

STEM

Education & Outreach

Go The Distance!

Grade level: 2-5

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Vocabulary words
are **bolded**
throughout
the booklet!



Vocabulary

Accurate: All of the details are correct.

Area: The amount of space covered by a flat surface or piece of land, described as a measurement.

Measure: To find the exact size, weight, or amount of something using a ruler, yardstick, scale, or another measuring tool.

Distance: A measure of the space between two things.

Perimeter: The distance around the outside of a shape.

Ratio: A way to compare different things to one another.

Scale: The similarity in measurement of the original object compared to another object. *The scale of a map shows the ratio between the distances on the map and the same distances in reality.*

Stakes: Markers in the ground to show the boundaries of land.

Stride: A long step or the distance covered by a normal step.

Surface: The area inside a boundary.

Surveyor: Professionals who determine the positions of objects in the real world.

Background

Measuring Area

Imagine you are walking by your new community center and see a sign that says: “New playground coming soon. Student helpers wanted!” You think it would be great to have a cool new playground with a big slide, a rope course, and large swings for your friend Kiki who uses a wheelchair. You love to build things so you decide to ask if you can help plan the playground.

At the first meeting, you meet someone called a **surveyor**. The **surveyor** walks around the **perimeter** of the new playground to show where it will be.

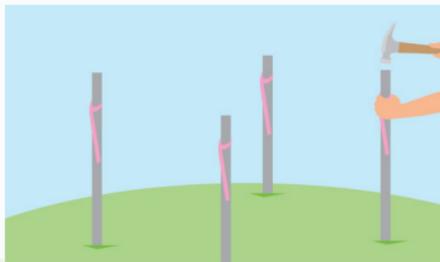
“Students, it’s important that we make sure that everything can fit inside of this **area**. These **stakes** show



Fact:

3 feet = 1 yard!



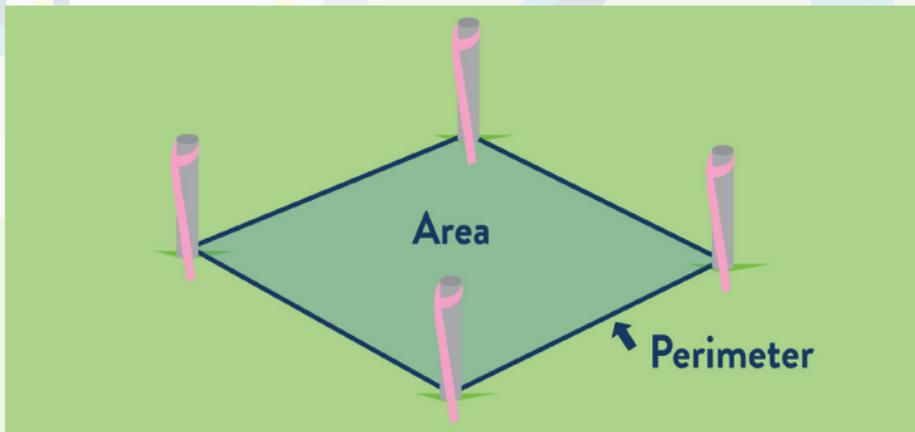


These stakes show where the boundaries are.

the **boundaries** of our new playground. This is all the room that we have, so we can't plan our playground past these **stakes**."

As you walk around the **perimeter**, you imagine all the cool things you will have at the new playground. You

wonder: Will it all fit in this space? How will we know how big or small to make things? Where should the swings go? The big slide? Will Kiki's wheelchair be able to get from one place to another? You have a lot to learn, but planning a playground is going to be a blast!



The stakes help mark the perimeter and the area

Did You Know?

A **surveyor** is a professional who measures distances between things on land. Finding this information is called surveying.

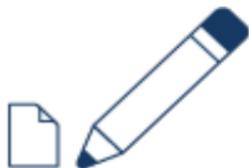
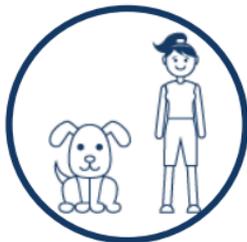
A construction **surveyor** makes sure roads and buildings are built in the right place.

