

Scaling in Maps

On a map you often see a **scale** such as 1:120,000 or 1:10,000 or 1:2,000,000. These scales are simply ratios that tell you how the distances measured on the map relate to distances in reality.

A scale of **1:120,000** means that **1 unit on the map corresponds to 120,000 units in reality**. This holds true whether you use centimeters, millimeters, or inches as your units. So 1 cm on that map corresponds to 120,000 cm in reality. And 1 inch on the map corresponds to 120,000 inches in reality.

Example 1. A map has a scale 1:150,000. How long in reality is a distance of 7 cm on the map?

Since 1 cm corresponds to 150,000 cm, then 7 cm corresponds to $7 \times 150,000 \text{ cm} = 1,050,000 \text{ cm}$. To be useful, this figure needs to be converted to kilometers. You can do this in two steps:

1. From centimeters to meters: Since $1 \text{ m} = 100 \text{ cm}$, we knock two zeros off of 1,050,000 cm to get 10,500 meters (or you can think of dividing by 100).
2. From meters to kilometers: Since $1 \text{ km} = 1,000 \text{ m}$, then 10,500 meters corresponds to 10.5 km (or you can think of dividing by 1,000).

So 7 cm on the map represents 10.5 km in reality.

1. A map has a scale ratio of 1:20,000.
Fill in the tables.

| on map | in reality (m) |
|--------|----------------|
| 3 cm | |
| 5 cm | |

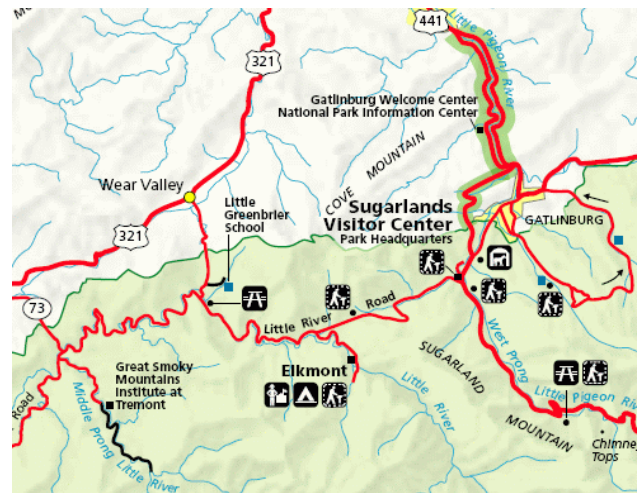
| on map | in reality (km) |
|--------|-----------------|
| 17 cm | |
| 22 cm | |

2. A ski track measures 5.2 cm on a map with a scale of 1:100,000.
How long is the ski track in reality?

3. Measure the air (aerial) distances with a centimeter ruler and then calculate the distances in reality.
(*Air distances* are distances you measure directly from point to point and not by following along the roads.)

The places are marked with squares on the map.

- a. from Elkmont to the Gatlinburg Welcome Center
- b. from the Great Smoky Mountains Institute at Tremont to the Little Greenbrier School
- c. from the Little Greenbrier School to Elkmont



Scale 1:180,000