

# ANSWER MAZE



## SCALE DRAWINGS AND SCALE FACTOR

### Multiply, or Just Add?

One page · 10–15 minutes · nothing to prepare

FREE

4

A rectangle marked ORIGINAL is 12 cm long. Its scale drawing is 4.8 cm long. What is the scale factor from the original to the drawing?

2.5 → **go to 3**

0.4 → **go to 7**

*Which figure is bigger? Which figure does the factor start from?*

7

A triangle has sides of 4 cm and 6 cm. In a scale drawing of it, the 4 cm side is 7 cm. How long is the side that matches 6 cm?

10.5 cm → **go to 2**

9 cm → **go to 6**

*Find the factor from the pair of matching sides first. Then use it on the other side.*

1. **Hand out page 3**, one per student. Calculators are fine. Nothing else is needed.
2. **Say this once:** *“Start at box 4. Read which figure the factor goes from. A scale drawing multiplies every length and keeps every angle. Write every box number in the row at the bottom as you go.”*
3. **Check a sheet quickly.** A student with no mistakes writes **4 7 2 5 8 1**: six boxes, then out.

|                      |                                                                                                                |
|----------------------|----------------------------------------------------------------------------------------------------------------|
| <b>Student sheet</b> | page 3, one per student. It shows an original and a scale drawing of it, with the factor worked out both ways. |
| <b>Answers</b>       | page 4.                                                                                                        |

**Every wrong answer comes from one of two mistakes.** The first is about finding the factor. The scale factor from the original to the drawing is a drawing length divided by the matching original length. Many students divide the larger number by the smaller, because they think a factor must be more than 1. When the original is the bigger figure, that gives the factor the wrong way round. A scale such as “1 inch represents 4 feet” has two units, and students often divide 4 by 1 without changing feet into inches. These wrong answers send the student to box 3.

The second mistake is about what the factor does. Many students see that 4 cm became 7 cm and add 3 cm to every side. A scale drawing multiplies every length by the same number, here 1.75. It also keeps every angle the same size, so multiplying an angle by the factor is wrong too. These wrong answers send the student to box 6. Boxes 3 and 6 ask the same kind of question again, and both of their answers lead back to the route.

**The row at the bottom is the check.** A clean run is six numbers. Each wrong answer adds at least one more. Guessing does not get a student out: every simple guessing rule, such as always taking the first answer, goes wrong within the first three boxes.



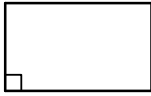
**This is the free lesson this activity came from.** The worksheet, the full answers and the lesson plan are on it, at three levels of difficulty.  
**chooseyourlesson.com** — 135 free geometry lessons.

Name \_\_\_\_\_

Period \_\_\_\_\_

Date \_\_\_\_\_

2.4 cm



4 cm

original



6 cm

drawing

3.6 cm

A **scale drawing** multiplies **every length** by the same number. The angles do not change.

The **scale factor from the original to the drawing** is  $6 \div 4 = 1.5$ . Check with the other pair:  $3.6 \div 2.4 = 1.5$ .

The **scale factor from the drawing to the original** is  $4 \div 6 = 2/3$ .

A factor more than 1 makes a figure bigger. Less than 1 makes it smaller.

**Answer the question in the box. Go to the box your answer names. Write each box number in the row at the bottom.**

**1**

A figure has sides of 12 cm and 8 cm. In a scale drawing of it, the 12 cm side is 9 cm. How long is the side that matches 8 cm?

6 cm → **you are out**

5 cm → **go to 6**

*Find the factor from the matching pair. Then use it on the other side.*

**2**

A house plan says: 1 inch represents 4 feet. What is the scale factor from the plan to the house?

4 → **go to 3**

48 → **go to 5**

*Write both lengths in one unit before dividing.*

**3**

A side of the ORIGINAL is 20 cm. The matching side of the DRAWING is 5 cm. What is the scale factor from the original to the drawing?

0.25 → **go to 7**

4 → **go to 4**

*Read which figure the factor starts from. Which figure is bigger?*

**4**

A rectangle marked ORIGINAL is 12 cm long. Its scale drawing is 4.8 cm long. What is the scale factor from the original to the drawing?

2.5 → **go to 3**

0.4 → **go to 7**

*Which figure is bigger? Which figure does the factor start from?*

**5**

The scale factor from a drawing of a roof to the roof is 3.5. On the drawing,  $\angle D = 34^\circ$ . How big is  $\angle D$  on the roof?

$34^\circ$  → **go to 8**

$119^\circ$  → **go to 6**

*Think about what a scale drawing does to the size of an angle.*

**6**

A rectangle is 6 cm by 10 cm. A scale drawing of it is 9 cm on the side that matches 6 cm. How long is its other side?

13 cm → **go to 7**

15 cm → **go to 2**

*Find the factor from the pair of matching sides. Then use it on the other side.*

**7**

A triangle has sides of 4 cm and 6 cm. In a scale drawing of it, the 4 cm side is 7 cm. How long is the side that matches 6 cm?

