Similarity: Using Proportions
Another Approach

Many adults would solve the problem from the video using a mathematical procedure similar to what is displayed below.

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?

Set up a proportion using the information from the problem. One way to do this is shown below.

$$\frac{\text{width}}{\text{length}} \quad \frac{4}{6} = \frac{20}{x} \quad \frac{\text{width}}{\text{length}}$$

Cross multiply to solve for x.

$$\frac{\text{width}}{\text{length}} \quad \frac{4}{6} \times \frac{20}{x} \quad \frac{\text{width}}{\text{length}}$$

$$4 \bullet x = 6 \bullet 20$$
$$4 \bullet x = 120$$
$$x = 30$$

Take a closer look at this problem and think about why *cross multiplication* or the *cross products* method works. *Cross products* is a short cut to writing each ratio as an equivalent ratio with a common denominator as shown below. In this case, the common denominator is 6x, the product of the two denominators.

$$\frac{4}{6} = \frac{20}{x}$$

Multiply $\frac{4}{6}$ by $\frac{x}{x}$ and $\frac{20}{x}$ by $\frac{6}{6}$ to get equivalent ratios with a common denominator.

$$\frac{4\,(x)}{6\,(x)} = \frac{20\,(6)}{x\,(6)}$$

$$\frac{4x}{6x} = \frac{120}{6x}$$

Notice that the resulting ratios have the same denominators. If the ratios are equal and the denominators are the same, the numerators must be equal. The numerators are the *cross*

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products. When using *cross products,* do not write the common denominators. Only write the resulting numerators and solve for x.

To solve a problem using *cross multiplication* or the *cross products* method, you must determine how to set up the proportion and then carry out the procedure correctly. Students often have difficulty with this type of problem because they are not sure how to set up the proportion, and they do not understand why *cross multiplication* works. Similarly, they often have difficulty recognizing if their answer makes sense. Once students develop an understanding of the relationships between the numbers in a proportion, *cross multiplication* becomes an efficient way to solve those problems.

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