Solve the following equation. \[ \frac{5}{12} x - \frac{2}{3} = \frac{-7}{12} x - \frac{5}{6} \]

Note that this is an equation so we can try \underline{___________} it. In the previous sections, we were \underline{________________} expressions (not solving anything because there were no equal signs!).

- We clear the fractions by multiplying both sides by the LCD! (You may also check if you can combine any like terms.)
- Remove grouping symbols using the distributive property, etc.
- Combine like terms and solve for \(x\). If the highest power on \(x\) is more than 1, bring all terms to one side with 0 on the other. Then see if you can solve by factoring, etc.
- Check the solution in the original equation.

We will be solving these same types of equations in this section, except there may be polynomials in the numerator or denominator. You still find the LCD, multiply both sides by it, simplify, and solve! You may have to factor the denominator before finding the LCD.
Example 1: Solve the following equations.

a) \( \frac{5}{x} + \frac{1}{6} = \frac{23}{6x} \)

b) \( \frac{3x}{x-5} + 2 = \frac{4x}{x-5} \)

c) \( \frac{1}{3x+1} = \frac{2}{9x^2-1} - \frac{1}{3x-1} \)
Proportions

Consider the following ratio (quotient of two quantities): \( \frac{1}{4} \)

If two ratios are equal, it is called a \( \underline{\text{____________________}} \): \( \frac{1}{4} = \frac{2}{8} \)

"1 is to 4 as 2 is to 8"

Consider the proportion: \( \frac{1}{3} = \frac{x}{39} \)

In the past, we have cleared the fractions in an equation by multiplying both sides by the LCD.

We can do the same here:

Notice that we could have also found \( x \) by taking the \( \underline{\text{____________________}} \). In other words, we could have “cross-multiplied”.

If \( \frac{a}{b} = \frac{c}{d} \), then \( ad = bc \).

Whenever a single fraction (or ratio) is equal to a single fraction (or ratio), you can cross multiply!

Example 2: Solve the following for \( x \).

\[ \frac{x + 1}{x + 2} = \frac{5}{3} \]

Application

When setting up a proportion, make sure the units make sense!

Example 3: On a certain map, one inch represents 5 miles. What is the distance represented by 6 inches?