Now is your opportunity to be a **surveyor**. Follow the directions to practice an important surveying skill—measuring distances.



Matching

Circle the image with the correct scale as shown in the example below. The **ratio** of the two objects should match examples in real life:



Materials



Using a printed booklet:

1. Printer



Using a digital booklet:

1. Tablet or smartphone



Materials

All:

1. Ruler or measuring tape (optional: yard stick)
2. Writing and/or drawing utensils (pen, pencil, crayons, markers)
3. Paper and tape or post-it notes
4. 3 feet of string/yarn/rope
5. Clipboard or hard surface to write on
6. Small object for counting (a toy, rock, etc.)





Activity

1. Gather all your materials. Younger students should find an adult or older friend to help.

- a. **FOOT MEASUREMENT:** Using a ruler, measure your foot from the back of your heel to the tip. (Or trace your foot on paper and measure on the paper.)



Each step you walk heel to toe will help you measure distance. For example: If your foot is 6 inches long and you walk heel to toe, switching feet, 10 times, you will have walked 60 inches (6x10). There are 12 inches in a foot, so $60 \text{ inches} \div 12 \text{ inches} = 5 \text{ feet}$.

My foot is _____ inches.

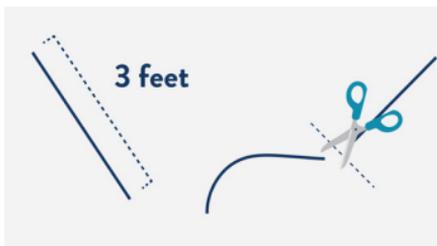
- b. **STRIDE MEASUREMENT:**
Your **stride** is how long your normal step is. Grab two socks and place one on the floor. Stand with one foot on top of sock 1 and take a normal step. Place sock 2 where your foot lands.



Measure between the socks with a ruler or measuring tape and write that number below:

My stride is _____ inches.

- c. **STRING MEASUREMENT:**
Lay a piece of string on the ground and measure out 3 feet. Lay a ruler or tape measure starting at one end of the string and pull it out until you find 3 feet or 36 inches. Cut the string at 36 inches.



2. In your home (or a friend's home), find an object in the room, like a wall, refrigerator, or table. Label this object "Point A" with paper, tape, or a post it.
-

My point A is: _____

3. Find another object on the other side of the room. For example: This could be another wall, chair, window, or door. Label this object "Point B."
-

My point B is: _____

4. **FOOT MEASUREMENT:**
Using your foot measurement, walk heel to toe from Point A to Point B.

Write the distance here:

_____ footsteps

5. STRIDE

MEASUREMENT:

Measure the **distance** again using your stride. Start at **Point A** and walking with your natural stride, count how many strides it takes to get to **Point B**.

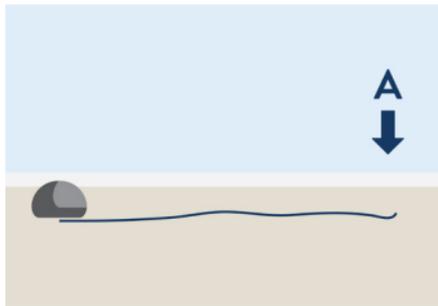
Write the distance here:

_____ strides

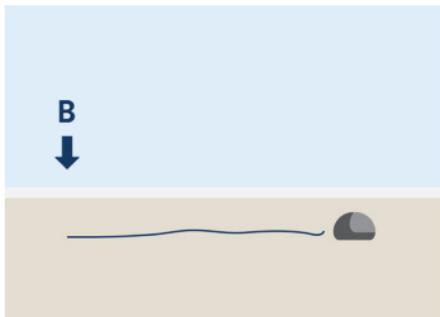
6. STRING

MEASUREMENT:

Measure the **distance** one last time using the string. You will need a rock or other small object. Put the end of the string at **Point A**, stretch the string out as far as it can go. Place your rock here and count one. Pick up the string and put one end where the rock is and



stretch it again. Move the rock to the end of the string and count 2. Repeat until you get all the way to Point B. Don't forget to count or tally each time you lay out the string. If you hit Point B in the middle or other point on the string, mark where it ends and measure that portion. For example, write: $3 \frac{1}{2}$ strings.