10.5 cm → **go to 2**

9 cm → **go to 6**

*Find the factor from the pair of matching sides first. Then use it on the other side.*

**8**

An ORIGINAL photo is 16 cm wide. Its DRAWING is 10 cm wide. What is the scale factor from the drawing to the original?

0.625 → **go to 3**

1.6 → **go to 1**

*Read which figure the factor starts from. Its length goes on the bottom.*

Write each box number as you reach it:

|  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|



**135 free geometry lessons**  
**chooseyourlesson.com**

The route, in order. Boxes 3 and 6 are not on it. A student reaches them only by a wrong answer. They are the last two rows of the table.

**4 → 7 → 2 → 5 → 8 → 1 → out**

|   | Box                                                                                                                                                      | Right answer, and why                                                                                                                       | Wrong answer, and why a student picks it                                                                                                      |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <b>Box 4</b><br>A rectangle marked ORIGINAL is 12 cm long. Its scale drawing is 4.8 cm long. What is the scale factor from the original to the drawing?  | <b>0.4</b><br>Divide the drawing length by the original length: $4.8 \div 12 = 0.4$ . The drawing is smaller, so the factor is less than 1. | 2.5 goes to box 3. 2.5 is $12 \div 4.8$ , the factor from the drawing to the original. Many students divide the larger number by the smaller. |
| 2 | <b>Box 7</b><br>A triangle has sides of 4 cm and 6 cm. In a scale drawing of it, the 4 cm side is 7 cm. How long is the side that matches 6 cm?          | <b>10.5 cm</b><br>The factor is $7 \div 4 = 1.75$ , so the side is $6 \times 1.75 = 10.5$ cm.                                               | 9 cm goes to box 6. 9 cm adds 3 to every side, because 4 became 7. Adding one amount changes the shape.                                       |
| 3 | <b>Box 2</b><br>A house plan says: 1 inch represents 4 feet. What is the scale factor from the plan to the house?                                        | <b>48</b><br>4 feet is 48 inches. So 1 inch on the plan stands for 48 inches of house: $48 \div 1 = 48$ .                                   | 4 goes to box 3. 4 divides the printed numbers without changing feet into inches. Both lengths must be in one unit.                           |
| 4 | <b>Box 5</b><br>The scale factor from a drawing of a roof to the roof is 3.5. On the drawing, $\angle D = 34^\circ$ . How big is $\angle D$ on the roof? | <b><math>34^\circ</math></b><br>A scale drawing multiplies lengths and keeps every angle. So $\angle D$ on the roof is $34^\circ$ too.      | $119^\circ$ goes to box 6. $119^\circ$ multiplies the angle by 3.5. The factor multiplies lengths only.                                       |
| 5 | <b>Box 8</b><br>An ORIGINAL photo is 16 cm wide. Its DRAWING is 10 cm wide. What is the scale factor from the drawing to the original?                   | <b>1.6</b><br>Divide the original width by the drawing width: $16 \div 10 = 1.6$ . The original is bigger, so the factor is more than 1.    | 0.625 goes to box 3. 0.625 is $10 \div 16$ , the factor from the original to the drawing, the other way round.                                |
| 6 | <b>Box 1</b><br>A figure has sides of 12 cm and 8 cm. In a scale drawing of it, the 12 cm side is 9 cm. How long is the side that matches 8 cm?          | <b>6 cm</b><br>The factor is $9 \div 12 = 0.75$ , so the side is $8 \times 0.75 = 6$ cm.                                                    | 5 cm goes to box 6. 5 cm takes 3 off every side, because 12 became 9. A scale drawing multiplies, it does not take one amount off.            |
|   | <b>Box 3</b><br>A side of the ORIGINAL is 20 cm. The matching side of the DRAWING is 5 cm. What is the scale factor from the original to the drawing?    | <b>0.25</b><br>Divide the drawing length by the original length: $5 \div 20 = 0.25$ . The drawing is smaller, so the factor is less than 1. | 4 goes to box 4. A student who still divides the larger by the smaller picks 4 ( $20 \div 5$ ), the factor the other way round.               |
|   | <b>Box 6</b><br>A rectangle is 6 cm by 10 cm. A scale drawing of it is 9 cm on the side that matches 6 cm. How long is its other side?                   | <b>15 cm</b><br>The factor is $9 \div 6 = 1.5$ , so the other side is $10 \times 1.5 = 15$ cm.                                              | 13 cm goes to box 7. A student who still adds picks 13 cm ( $10 + 3$ ). Adding one amount to each side changes the shape.                     |

**How to check any box.** For a factor, ask: “Which figure does the factor go from? Its length goes on the bottom of the division.” For a length, find the factor from a pair of matching sides first, then multiply.

A student can find the last four boxes of the route by following the arrows backward from “you are out.” So ask a student with a clean row to explain one box.