PROBLEM SOLVED
MAKING SENSE OF MATHEMATICS

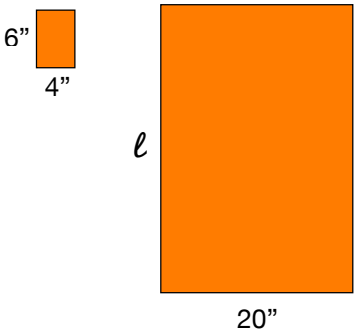
Similarity: Using Proportions
A Closer Look at the Video

After watching the *Similarity: Using Proportions* video, make sense of the mathematics by taking a closer look at the problem situation and solutions. Use the comments and questions in bold to help you solve the problems and develop a deeper understanding of similarity and proportions.

Problem: Erica has a picture with dimensions of 4 inches by 6 inches. She wants it enlarged into a poster with a width of 20 inches, but she doesn't know how long the poster should be in order to ensure the poster is similar to the original picture. How long should the poster be?

What does it mean for the poster to be similar to the original picture?
The word, similar, has a very specific meaning in mathematics. Similar shapes have equal angles and corresponding sides that are proportional. The objects are the same shape but different sizes. If the poster is not mathematically similar to the picture, the picture on the poster will be distorted.

Method 1: Between ratios
One way to solve this problem is by looking at the relationship between the width of the photo, 4 inches, and the width of the poster, 20 inches.



width of picture → $\frac{4 \text{ inches}}{6 \text{ inches}} = \frac{20 \text{ inches}}{\ell}$ ← width of the poster
length of picture → ← length of the poster

How many times larger is the width of the poster than the width of the picture? Since 5 times 4 equals 20, the width of the poster is 5 times larger than the width of the picture.

How can you use this information to find the length of the poster? Each dimension of the poster will be 5 times as large as the dimensions of the picture. Since 6 x 5 = 30, the poster will be 30 inches long.

x 5

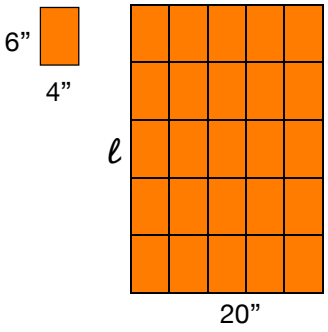
width of picture → $\frac{4 \text{ inches}}{6 \text{ inches}} = \frac{20 \text{ inches}}{\ell}$ ← width of the poster
length of picture → ← length of the poster

x 5

MakingSense

Scale Factor

What is the scale factor in this problem? The scale factor lets you know that every dimension of the poster is 5 times larger than the corresponding dimension of the original picture. The scale factor is 5. The scale factor reflects the relationship between two equal ratios.



Method 2: Within ratios

Another way to solve this problem is by looking at the relationship between the width and length of the picture and between the width and length of the poster. The width of the picture is 4 inches and the length is 6 inches. Use this relationship to determine the length of the poster.

width of picture → $\frac{4 \text{ inches}}{6 \text{ inches}} = \frac{20 \text{ inches}}{\ell}$ ← width of the poster
length of picture → ← length of the poster

How many times larger is the length of the picture than the width of the picture? Since, 1½ times 4 equals 6, the length of the picture is 1½ times larger than the width of the picture.

How can you use this information to find the length of the poster? The length of the poster will be 1½ times as large as the width of the poster. Since 1½ x 20 = 30, the poster will be 30 inches long.

width of picture → $\times 1\frac{1}{2}$ $\frac{4 \text{ inches}}{6 \text{ inches}} = \frac{20 \text{ inches}}{\ell}$ $\times 1\frac{1}{2}$ ← width of the poster
length of picture → ← length of the poster

Constant of Proportionality

What is the constant of proportionality for this problem? The constant of proportionality is 1½. The length of the picture is 1½ times the width of the picture and the length of the poster is 1½ times the width of the poster. The constant of proportionality reflects the relationship within a ratio. All similar rectangles will have the same constant of proportionality.

There are several ways to solve a problem involving similarity. One way is to set up a proportion and look at the relationship between the two ratios. Another way is to look at the relationship between the numbers in each ratio. The scale factor reflects the relationship between two equal ratios. The constant of proportionality reflects the relationship within a ratio.