Write the distance here:

_____ strings

7. Calculate the distance from Point A to Point B using the three different measurement methods below so that they are all in inches. See the first row for an example. Feel free to use a calculator if you like!

Measuring Tool	LENGTH of the tool in inches	COUNT how many measuring tools it took to get from Point A to B	Total inches: LENGTH x COUNT = total inches
Ruler	12 inches	10 rulers	12x10= 120 in.
Footstep	____inches (see 1a)	____steps (see 4)	____x____ = ____
Stride	____inches (See 1b)	____strides (see 5)	____x____ = ____
String	36 inches	____strings (see 6)	____x____ = ____

8. Think!

Which tool was easiest to use and why? (circle one)

The FOOT / STRIDE / STRING was easiest to use

because _____

Which tool do you think is most accurate (correct)?

Why? (circle one)

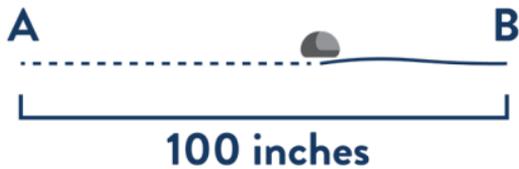
I think the FOOT / STRIDE / STRING measure tool is

most accurate because _____

Optional Activity: Scale

9. Because our paper is small, we must scale the distance between Point A and Point B down to fit on the paper. We have to divide by a number so that point A and Point B will fit on the paper. For example, if the distance between Point A and Point B is 100 inches, we could divide by 20.

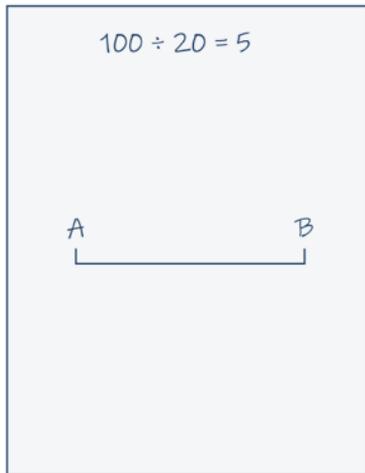
$100 \text{ inches (real life distance)} \div 20 \text{ inches (scale of change)} = 5 \text{ inches (scaled measurement)}$. In the journal, this person would draw a line that is 5 inches across and mark one end Point A and the other end Point B. In this example, 1 inch = 20 inches in real life. This means that every 1 inch of distance in the drawing, that accounts for 20 inches in the room.



10. Now let's draw the distance between your Point A and Point B. Choose one of the measurements from Step 7 in inches. For example, if you choose the STRING METHOD, use that measurement you got in inches.

The distance between Point A and Point B using my FOOT/STRIDE/STRING method is _____ inches.

11. Challenge yourself to draw your Point A and Point B in the space provided on pages 18 and 19 to scale. Mark Point A and Point B using letters and draw a line to indicate the scaled distance between the two using your ruler.



1 inch = _____ inches

in real life



My Drawing

Conclusions help us understand what happened in an experiment.

