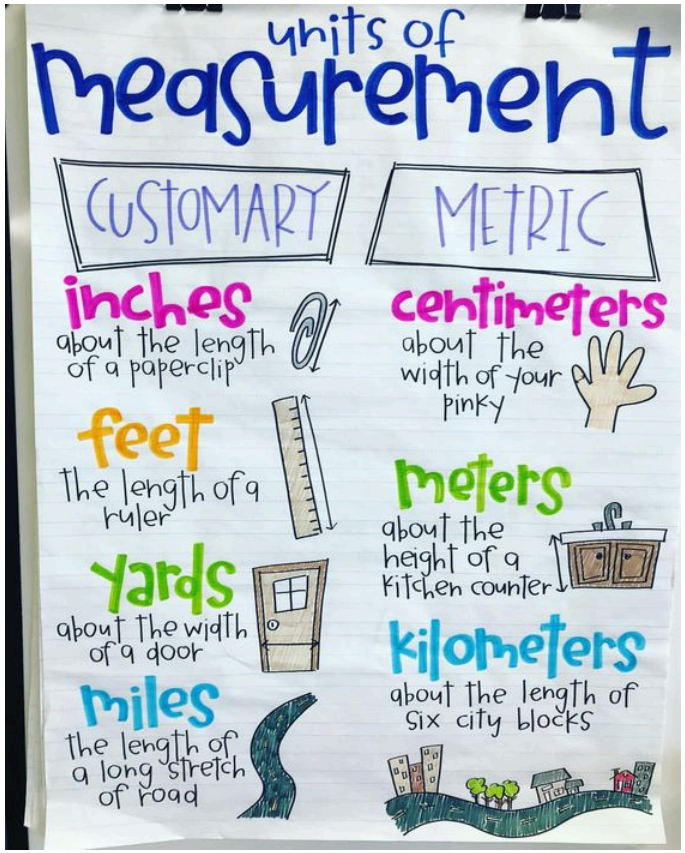
1. Indi Robots + accessories.
2. White Board
3. Dry Erase Markers
4. Large space on the floor.

3. Ask students to record the distance measurements for each unit on a whiteboard. 4. Have each group present their findings to the class and discuss the differences in the distance measurements for each unit.	
Elaborate: How will the students have the opportunity to expand and solidify their understanding and apply what they have learned?	
Day 4 Activity: Students will measure one item from home using the Indi robots. Students will use their knowledge of measuring with robots and knowing relative sizes, by applying their new skills to find the PERIMETER of shapes. (eg: the rug, a car, a desk) 1. Divide the class into small groups and distribute one Sphero Indi robot per group. 2. Instruct students to use one desk table and have the indi robot "walk" the perimeter of the table. 3. Students will count how many "squares" it takes to go the length and width of a table. 4. Students will repeat this process for a chair.	1. Indi Robots + accessories. 2. Table 3. Chair 4. Grid on Anchor Chart Paper 5. Large space on the floor.
Evaluate: Describe your final evaluation technique. Also, describe how you will use formative and summative assessment throughout the lesson and how you will involve students in evaluating their progress.	
Activity: Exploring Relative Sizes of Units (20 minutes): 1. Divide the class into small groups and distribute one Sphero Indi robot per group. 2. Instruct students to use the measuring tape to measure the distance the robot can travel in different units of measurement (ft., in., m, cm, km). 3. Ask students to record the distance measurements for each unit on a whiteboard.	

4. Have each group present their findings to the class and discuss the differences in the distance measurements for each unit. Assessment (10 minutes): 1. Student participation in group activities 2. Accuracy of distance measurements recorded on the whiteboard 3. Completion of worksheet with 80% accuracy	

Support Items for the Unit:

Item #1 - Anchor chart to be displayed on Day 2



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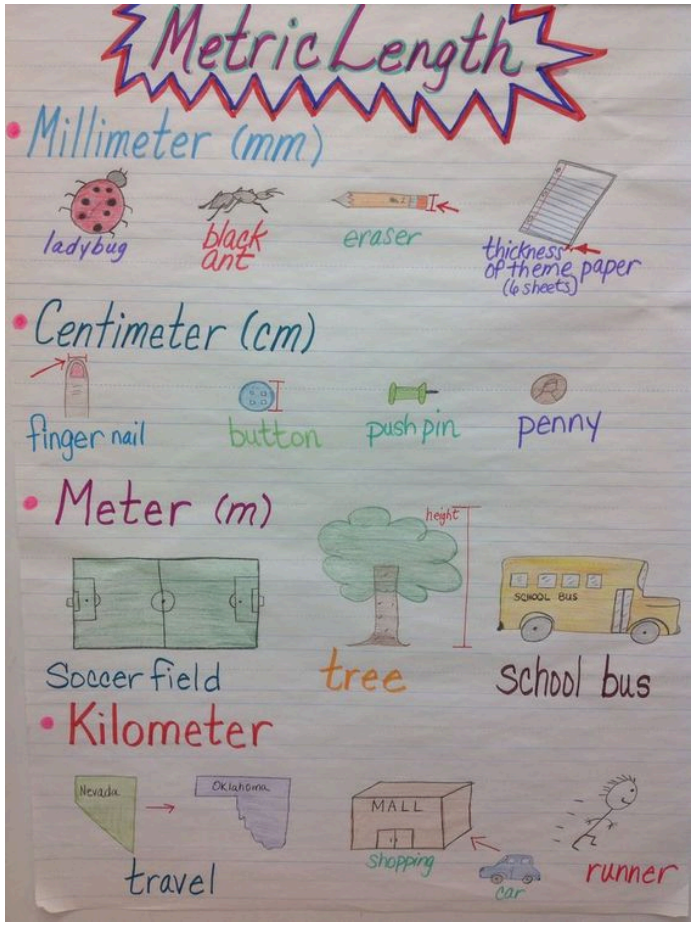
Item #2 - Video for viewing on Day 2

Inches, Feet and Yards Song | Measurement Song | Customary Units


Metric Length
Millimeter (mm)
ladybug
black ant
eraser
thickness of theme paper (6 sheets)
Centimeter (cm)
finger nail
button
push pin
penny
Meter (m)
height
SCHOOL BUS
Soccer field
tree
school bus
Kilometer
Nevada
Oklahoma
MALL
travel
shopping
car
runner