M9

Scale Models

6.3

- Diagrams, plans, patterns, maps, and sketches are drawn to scale to correctly model reality.
- A scale is a ratio between the model and the reality.
- Examples of scales
  - 1 cm on a map : 10 km in reality (written in a legend as 1:1 000 000)
  - 1 cm on a floor plan : 3m in reality (written in a legend as 1cm : 3m OR 1 : 300)
  - 1 cm on a sketch : 10 cm in reality (written in a legend as 1cm : 10 cm OR 1 : 1000)
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- Scaling changes the size of the dimensions such as length, depth, height, width, radius, diameter, …

- Scaling does not change angles and shape.

Scale Factor

- A number that expresses the ratio between the image and the original.

$$SF = \frac{new\ dimension}{original\ dimension} = \frac{image}{original} = \frac{new}{old}$$

- SF>1 means enlarging OR scaling up
- $0 < SF < 1$ means reducing OR scaling down
- There is no SF = 1 because multiplying dimensions by 1 will give an image that is exactly the same size and shape as the original.

$$Dimensions\ of\ the\ new\ shape = SF \times dimensions\ of\ the\ original$$

Example 1: Sketch a labeled diagram of a scaled rectangle given the scale factor.

Original rectangle:

4.0 cm

13 cm

a) SF = 3

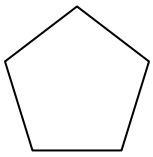
b) SF = 0.5

c) SF = 10

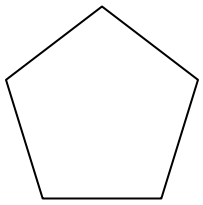
Example 2: What is the radius of the original circle if the enlarged circle has a radius of 14 cm and the scale factor used to create the scaled up image was 5 ? Include a labeled diagram in your solution.

Example 3: What is the length of a diagonal of a reduced square if the original square with a diagonal of 8.5 cm was scaled down by a factor of 0.2 ? Include a labeled diagram in your solution.

Example 4: What scale factor created the image below? What assumption do you make?



5 cm



12 cm