# ▶ 7.2 Scale Diagrams and Reductions

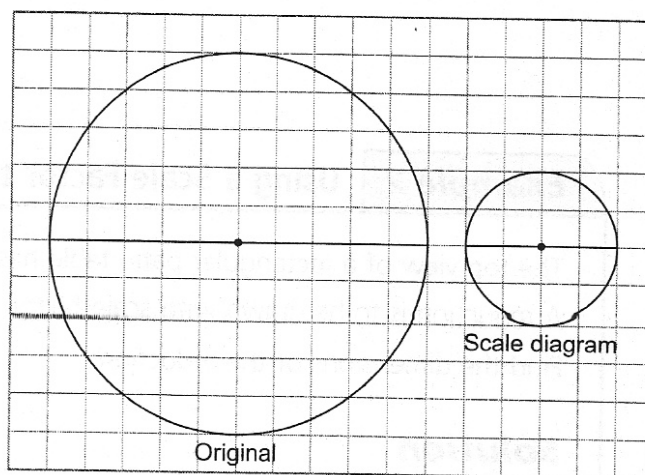**FOCUS** Draw and interpret scale diagrams that represent reductions.

A scale diagram can be smaller than the original diagram.
This type of scale diagram is called a **reduction.**
A reduction has a scale factor that is less than 1.

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**Example 1** **Using Matching Lengths to Determine the Scale Factor**

Find the scale factor for this reduction.



Scale diagram

Original

### Solution

Measure the diameter of the original circle. The diameter is 5 cm.
Measure the diameter of the scale diagram. The diameter is 2 cm.

The scale factor is: $\dfrac{\text{diameter on scale diagram}}{\text{diameter on original diagram}} = \dfrac{2 \text{ cm}}{5 \text{ cm}} = \dfrac{2}{5}$
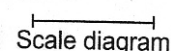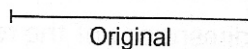
The scale factor is $\dfrac{2}{5}$.  The scale factor is less than 1.

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## Check

**1.** Find the scale factor for each reduction.

**a)** Measure the length of the original line segment.
Length = _____ cm

Original        Scale diagram

Measure the length of the line segment in the scale diagram.
Length = _____ cm

Scale factor = $\dfrac{\text{length on scale diagram}}{\text{length on original diagram}}$

$= \dfrac{\rule{2cm}{0.4pt}}{\rule{2cm}{0.4pt}} = \rule{2cm}{0.4pt}$

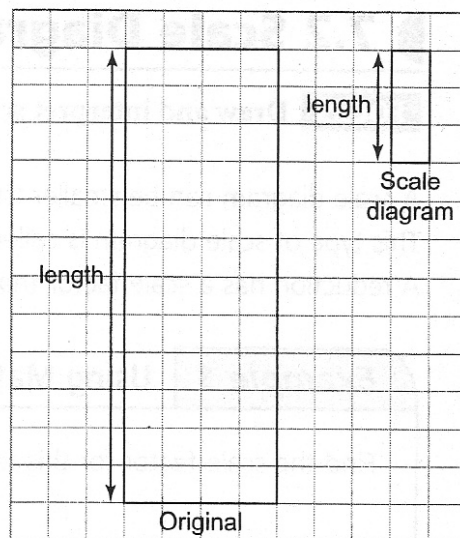The scale factor is _____ .

**b)** Length of original rectangle: _____

Length of rectangle in scale diagram: _____

$$\text{Scale factor} = \frac{\text{length on scale diagram}}{\text{length on original diagram}}$$

$$= \frac{\rule{2cm}{0.4pt}}{\rule{2cm}{0.4pt}}$$

$$\dot{=} \rule{2cm}{0.4pt}$$

The scale factor is _____.



length

Scale diagram

length

Original

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## Example 2 | Using a Scale Factor to Determine Dimensions

The top view of a rectangular patio table has length 165 cm and width 105 cm.

A reduction is to be drawn with scale factor $\frac{1}{5}$.

Find the dimensions of the reduction.

### Solution

Write the scale factor as a decimal.

$\frac{1}{5} = 1 \div 5 = 0.2$

Length of original table: 165 cm

Length of reduction: $0.2 \times 165 \text{ cm} = 33 \text{ cm}$

Width of original table: 105 cm

Width of reduction: $0.2 \times 105 \text{ cm} = 21 \text{ cm}$

The reduction has dimensions 33 cm by 21 cm.

## Check

**1.** A window has dimensions 104 cm by 89 cm.

A reduction is to be drawn with scale factor $\frac{1}{20}$.

Find the dimensions of the reduction.

Write the scale factor as a decimal. $\frac{1}{20} = $ _____

Length of original window: _____

Length of reduction: _____ = _____

Width of original window: _____

Width of reduction: _____ = _____

The reduction has dimensions _____

**2.** The top view of a rectangular swimming pool has dimensions 10 m by 5 m.
A reduction is to be drawn with scale factor $\frac{1}{50}$.
Find the dimensions of the reduction.

Write the scale factor as a decimal.

_____

Length of pool: _____

Length of reduction: _____

Convert this length to centimetres:

1 m = 100 cm

So, _____

_____

Width of pool: _____

Width of reduction: _____

Convert this width to centimetres:

_____

_____

The reduction has dimensions _____.

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## Practice

**1.** Find the scale factor for each reduction.

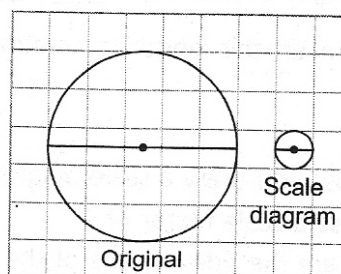**a)** Diameter of original circle: _____ cm
Diameter of reduction: _____ cm

$$\text{Scale factor} = \frac{\text{diameter on scale diagram}}{\text{diameter on original diagram}}$$

$$= \frac{\rule{2cm}{0.4pt}}{\rule{2cm}{0.4pt}}$$

$$= \rule{2cm}{0.4pt}$$



Scale diagram

Original

The scale factor is _____.

**b)** Length of original line segment: _____
Length of reduction: _____

$$\text{Scale factor} = \frac{\text{length on scale diagram}}{\text{length on original diagram}}$$

$$= \frac{\rule{2cm}{0.4pt}}{\rule{2cm}{0.4pt}}$$

$$= \rule{2cm}{0.4pt}$$

Original          Scale diagram

The scale factor is _____.
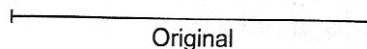
**2.** A line segment has length 36 cm.
A reduction is to be drawn with scale factor $\frac{3}{20}$.
Draw a line segment with the new length.

Write the scale factor as a decimal.

_____

Original length: _____

Length of reduction: _____ = _____

Draw the line segment:

**3.** A reduction of each object is to be drawn with the given scale factor.
Find the matching length in centimetres on the reduction.

**a)** A water ski has length 170 cm.
The scale factor is 0.04.
Length of water ski: _____
Length of reduction: _____ = _____

**b)** A canoe has length 4 m,
The scale factor is $\frac{3}{50}$.
Write the scale factor as a decimal.

_____

Length of canoe: _____

Length of reduction: _____ = _____

Convert this length to centimetres: _____
_____

**4.** Suppose you draw a scale diagram of this triangle.
You use a scale factor of $\frac{1}{4}$.
What are the side lengths of the reduction?

Side lengths of original triangle: _____
Write the scale factor as a decimal.

_____

Side lengths of reduction:

_____
_____
_____
_____
_____