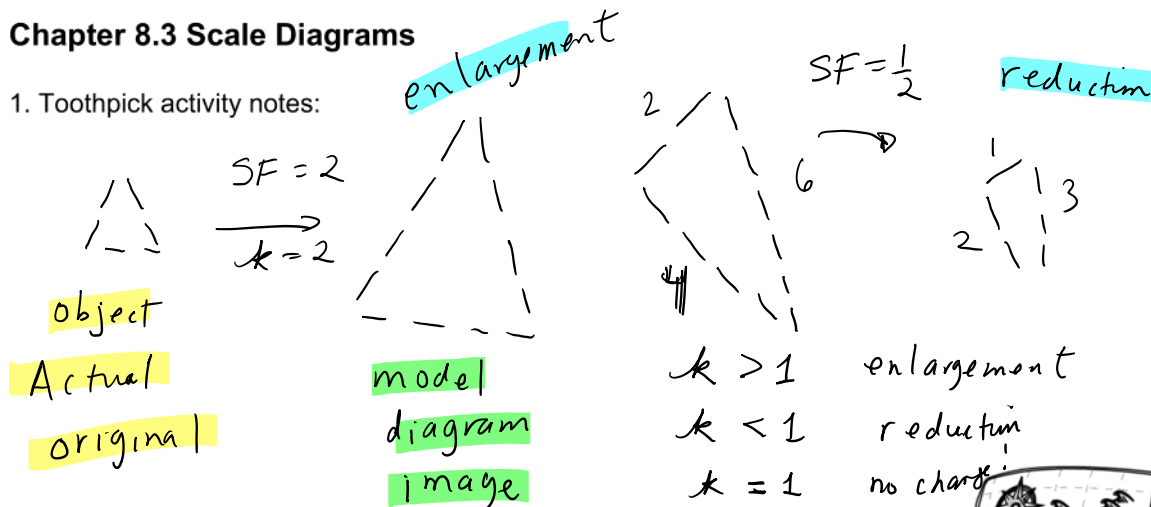


1 Scale Diagrams

May 4, 2023 8:45 PM

Chapter 8.3 Scale Diagrams

1. Toothpick activity notes:



Figures that have the same shape, but different sizes are found throughout everyday life. Examples include **MAPS**, **BLUEPRINTS**, **MODEL TRAINS**, **MODELS OF ATOMS**, and **PICTURES**. When you compare the drawing of an atom in your science textbook to the actual atom, the drawing is much larger. This is an enlargement.

When you compare the model train to the real train, the model is much smaller. This is a reduction. The **SCALE FACTOR, k** , tells how much larger or smaller the "model" is to the "real" object.

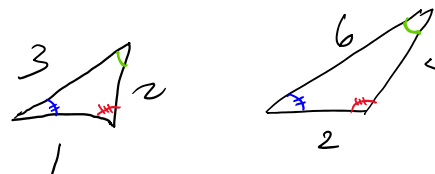
$$\text{SF scale factor, } k = \frac{\text{length in model}}{\text{length in actual}}$$

Scale Factor, k :

- The units for both measurements must be same but
- the scale factor has no units!
- k is written as a fraction, decimal, or %. $\frac{1}{2} = 50\%$; or ratio 1:2

Scale diagrams are examples of **similar figures**, i.e., figures that are the SAME shape but DIFFERENT sizes. Figures are similar if:

- Corresponding \angle 's are equal
- Corresponding sides are proportional (same scale factor)



Problems involving **REDUCTIONS** ($k < 1$)

Example 1: Photo activity: Have someone take your pictures from head to toe. Measure your height in the photo (in cm) and your ACTUAL height (in cm).

