8.3 Scale Diagrams

A **scale drawing** is a reproduction of a diagram. It is either larger or smaller than the original, but it has the **same shape** (ie. It is **similar**). Each dimension of the figure is multiplied by the same **scale factor**.

In order to visualize the actual figure, you need to know the scale of the scale drawing. You will need to use ratios and convert measurement units.

The scale of a diagram can be specified in four ways:

1. as a statement (1cm = 50km)
2. as a rate $\left(\frac{1cm}{50km}\right)$
3. as a ratio (1 : 5000000)
4. as a linear scale

If the image length is larger than the object length, then the scale factor is greater than 1 and we have an **enlargement**. If the image length is less than the object length, then the scale factor is less than 1 and we have a **reduction**.

$$\text{Scale factor} = \frac{\text{Image}}{\text{object}} \quad \left(\frac{\text{New}}{\text{old}}\right)$$

Example 1: Complete the table.

Object Length	Image Length	Scale Factor	Enlargement or Reduction
7cm	14cm	$\frac{14}{7} = 2$	Enlargement
15 in	5 in	$\frac{5}{15} = \frac{1}{3}$	Reduction
4m	6m	1.5	Enlargement
8ft	3.2ft	0.4	Reduction

$\frac{6}{x} = \frac{1.5}{1}$

$1.5x = 6$

$x = 4$

$\frac{x}{8} = \frac{0.4}{1}$

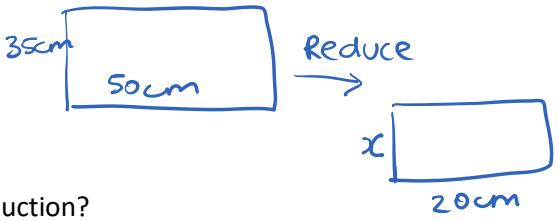
$1x = 0.4 \times 8$

$x = 3.2$

Example 2: A portrait measures 50cm by 35cm. The larger side of a reduction of its measures 20cm.

a) What is the scale factor of the reduction?

$$\frac{\text{New}}{\text{old}} = \frac{20cm}{50cm} = \frac{2}{5} = 0.4$$



b) What is the length of the shorter side of the reduction?

$\frac{\text{New}}{\text{old}}$ $\frac{x}{35} = \frac{0.4}{1}$

$1x = 0.4 \times 35$

$x = 14$

14cm.

8.4 Scale Factors and Areas of 2-D Shapes

8.3 – we studied the concept of **similar objects** – objects which have the same shape by different sizes. Another way of describing the enlargement or reduction of an object proportionally is by **scale factors**. Here we explore the relationship between scale factors and the **perimeter** and **area** of 2-D objects.

Complete the table below for similar rectangles:

Rectangle	Length (cm)	Width (cm)	Perimeter (cm)	Area (cm^2)
A				
B				
C				

Use the results from the table above to complete the following table:

Rectangle	Scale Factor	Ratio of Perimeters	Ratio of Areas
B to A			
C to A			
C to B			

What is the relationship between the scale factor and the ratios of the perimeters?

What is the relationship between the scale factor and the ratio of the areas?

Example 1: Jasmine is making a kite from a 1:20 scale diagram. The area of the scale diagram is 30 cm^2. How much fabric will she need for her kite?

Homework: p. 479 # 1 – 4, 6 - 8, 12*, 14* and p. 487 # 1 - 3, 4 a, 5 a, 8, 9, 10*, 13*

*Optional