

1.3 - Linear Scale Factors & Area

September 4, 2019 4:02 PM

The scale factor,

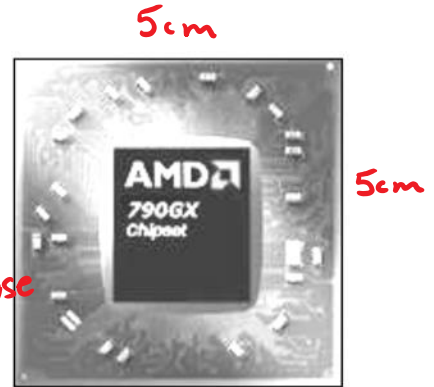
$$k = \frac{\text{Diagram}}{\text{original}}$$

is the linear scale factor and would be

applied to linear dimensions such as length, width, height, ...

SCALE FACTORS FOR AREA

The smaller image is a computer chip at its actual size, a 1 cm square. Beside it is a 5 cm enlargement.



Note:
Area = l x w

The **linear** scale factor,

$$k = \frac{\text{Diagram}}{\text{original}} = \frac{5\text{cm}}{1\text{cm}} = 5$$

The area scale factor is

$$\frac{\text{original}}{A = 1\text{cm} \times 1\text{cm} = 1\text{cm}^2} \quad \left\{ \begin{array}{l} \text{Diagram} \\ A = 5\text{cm} \times 5\text{cm} = 25\text{cm}^2 \end{array} \right. \quad \left| \begin{array}{l} \text{Increase} \\ \frac{25}{1} = 25 \end{array} \right.$$

The **area scale factor** is $\frac{\text{Diagram Area}}{\text{Original Area}} = \frac{25\text{cm}^2}{1\text{cm}^2} = 25$
 which is also equal to k^2 , the square of the linear scale factor.
 $k_{\text{linear}}, k_{\text{area}} = (k_{\text{linear}})^2$

example: A 6 m by 10 m room is drawn as a 3 cm by 5 cm rectangle on a floor plan. Find the scale factor and the area scale factor of the floor plan to determine the area of a kitchen that is 8 cm² on the floor plan.

o scale factor,

$$k_{\text{linear}} = \frac{\text{Diagram Length}}{\text{original Length}} = \frac{3\text{cm}}{6\text{m}} = \frac{3\text{cm}}{600\text{cm}} = \frac{1}{200} = 0.005$$

o area scale factor =

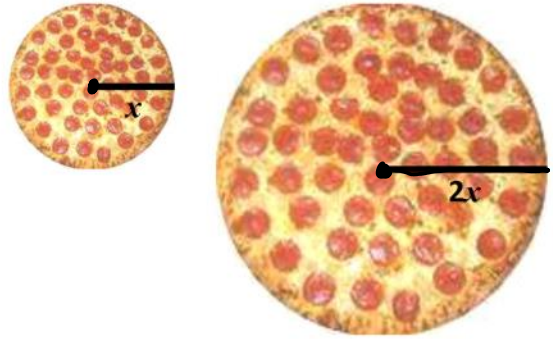
$$k_{\text{area}} = (k_{\text{linear}})^2 = (0.005)^2 = 0.000025$$

o Find the actual kitchen area,

$$k_{\text{area}} = \frac{\text{Diagram Area}}{\text{Original Area}} \Rightarrow (0.000025) = \frac{(8\text{cm}^2)}{X} \Rightarrow X = \frac{8\text{cm}^2}{0.000025}$$

$$X = 320,000\text{cm}^2 = 32\text{m}^2$$

exercise: The radius of a special giant-size pizza is twice the radius of a small pizza. How much bigger is the giant-size pizza when compared to a small pizza?



- Define variable x to represent the radius of the smaller pizza.
- Calculate the scale factor of the enlargement

$$k = \frac{\text{Diagram Length}}{\text{Original Length}} = \frac{2x}{x} = 2$$

- The area scale factor of the enlargement,

$$k_{\text{area}} = (k_{\text{linear}})^2 = (2)^2 = \boxed{4}$$

exercise: The area of a computer display is 144 in^2 . When the display is projected onto a screen, the image is 25 ft^2 . What is the scale factor of the projection?

- The area scale factor of the projected image is

? You try 😊