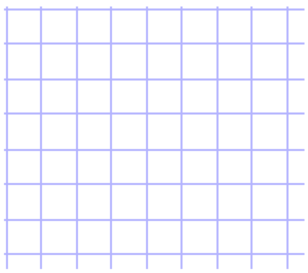
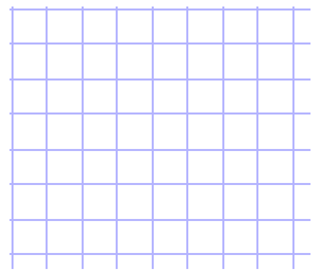
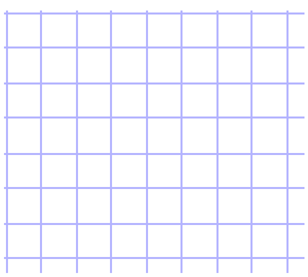
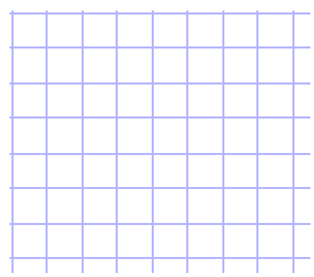
Math 20-2
Objectives: Determine how scale factor affects the area of a figure.
Solve scale factor problems involving area.

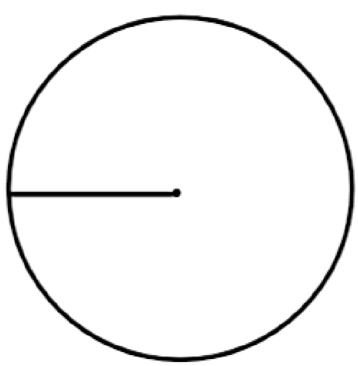
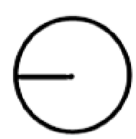
1. How does changing the length and width or the radius affect the area of a 2-Dimensional shape?
   a) On the grid, draw a 2 x 2 square at the top left. At the top left corner of the square you just drew, draw a square that is three times the length and three times the width of the smaller square $\left[k = \frac{new}{original} = \frac{3}{1}\right]$. Determine the area of each square.

   b) On the grid, draw a 2 by 3 rectangle, then double each dimension $\left[k = \frac{new}{original} = \frac{2}{1}\right]$. Determine the area of each rectangle.

   c) If the first circle has a radius of 6 cm and the second circle has a radius of 2 cm, determine the area of each circle $\left[k = \frac{new}{original} = \frac{1}{3}\right]$. $A = \pi r^2$

d) Look for a pattern between the scale factor for the dimensions and the relationship between the areas

$\left[k = \frac{new}{original} = \frac{3}{1}\right] \quad \frac{new\ Area}{original\ Area} =$

$$\left[k = \frac{new}{original} = \frac{2}{1}\right] \quad \frac{new\ Area}{original\ Area} =$$

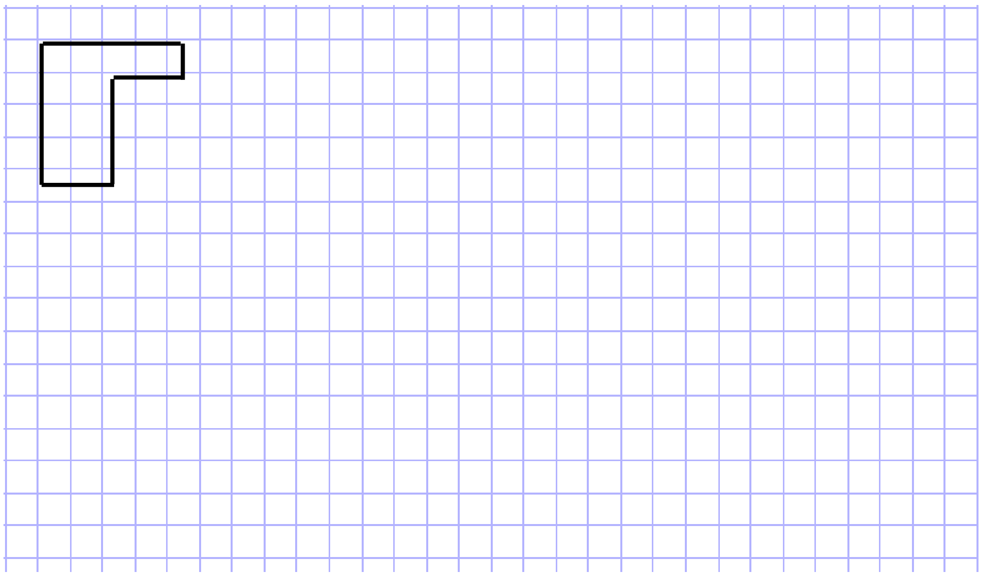
$$\left[k = \frac{new}{original} = \frac{1}{3}\right] \quad \frac{new\ Area}{original\ Area} =$$