- Your height in the photo: 6.6 cm
- Your ACTUAL height: 176 cm

Find the **scale factor, k** :

$$k = \frac{\text{length in model} \leftarrow \text{picture}}{\text{length of actual}}$$

$$= \frac{6.6}{176}$$

$$k = 0.0375$$

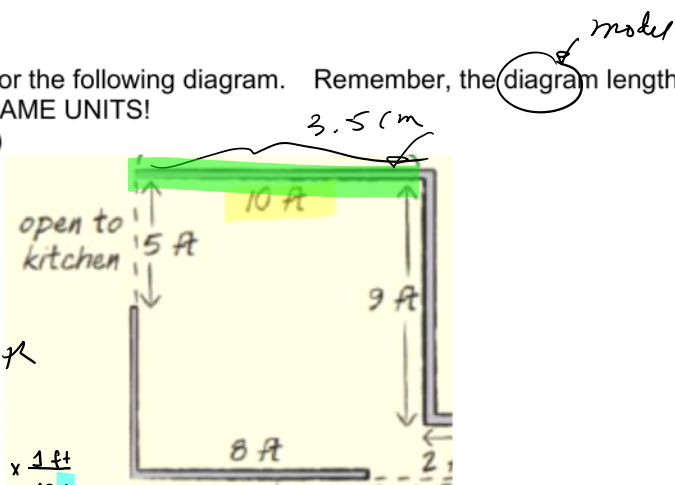
Example 2: Find the scale factor for the following diagram. Remember, the diagram length and actual length must be in the SAME UNITS! (Facts: 1 in = 2.54 cm, 1 ft = 12 in)

$$k = \frac{\text{model length}}{\text{actual length}}$$

$$= \frac{3.5 \text{ cm}}{1} \times \frac{1 \text{ in}}{2.54 \text{ cm}} \times \frac{1 \text{ ft}}{12 \text{ in}}$$

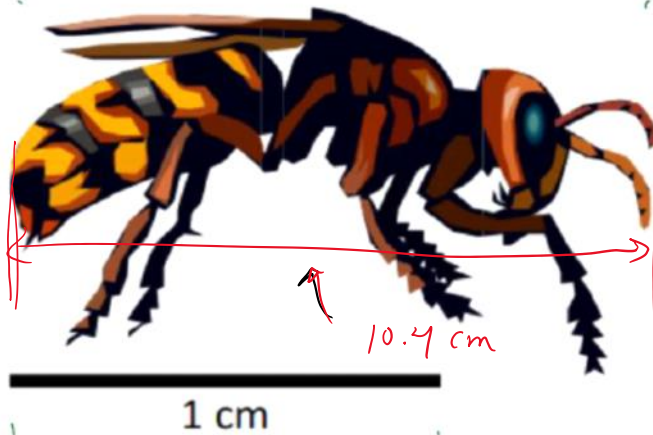
$$= 0.0114827 \dots$$

$$k \approx 0.0115$$



Problems involving **ENLARGEMENTS** ($k > 1$)

Example 3a) Find the **scale factor** for the following picture. b) Calculate the length of the actual wasp.



$$a) k = \frac{\text{model length}}{\text{actual length}}$$

$$= \frac{6.9 \text{ cm}}{1 \text{ cm}}$$

$$k = 6.9$$

$$b) k = \frac{\text{model}}{\text{actual}} = \frac{6.9}{1} = \frac{10.4}{x}$$

$$6.9x = (1)(10.4)$$

$$6.9x = 10.4$$

$$\frac{6.9}{6.9} = \frac{10.4}{6.9}$$

$$x = 1.50 \text{ cm}$$

↑ wasp's length

Example 4: The animal cell that's represented by this scale diagram is actually **0.25 mm**. What scale factor was used to draw this scale diagram? (Fact: **1 cm = 10 mm**)

$$k = \frac{\text{model length}}{\text{actual length}}$$

$$= \frac{3.5 \text{ cm} \times \frac{10 \text{ mm}}{1 \text{ cm}}}{0.25 \text{ mm}}$$

$$k = 140$$

The diagram is 140 times larger than actual cell!

