NOTES: Scale Drawings

Date: Nov. 7

Scale drawings (or models) are used to accurately represent an actual object. Drawing (or model) measurements are proportionally larger or smaller than the real object.

scale statement

- a ratio that compares the size of a model to the size of the original object

  model length : original length

  * measurements in the same units

- for example, a model might be given a scale statement of 3:5 (this means that 3 units on the model represent 5 units on the original object)

Example

A model of a sports car is 25 cm long. The actual sports car is 2.4 m long. Express this as a scale statement.

240 cm

same units

① all measurements in (cm)

$\frac{1\text{ m}}{100\text{ cm}} = \frac{2.4\text{ m}}{x}$

$x = 100 \times 2.4$

$= 240\text{ cm}$

② create ratio

model : original (actual)

25 : 240

÷5 ÷5

③ reduce to lowest terms

5 : 48

÷5 ÷5

1 : 9.6

* scale statements often reduced so that the smallest number = 1

You Try

The tires on the actual sports car are 0.3 m in diameter. What is the diameter of the tires on the model?

5 : 48 ← scale statement

model

$\frac{5}{48} = \frac{x}{0.3\text{ m}}$

actual

$x = \frac{5 \times 0.3}{48}$

$= 0.03125\text{ m}$

$\times 100$

$= 3.125\text{ cm}$

cm is a more appropriate unit

scale factor • the number by which all the dimensions of an original figure are multiplied to produce an enlargement (scale factor > 1) or a reduction (scale factor < 1)

tells us how the size changes.

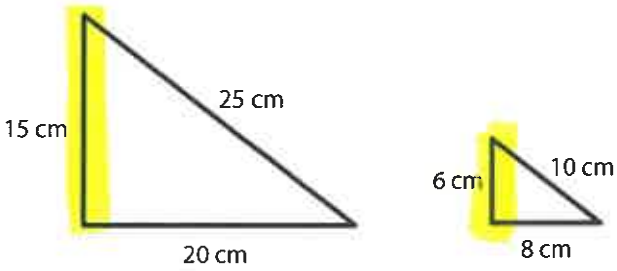
scale factor = $\frac{\text{model length}}{\text{original length}}$

* measurements need to be in the same units

Example

Write a scale statement for the reduced or enlarged object and calculate the scale factor used to create the reduced or enlarged object.

Original: x 0.4 = **Model:**



scale statement.

M : O

6 : 15 (÷3)

2 : 5 (÷2)

or

1 : 2.5

Scale factor: $SF = \frac{M}{O} = \frac{6}{15} = 0.4$

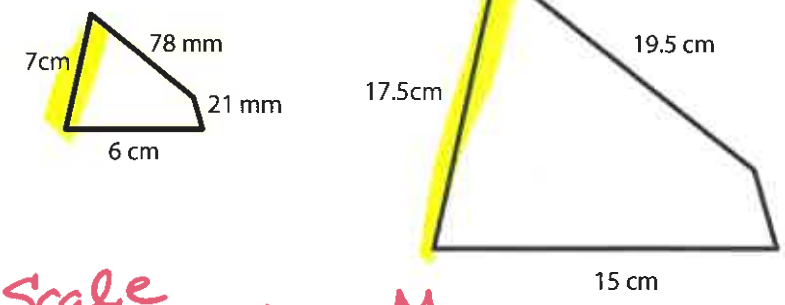
scale statement = 2:5 or 1:2.5

scale factor = 0.4

You Try

Write a scale statement for the reduced or enlarged object and calculate the scale factor used to create the reduced or enlarged object.

Original: x 2.5 = **Model:**



Scale statement

M : O

17.5 : 7 (÷7)

2.5 : 1 (x2)

or

5 : 2

Scale factor: $SF = \frac{M}{O} = \frac{17.5}{7} = 2.5$

scale statement = 5:2 or 2.5:1

scale factor = 2.5

change cm → m

$\frac{1\text{ m}}{100\text{ cm}} = \frac{x}{3.7\text{ cm}}$

$x = 0.037\text{ m}$

change km → m

$\frac{1\text{ km}}{1000\text{ m}} = \frac{1850\text{ km}}{x}$

$x = 1850000\text{ m}$

Example

The distance between Vancouver and Winnipeg is approximately 1850 km in a straight line. The same distance on a map is 3.7 cm.

Write a scale statement for the map in the form 1:*x*.

What scale factor was used to make the map?

scale statement = 1:50 000 000

scale factor = 0.00000002

scale statement

map → model : original ← real world

0.037 : 1 850 000 (÷0.037 on each)

1 : 50 000 000

scale factor

$SF = \frac{\text{model}}{\text{original}}$

$= \frac{0.037}{1\,850\,000}$

$= 2E^{-8}$

$= 2 \times 10^{-8}$ ← move decimal 8 places to the left

0.00000002