e) More area patterns:

$$\frac{Area\ BIG}{Area\ SMALL} =$$

2. What would the area of the below object be if it were *quadrupled* in size $[k = 4]$? Verify by drawing the enlarged figure and counting the boxes in it.

$$\frac{Area\ BIG}{Area\ SMALL} =$$

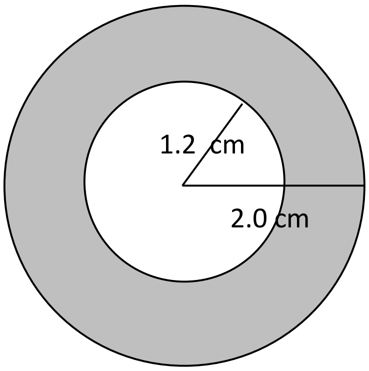


Another complicated shape:

Math 20 – 2 8.4 Scale Factors and Areas of 2-D Shapes

EXPLORE page 475.

Determine the area of the shaded region. ($A = \pi r^2$)



Divide the area of the larger circle (NOT the shaded region) by the area of the smaller circle and write the answer to two decimal places:

If both radii are doubled, what is the area of shaded region now?

How many times greater is the second shaded region compared to the first?

Divide the area of the larger circle by the area of the smaller circle and record to two decimal places. What do you notice about this ratio compared to the ratio found above?

AREA Scale Factors

If an airplane model is constructed so it is 1/5th the size of the original, we say the scale factor is $\frac{1}{5}$. Often this scale factor is abbreviated ***k*.** The equation, for linear measurements is:

$$\boldsymbol{k} = \frac{\textbf{model}}{\textbf{original}}$$

If we were asked to find how much paint it would take to cover the airplane (painting deals with surface area) the above equation becomes:

$$k^2 = \frac{\text{area of model}}{\text{area of original}}$$

For example, if it takes 40 m^2 of paint to cover a model plane 1/5th the size of the real one, we can find how much paint it would take to cover the real plane:

$$k^2 = \frac{\text{area of model}}{\text{area of original}}$$

$$\left(\frac{1}{5}\right)^2 = \frac{40}{x}$$

Example: A student has hooked up their iPad to a big screen TV with an HDMI cable to show a NetFlix movie. The screen on the iPad is 7.5” by 6”. The big screen TV has dimensions of 67.5” by 54”.

- How many times longer is the TV than the iPad?
- How many times wider is the TV than the iPad?
- How many times greater is the area of the TV than the iPad?

Example: Jasmine is making a kite from a 2:25 scale diagram. The area of the drawing is 20 cm^2. How much fabric will she need for the real kite?

Example: A laptop monitor has dimensions of 9” by 12”. An image on the laptop monitor is displayed on a whiteboard that has an area of 2836.6875 in^2.

- Assume the image on the whiteboard is similar to the image on the laptop. Determine the scale factor used to project the image on the laptop to the whiteboard.

- Determine the dimensions of the whiteboard.