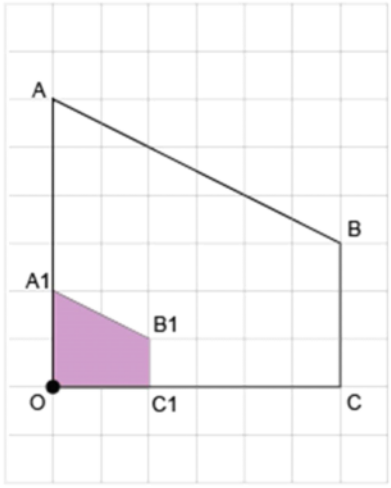
1.1 - Linear Scale Factors & Perimeter

September 4, 2019 4:00 PM

FOUNDATIONS OF MATH 11 Ch. 1 – Day 2: Linear Scale Factors & Perimeter

Consider the following diagram where the solid shape is the "original" shape:



What do you notice about the lengths of the corresponding lines?

Line OA : Line OA_1

6 : 2

3 : 1

Line OC : Line OC_1

6 : 2

3 : 1

Line BC : Line B_1C_1

3 : 1

They are all equal. The larger shape is 3 times bigger

When a diagram is a perfect enlargement or reduction (**every** length is increased or decreased by the same factor) of another diagram, it is called a **scale diagram**, and matching lengths between the diagrams are called **corresponding lengths**.

The amount by which the diagrams increase in size is called the **scale factor**, **"k"**, and is calculated by:

$$scale\ factor = k = \frac{scale\ diagram\ length}{original\ diagram\ length}$$

$= 2^{nd} / 1^{st} : \frac{New}{Old}$

In the above example, we calculated the scale factor for the scale diagram to be 3, because all lengths of the scale diagram are 3 times as long as the original.

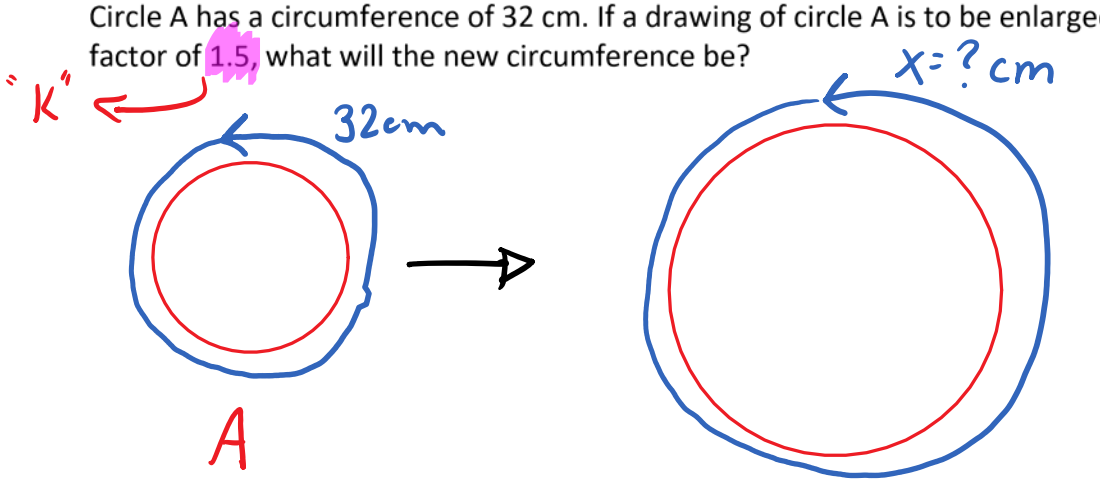
Because the corresponding sides all use the same scale factor, we say they are *proportional*.

When we are dealing with a ***length***, we say that the scale factor is linear.

Because the perimeter of geometric shapes will always be a length, we can apply the scale factor to perimeter problems.

Example

Circle A has a circumference of 32 cm. If a drawing of circle A is to be enlarged by a factor of 1.5, what will the new circumference be?



K: Diagram / Original

$(1.5) = \frac{X}{(32\,cm)}$ } Solve for X

$\times 32cm$

$1.5 = \frac{X}{32cm}$ $\times 32cm$

$X = 1.5 \times 32\,cm = \boxed{48cm}$

Example

A customer brings an 8 x 10 inch photograph in to a printing and framing store. The customer wants the photo to be printed twice as large and framed. What length of framing material should the framer use to completely frame the enlarged picture?

$k = 2$

Length

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

$(2) = \frac{\ell}{(10\text{cm})}$ (×10cm, ×10cm)

$\ell = 2 \times 10\text{cm} = 20\text{cm}$

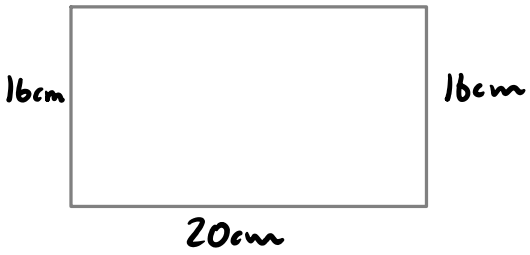
Width

$k = \frac{D}{O}$

$(2) = \frac{w}{(8\text{cm})}$ (×8cm, ×8cm)

$w = 2 \times 8\text{cm} = 16\text{cm}$

$\Rightarrow$



Required Framing material
= Perimeter
= 16cm + 16cm + 20cm + 20cm
= 72cm

Note: Reductions k-value are smaller than 1.

ex: "make something half as big", $k = 0.5 = \frac{1}{2}$