

Grade 7 - Scale Drawings - Lesson

Common Core 7.G.A.1 · maths-pdf.fr/en/

A scale drawing is a copy of a real object in which all lengths change by the same factor. The scale, such as 1 inch = 5 feet, works like a rate: multiply a drawing length by it to get the actual length. Areas change by the square of the scale factor.

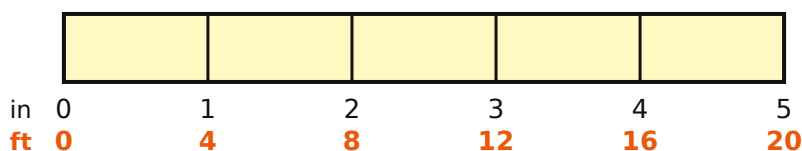
Grade 7 · Common Core State Standards: **7.G.A.1**

Key facts

- The scale is a rate: $1\text{ in} = 5\text{ ft}$ means 5 feet per 1 inch.
- Actual length = drawing length * rate; drawing length = actual length ÷ rate.
- Scale factor compares drawing length to actual length in the same units.
- Actual area = drawing area * (rate)².
- To change scales, find actual lengths first, then divide by the new rate.

What is a scale drawing?

A **scale drawing** is a smaller or larger copy of a real object in which all lengths are changed by the same factor. The **scale** tells how a length on the drawing compares with the real length, such as $1\text{ in} = 4\text{ ft}$.



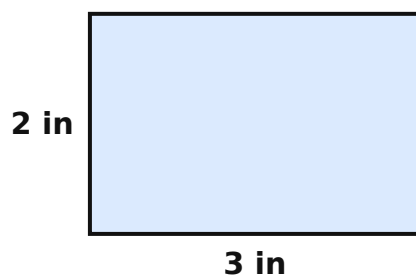
With the scale 1 inch = 4 feet, every inch on the drawing stands for 4 feet in real life.

How do you find an actual length?

Treat the scale as a rate. Multiply the drawing length by the number of real units each drawing unit stands for.

Scale factor

The **scale factor** is the ratio of a drawing length to the matching actual length, written in the same units. The scale $1\text{ in} = 5\text{ ft}$ is the same as $1\text{ in} = 60\text{ in}$, so the scale factor is $\frac{1}{60}$.



Scale: 1 in = 5 ft

The room measures 3 in by 2 in on paper, so it is 15 ft by 10 ft in real life.

1. Write the scale as a rate, such as 5 feet per 1 inch.
2. Multiply the drawing length by the rate: $3 \times 5 = 15$ feet.
3. To go from actual to drawing, divide by the rate.

Drawing (in)	1	2	3	4.5
Actual (ft)	5	10	15	22.5

A ratio table organizes scale conversions.

What happens to area?

Lengths are multiplied by the scale, but area is multiplied by the **square** of the scale. A room drawn as 3 in by 2 in with 1 in = 5 ft has a drawing area of 6 square inches. Its actual area is $15 \times 10 = 150$ square feet, which equals 6×25 .

Scale	Length	Area
1 in = 5 ft	x 5	x 25
1 in = 10 ft	x 10	x 100
1 in = 20 ft	x 20	x 400

Area is multiplied by the square of the length factor.

How do you redraw at a different scale?

Find the actual length first, then divide by the new scale. A wall that is 4 inches long at 1 in = 10 ft is 40 feet. At 1 in = 5 ft the same wall is $40 \div 5 = 8$ inches long.

Maps use the same ideas. If 1 in = 25 mi, then a distance of 2.5 in on the map is 62.5 miles. Always check that the units on both sides of the scale match the units in the question.

Questions about scale drawings

How do you find the actual length from a scale drawing?

Multiply the drawing length by the scale rate. With $1\text{ in} = 5\text{ ft}$, a 3-inch line is $3 \times 5 = 15$ feet.

What is the scale factor?

It is the ratio of the drawing length to the actual length with both in the same unit. For $1\text{ in} = 5\text{ ft}$, it is 1:60 because $5\text{ ft} = 60\text{ in}$.

How does area change with scale?

Area is multiplied by the square of the length factor. If lengths are 5 times as long, areas are 25 times as large.

How do you find the scale from a drawing?

Divide the actual length by the drawing length. If 2.5 in stands for 20 ft, then $20 \div 2.5 = 8$, so the scale is $1\text{ in} = 8\text{ ft}$.

How do you redraw a plan at a different scale?

Find each actual length, then divide by the new scale rate. A 40-foot wall is 8 inches long at $1\text{ in} = 5\text{ ft}$.