Conclusion



1. Why is it important for surveyors to measure accurately?



2. Can you name three types of projects a surveyor might work on?

1. _____

2. _____

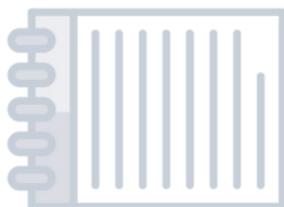
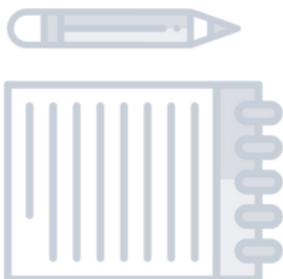
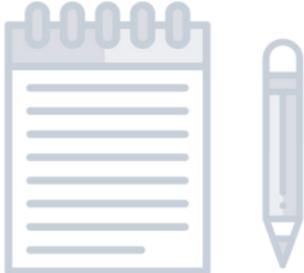
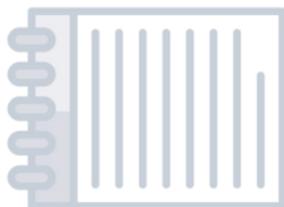
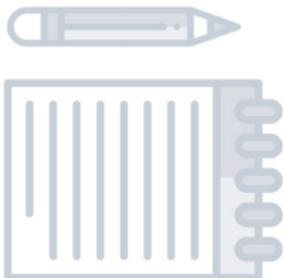
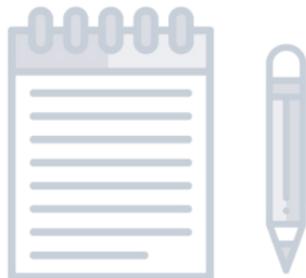
3. _____



3. Why is it important to understand scale?

4. Would you want to be a surveyor? YES / NO
Why or why not? _____







Lesson Plan



Adults can cut out this lesson plan to help guide students.

Go The Distance!

Subject: Science

Grade level: 2-5

Time: 60 minutes

Overview: Surveyors will measure a **distance** using 3 different measurement tools. They will show a scaled version of the **distance** in their booklet.

Objectives:

- Make a hypothesis
- Observe and make conclusions
- Articulate the scientific findings

Essential Questions: What does a **surveyor** do? How do you **measure** a large space or **distance** and **scale** it down to a map? Why do we need to know the **distance** between objects?





Lesson Plan

Materials:

- Using a printed booklet:
 - Printer
- Using a digital booklet:
 - Tablet or smartphone
- Ruler or measuring tape (optional: yard stick)
- Writing and/or drawing utensils (pen, pencil, crayons, markers)
- 3 feet of string/yarn/rope
- Clipboard or hard surface to write on
- Small object for counting (a toy, rock, etc.)

Instructions:

1. Students will try each of the ideas below to create ways to measure **distances**.
 - FOOT MEASUREMENT : Using a ruler, **measure** your foot from the back of your heel to the tip.
 - STRIDE MEASUREMENT: Your **stride** is how long your normal step is. Grab two socks and place one on the floor. Stand with your



Lesson Plan

toes touching sock 1 and take a normal step. Place sock 2 where your foot lands. *Measure between the socks with a ruler or measuring tape to determine your stride measurement.*

- STRING MEASUREMENT: Lay a piece of string on the ground and measure out 3 feet. Lay a ruler or tape measure starting at one end of the string and pull it out until you find 3 feet or 36 inches. Cut the string at 36 inches.
- 2. In your home, find an object in the room and label it as “Point A.”
- 3. Find another object and label it as “Point B.”
- 4. FOOT MEASUREMENT: Using your foot measurement, walk heel to toe from Point A to Point B.
- 5. STRIDE MEASUREMENT: Measure the **distance** again using your stride. Start at Point A and walking with your natural stride, count how many strides it takes to get to Point B.
- 6. STRING MEASUREMENT: Measure the **distance** one last time using the string. Put the end of



Lesson Plan

the string at Point A, stretch the string out as far as it can go and count “1.” Mark where the string ended with a rock or small object and then pick the string up, stretch it out again- and count “2.” Repeat until you get to the all the way to Point B.

7. Calculate the **distance** of each measurement using the table provided so that they are all in inches.

Optional Activity: Scale

8. Because our paper is small, we must **scale** the **distance** between Point A and Point B down to fit on paper.
9. Choose one of the measurements from Step 7.
10. Challenge yourself to draw your Point A and Point B in the space in provided in the booklet to **scale**.



My Notes





My Notes

A large, empty rectangular frame with a dark blue border, intended for writing notes.



My Notes

A large, empty rectangular frame with a dark blue border, intended for writing notes.

