Proportions

Objective 1: Solve Proportion Problems

A proportion is an equation with two ratios! The equation \( \frac{x}{4} = \frac{2}{3} \) represents a proportion and it can be solved using a technique called cross-multiplying. It can also be solved by first using an LCD to clear the fractions.

Sometimes it may be easier to clear the fractions, but most students tend to like to cross-multiply.

Here we will solve the proportion problem using the cross-multiplication technique.

\[
\frac{x}{4} = \frac{2}{3}
\]

\[
3x = 8
\]

\[
x = \frac{8}{3} \text{ or } 2 \frac{2}{3}
\]
Now we will solve the proportion problem using the clearing fraction or “Kung Fu” fraction technique.

\[ \frac{x}{4} = \frac{2}{3} \quad \text{LCD}=12 \]

\[ 12 \left( \frac{x}{4} \right) = 12 \left( \frac{2}{3} \right) \]

\[ 3x = 8 \]

\[ x = \frac{8}{3} \text{ or } 2 \frac{2}{3} \]

Remember that you can only cross-multiply across an equals (=) sign and you should only do this when you have a proportion. Do not attempt to cross-multiply on the equation below. It is not a proportion. Use the clearing fractions technique in this case.

\[ \frac{x}{2} = \frac{3}{4} + \frac{1}{5} \quad \text{LCD}=20 \]

\[ x = \frac{19}{10} \]
Example 1: Solve the proportion.

\[ \frac{1}{2} = \frac{4}{x} \]

In this problem we will cross-multiply twice to reach the solution.

\[ \frac{1}{2} \cdot \frac{2}{3} = 4 \cdot x \]

Remember, this is called "cross-cancelling" and can only be performed across a multiplication operation!

\[ \frac{1}{3} = 4x \]

Here we rewrite $4x$ as a fraction by placing it over 1. This way we can again cross-multiply.

\[ \frac{1}{3} = \frac{4x}{1} \]

\[ \frac{1}{12} = x \text{ or } x = \frac{1}{12} \]
Example 2: Solve each proportion problem.

a) \( \frac{x}{4} = \frac{5}{8} \)

b) \( \frac{2}{5} = \frac{4}{x} \)

c) \( \frac{25}{100} = \frac{x}{4} \)

Answer the following homework questions.

In Exercises 1 - 9, solve each proportion problem. Try not to use a calculator.

1) \( \frac{4}{x} = \frac{2}{9} \)

2) \( \frac{3}{x} = \frac{10}{11} \)

3) \( \frac{0.5}{1.2} = \frac{1}{x} \)

4) \( \frac{x}{1.4} = \frac{0.15}{3} \)

5) \( \frac{x}{0.5} = \frac{0.5}{2.5} \)

6) \( \frac{x}{12} = \frac{0.05}{0.12} \)

7) \( \frac{x}{\frac{1}{2}} = \frac{\frac{5}{2}}{3} \)

8) \( \frac{\frac{2}{3}}{x} = \frac{8}{\frac{1}{2}} \)

9) \( \frac{\frac{1}{2}}{x} = \frac{\frac{1}{3}}{14} \)