8.3 Scale Diagrams

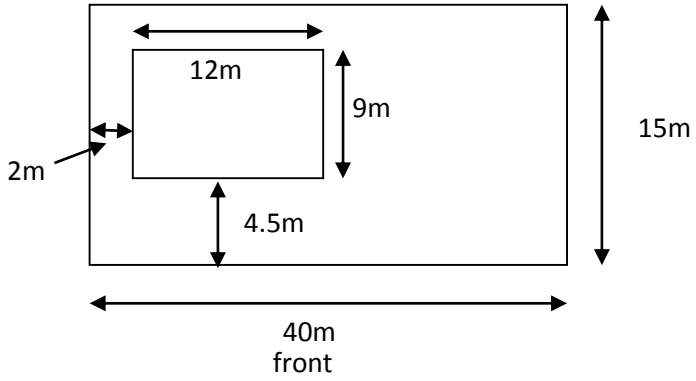
Learning Outcomes:

Learn to understand and use scale diagrams involving 2-D shapes.

Examples:

1) This photo of house has dimensions 6cm by 4cm. The photo is to be enlarged by a scale factor of $\frac{7}{2}$. Calculate the dimensions of the enlargement.

2) A builder plans to construct a house on a rectangular lot, as shown below, Draw a scale diagram of the lot and house using a scale of 1m: 500m



Would I leave all my measurements in meters if I wanted to create the drawing on a piece of paper? What other unit could I convert it to? What would the new measurements be?

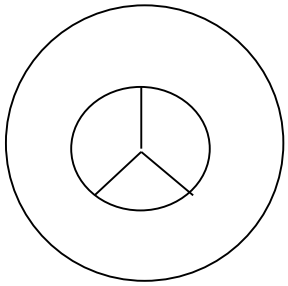
3) Josh designed the logo shown for an environment club. He wants to enlarge the logo so that it can be applied to the front of a baseball cap. The hat company has suggested a scale factor of $\frac{5}{3}$. Draw a scale diagram of the logo as it will appear on the baseball cap.

Diameter of outer circle: 3cm

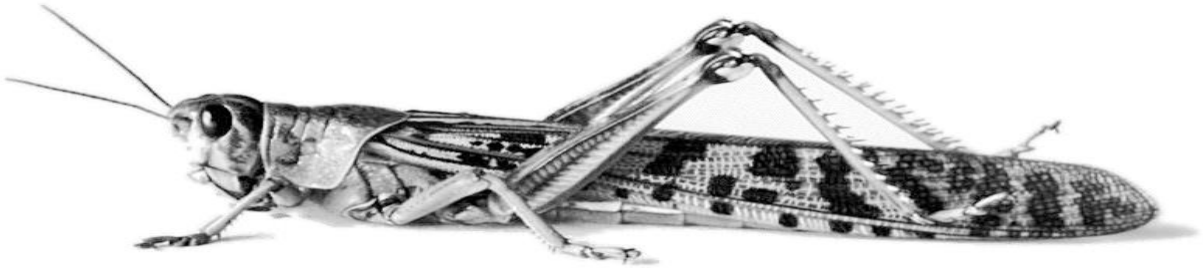
Diameter of inner circle: 1.5 cm

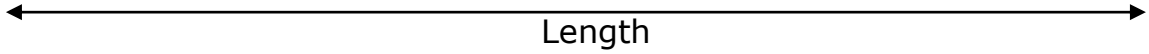
Length of each line segment: 0.75cm

Measure of all sector angles: 120°



4) This drawing of a grasshopper was printed in a newspaper article about crop destruction. The actual length of the grasshopper is 80mm. Determine the scale factor of the diagram.





To calculate the scale factor, units of length must be the same.

Key Ideas:

To determine a scale factor: $\frac{Diagram\ measurement}{Actual\ measurement}$

Scale factor between 0 and 1 is a reduction

Scale factor greater than 1 is an enlargement

Questions: Textbook Page 471 #1-4, 6, 9, 11, 13, 16

8.4 Scale Factors and Areas of 2D Shapes

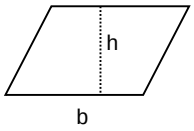
Learning Outcome:

Learn to solve area problems that involve similar 2-D shapes.

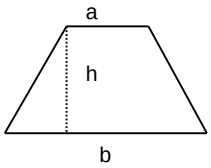
Formulas:

$A_{triangle} = \frac{1}{2}bh$ $A_{circle} = \pi r^2$

$A_{parallelogram} = bh$

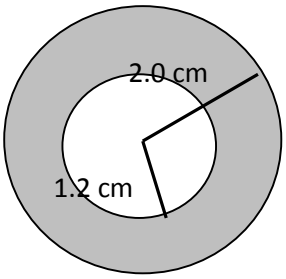


$A_{trapezoid} = \frac{1}{2}h(a+b)$



Investigation:

Determine the area of the shaded region. If both radii are doubled, does the area also double?



Is there a relationship between the area of the similar shape and the area of the original shape?

If two 2-D shapes are similar and their dimensions are related by a scale factor *k*, then the relationship between the area of the similar shape and the area of the original shape can be expressed as:

$$Area\ of\ similar\ 2-D\ shape = k^2(areaoforiginalshape)$$

Does this formula hold true for our first example?

Examples:

1) Arhum is making a kite from a 2:25 scale diagram. The area of the scale diagram is 20cm². How much fabric will he need for his kite?

2) Mrs. Henry's laptop has a monitor with the dimensions 9 in. by 12 in. The image on her laptop is projected onto the screen of a whiteboard. According to the documentation for the whiteboard, its screen area is 2836.6875 in².

   a) The image on the whiteboard is similar to the image on the laptop. Determine the scale factor used to project the images on the laptop to the whiteboard.

   b) Determine the dimensions of the whiteboard.

Key Ideas:

If the area of a similar 2-D shape and the area of the original shape are known, then the scale factor, *k*, can be determined using the formula:

$$k^2 = \frac{area\ of\ similar\ 2-D\ shape}{area\ of\ original\ shape}$$

Questions: Textbook Page 479 #1-5, 8, 9, 12, 13, 17