

## Section 3.1/3.2 Solving Equations Using Addition, Subtraction, Multiplication and Division

An equation is like a balanced scale. the two sides are equivalent to each other. If you add something to one side, you must add the same thing to the other side. the same thing happens when you subtract.

We can use the *balance* idea to solve for a variable in an equation. Think of trying to undo whatever is being done to the variable. We “undo” by doing the opposite. To do this we need to know what the opposite operation is. The following table show the operations and their opposites.

Operation	Opposite Operation
Addition	Subtraction
Subtraction	Addition
Multiplication	Division (multiply by the reciprocator)
Division	Multiplication

So, to solve an equation all we have to do is undo the operations being done to the variable.

### Examples:

$$x + 7 = 10 \quad \begin{array}{r} x + 7 = 10 \\ -7 \quad -7 \\ \hline x = 3 \end{array}$$

To undo this we identify that 7 is being added to x. To undo it, we do the opposite and subtract 7. To keep the balance, we subtract 7 from **both sides**. (Be sure to show your work!)

$$x - 4 = 12 \quad \begin{array}{r} x - 4 = 12 \\ +4 \quad +4 \\ \hline x = 16 \end{array}$$

The opposite of subtracting 4 is adding 4 to **both sides**.

$$3x = 18 \quad \begin{array}{r} 3x = 18 \\ \frac{3x}{3} = \frac{18}{3} \\ x = 6 \end{array}$$

x is being multiplied by 3. The opposite operation is to divide by 3. So we divide **both sides** by 3.

$$\frac{x}{5} = 10 \quad \begin{array}{r} (5) \frac{x}{5} = 10(5) \\ x = 50 \end{array}$$

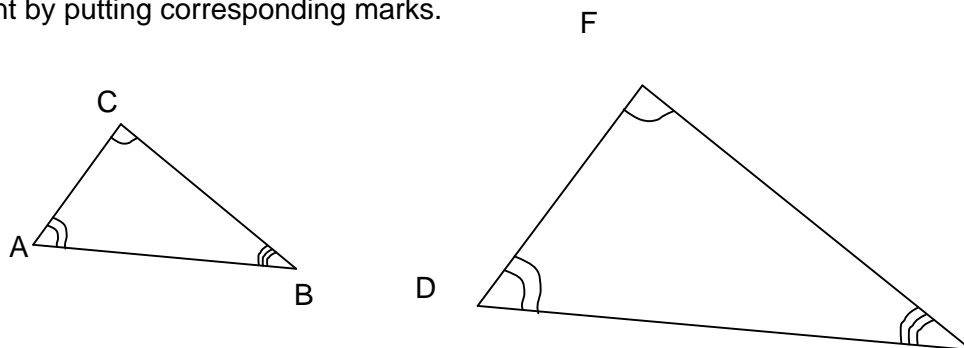
The opposite of dividing by 5 is to multiply by 5.

$$\frac{2}{3}x = 12 \quad \begin{array}{r} \left(\frac{3}{2}\right) \frac{2}{3}x = 12\left(\frac{3}{2}\right) \\ x = 18 \end{array}$$

The opposite of multiplying by  $\frac{2}{3}$  is dividing by  $\frac{2}{3}$ . But, dividing by  $\frac{2}{3}$  is the same as multiplying by its reciprocal which is  $\frac{3}{2}$ .

## Similar Triangles

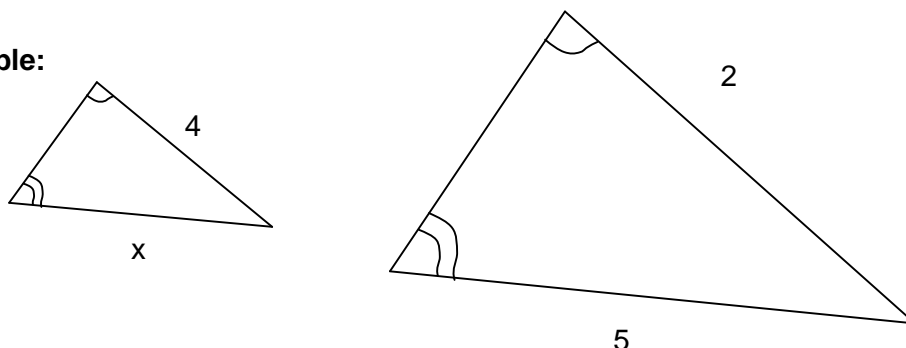
Two triangles are similar if they have three angles that are equivalent. We show that they are equivalent by putting corresponding marks.



If two triangles are similar, then the ratios of the corresponding sides are equal. E

So...  $\frac{\overline{AC}}{\overline{DF}} = \frac{\overline{AB}}{\overline{DE}}$  and any other ratios of corresponding sides would be equal.

**Example:**



The ratios of the corresponding sides are equivalent.

$$\frac{x}{4} = \frac{5}{2}$$

Solve by multiplying both sides by 4.

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

$$\mathbf{x = 10}$$