MATHEMATICS · GRADES 7-9

Scale Factors

Difficulty level: Intermediate

Mathematics: Grades 7-9

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Overview of the concept

This is how you print a photo bigger for a frame or shrink a map to fit a page, and still keep every length in the right proportion. A photographer enlarging a print for a frame uses the same scale factor for height and width, so faces do not stretch. A teacher shrinking a worksheet to fit the page uses one factor for everything, so the diagram stays true. Knowing scale factors tells you how to resize anything without distorting it, by changing every length by the same amount.



Rule

Scale factor: new length = original length × scale factor.

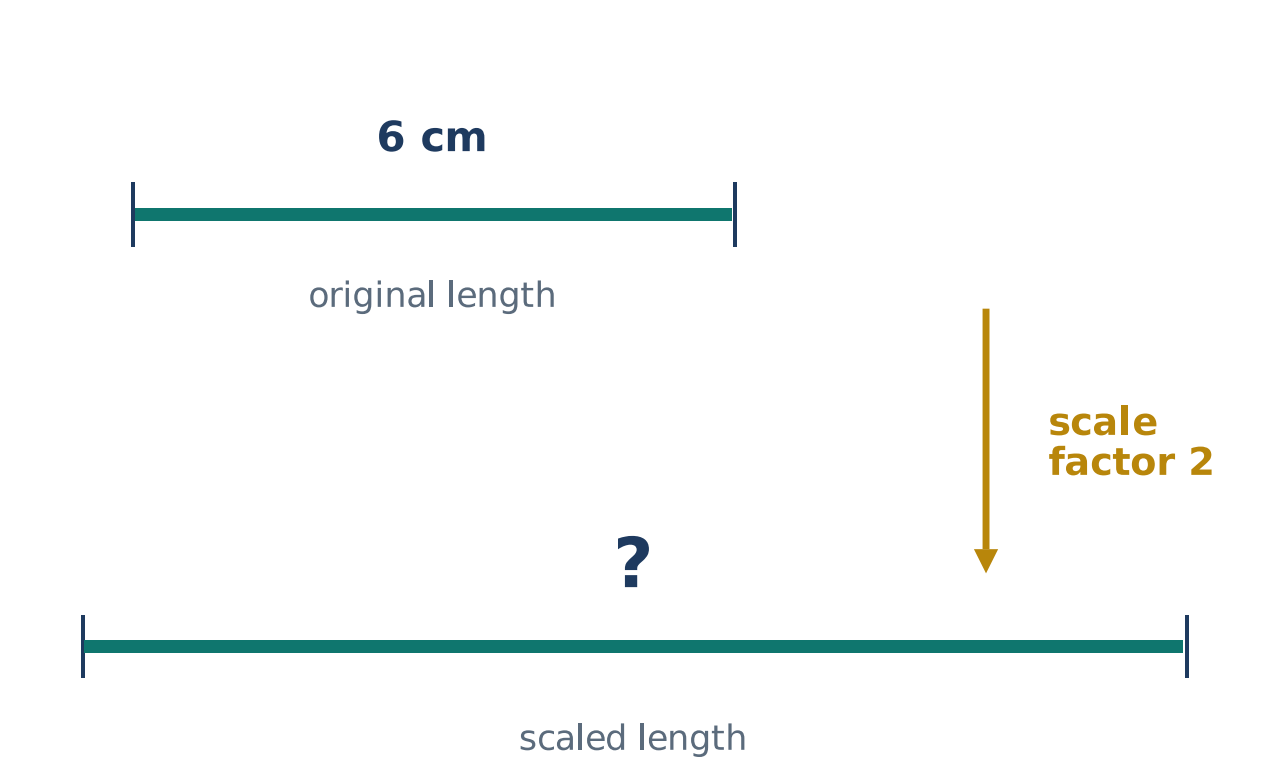
A scale factor bigger than 1 enlarges, and a scale factor smaller than 1 shrinks.

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Worked examples

EXAMPLE 1

Q A drawing uses scale factor 2. A length of 6 cm becomes what?



SOLUTION

Multiply the original length by the scale factor.

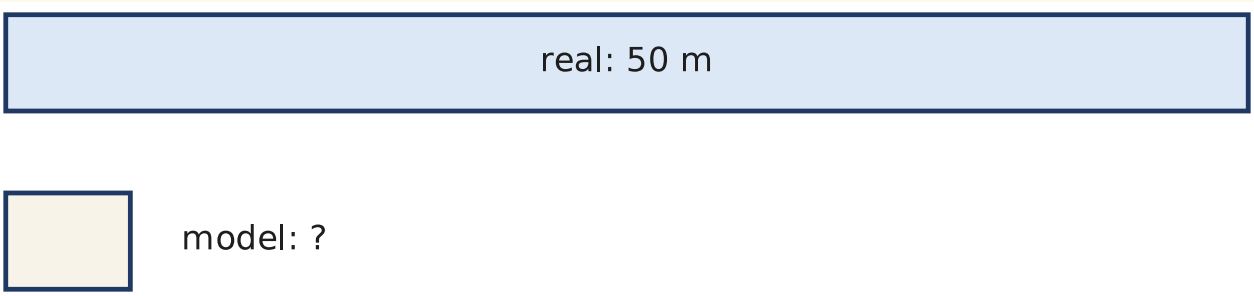
$6 \times 2 = 12$

The new length is 12 cm.

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EXAMPLE 2

Q A model uses scale factor $\frac{1}{10}$. A real length of 50 m becomes what in the model?



SOLUTION

Multiply the real length by the scale factor.

$50 \times (\frac{1}{10}) = 5$

The model length is 5 m.

Practice questions

1 A poster is enlarged by scale factor 4. The poster is 7 cm wide. How wide is the enlarged poster? Write the width in cm.

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2 A model ship is built to scale factor $\frac{1}{20}$. The real ship is 80 m long. How long is the model? Write the length in m.

- **A** 2 m
- **B** 4 m
- **C** 8 m
- **D** 16 m

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3 A drawing is enlarged by scale factor 3. A length of 4 cm becomes what? Write the new length in cm.

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4 A photo is enlarged by scale factor 5. A length of 2 cm becomes what? Write the new length in cm.

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5 A garden plan is reduced by scale factor $\frac{1}{2}$. A length of 10 cm becomes what? Write the new length in cm.

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6 A model airplane is built to scale factor $\frac{1}{4}$. A real wing is 20 cm long. How long is the model wing? Write the length in cm.

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7 The original segment is 3 cm long and the image segment is 9 cm long. What is the scale factor? Write the scale factor.

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8 The original segment is 8 cm long and the image segment is 2 cm long. What is the scale factor? Write the scale factor.

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9 A photo 4 cm wide is enlarged by scale factor 2.5. What is the new width? Write the width in cm.

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10 A map scale is 1 to 100. A length of 2 cm on the map is what in real life? Write the length in cm.

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ANSWER KEY

1. 28 cm

2. 4 m

3. 12 cm

4. 10 cm

5. 5 cm

6. 5 cm

7. 3

8. $\frac{1}{4}$

9. 10 cm

10. 200 cm

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