



3.1 Map Scales

READ


Mapmakers have developed a tool that allows them to accurately draw the entire world on a single piece of paper. It's not magic—it's drawing to scale. To be useful, maps must be accurately drawn to scale. The mapmaker must also reveal the scale that was used so that a map-reader can appreciate the larger real-life distances. The scale is usually written in or near the map's legend or key.

There are three kinds of map scales: fractional, verbal, and bar scales. A fractional scale shows the relationship of the map to actual distance in the form of a fraction. A scale of $1/100,000$ means that one centimeter on the map represents 100,000 centimeters (or 1 kilometer) of real life distance.

A verbal scale expresses the relationship using words. For example, "1 centimeter equals 500 kilometers." This is a more usable scale, especially with large real-life distances. With a scale of $1 \text{ cm} = 500 \text{ km}$, you could make a scale drawing of North America on one piece of paper.

A bar scale is the most user-friendly scale tool of all. It is simply a bar drawn on the map with the size of the bar equal to a distance in real life. Even if you do not have a ruler, you can measure distances on the map with a bar scale. Just line up the edge of an index card under the bar scale and transfer the vertical marks to the card. Label the distances each mark represents. You can then move the card around your map to determine distances. You might wonder what you should do if a location falls between the vertical interval lines. You must use estimation to determine that distance. Be careful to look at the scale before estimating. For example, if the distance falls half-way between the 10 and the 20 kilometer scale marks, estimate 15 kilometers. If the scale is different and the distance falls half-way between 30 and 60 kilometer marks, you must estimate 45 kilometers.

Types of map scales		
Fractional $1/1,000,000$	Verbal $1 \text{ cm} = 1 \text{ km}$	Bar

Let's explore the different kinds of scales. You will need centimeter graph paper, plain paper, an index card, and a centimeter ruler or measuring tape for these activities.

EXAMPLES

Fractional scale

Materials: Graph paper

Trace a simple object on a piece of graph paper. (A large paper clip, pen, small scissors, or paperback book works well.) Now make a scale drawing of the object using the fractional scale of $1/4$. (Remember this means that for every 4 blocks occupied in the original tracing, you will have only one block on the scale drawing.) Be sure to label the scale on the finished scale drawing.



Verbal scale

Materials: Centimeter graph paper and centimeter measuring tape or ruler.

You are going to make a scale drawing of a person. Ask a classmate to stand against a wall with his/her arms outstretched to the side. Take 4 measurements in centimeters: 1) Distance from top of head to floor. 2) Distance from right finger tip to left finger. 3) Distance from top of head to shoulders. 4) Distance from shoulders to waist. Write the verbal scale of “1 cm equals 10 cm” on the bottom of a piece of centimeter graph paper. On that paper translate the measurements that you took into a simple figure drawing of your classmate. (Remember if a measurement is 25 centimeters in real life, you will have to make a drawing that is within 2 ½ centimeter blocks of the graph paper.)

Bar scale

Materials: Plain paper and centimeter ruler or tape.

Position the paper so that it is wider than it is long.

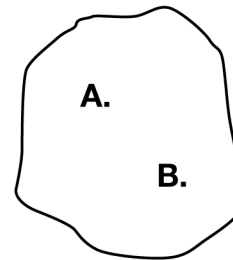
Draw a bar scale that is a total of 6 centimeters long at bottom of the paper. Make four vertical marks at 0 cm, 2 cm, 4 cm, and 6 cm. Write “0” over the first mark, “50” over the second, “100” over the third and “150” of the last mark. Underneath the bar write “Kilometers.” Mark “N” for north at the top of your paper. Now use your imagination to draw an island (of any shape) that is 450 miles long and 200 miles wide at its widest point. Draw a star to mark the capital city, which is located on the northern coast 100 miles from the west end of the island.

PRACTICE

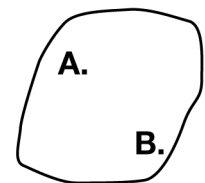


- Answer these questions about Andora and Calypso:
 - Which island appears bigger?
 - Can you tell whether you can ride a bike in one day from point A to point B on either map? If no, why not?
 - Measure the distance from the center of the dot to the right of A to the center of the dot to the left of B on both maps. Are the measurements the same?
 - If the measurements are the same on both maps, does that mean the distance from point A to point B is the same on both maps? Explain your answer.
 - Let's write in the scale for these two islands. Write the scale of 1 cm = 5 km on Andora. Write the scale of 1 cm = 1000 km on Calypso. Now answer the question, which island is bigger?
- On the next page is a map of Monitor Island. Use the bar scale to find distances on this island. Assume that you are measuring “as the crow flies.” That means from point to point by air because there are no roads to follow. Always measure from dot to dot, and be sure to label your answers in kilometers.
 - Point L to Point M
 - Point Y to Point Z
 - Point Z to Point P
 - Point P to Point M
 - Point Q to Point T

Andora



Calypso





- f. Point Q to Point M
- g. Point T to Point M
- h. Point Z to Point P to Point X
- i. Point X to Point L to Point M
- j. Point X to Point P to Point Z to Point Y

Bonus: Measure around the coast of Monitor Island. It's hard to be exact, but write your best estimate.

Monitor Island

