

FORMULAS (2.5)

The steps for solving a formula are THE SAME as the steps for solving an equation. The only difference is that we may not be able to do the arithmetic and simplify the way we can with numbers (i.e. LESS work).

Equation	Examples	Formula
$92 = \frac{80 + 94 + x}{3}$ <p>Clear fractions by multiplying both sides by 3. $3(92) = 80 + 94 + x$</p> <p>Simplify both sides. $276 = 174 + x$</p> <p>Isolate x on one side by subtracting 174 from both sides. $276 - 174 = x$</p> <p>Simplify left side. $102 = x$</p> <p>This equation is solved for x.</p>	<p>Examples</p>	$A = \frac{a + b + c}{3}$ <p>Solve for c</p> <p>Clear fractions by multiplying both sides by 3 $3A = a + b + c$</p> <p>Can't be simplified. $3A = a + b + c$</p> <p>Isolate c on one side by subtracting a and b from both sides. $3A - a - b = c$</p> <p>Can't be simplified. $3A - a - b = c$</p> <p>This formula is solved for c.</p>

DO NOT BE INTIMIDATED BY THE FACT THAT YOU ARE WORKING WITH LETTERS INSTEAD OF NUMBERS! THE RULES OF SOLVING ARE THE SAME.

Equation		Formula
$8 = \frac{2x}{3}$ <p>Clear fractions by multiplying both sides by 3. $3(8) = 2x$</p> <p>Simplify $24 = 2x$</p> <p>Isolate x by dividing both sides by 2. $\frac{24}{2} = x$</p>	<p>Formula</p>	$P = \frac{ab}{c}$ <p>Solve for b</p> <p>Clear fractions by multiplying both sides by c. $cP = ab$</p> <p>Can't be simplified. $cP = ab$</p> <p>Isolate b by dividing both sides by a. $\frac{cP}{a} = b$</p>

Simplify.

$$12 = x$$

This equation is solved for x.

Equation

$$10 = \frac{1}{2}(5x) - \frac{1}{2}(3x)$$

Multiply both sides by 2 to clear fractions.

$$2(10) = 5x - 3x$$

Simplify.

$$20 = 2x$$

To isolate the x, divide both sides by 2.

$$\frac{20}{2} = x$$

Simplify.

$$10 = x$$

This equation is solved for x.

NOTE!!!

This is a very common mistake that students make:

Can't be simplified.

$$\frac{cP}{a} = b$$

This formula is solved for b.

Formula

$$A = \frac{1}{2}(ah) - \frac{1}{2}(bh) \quad \text{Solve for h.}$$

Multiply both sides by 2 to clear fractions.

$$2A = ah - bh$$

Can't be simplified.

Notice though that we need some way of "combining" the ah and the bh so that we can "isolate" the h. When your variable appears in 2 terms (or more) that cannot be combined, use the distributive law to

factor out your variable.

$$2A = h(a - b)$$

To isolate the h, divide both sides by (a - b).

$$\frac{2A}{a - b} = h$$

Can't be simplified.

$$\frac{2A}{a - b} = h$$

This formula is solved for h.

$$\frac{2 + 3x}{2} \neq \frac{\cancel{2} + 3x}{\cancel{2}} \quad (= 3x)$$

DON'T DO IT! You cannot distribute a divisor to only selected numbers in the numerator! You must distribute the divisor to all the terms (just like distributing a multiplier).

$$\frac{2 + 3x}{2} = \frac{2}{2} + \frac{3x}{2} = 1 + \frac{3x}{2}$$

So when you get a solution like $\frac{4P+R}{P}$ do not do this: $\frac{4\cancel{P}+R}{\cancel{P}} = 4+R$ (wrong!)

It is perfectly acceptable to leave your answer as $\frac{4P+R}{P}$ but if you wish, you may simplify

it this way: $\frac{4P+R}{P} = \frac{4\cancel{P}}{\cancel{P}} + \frac{R}{P} = 4 + \frac{R}{P}$

Problems

Solve for the indicated variable.

1. $z = \frac{x-y}{2}$ Solve for x

2. $ax + by = c$ Solve for y

3. $T = 3a + 2ba$ Solve for a

4. $C = 2\pi r$ Solve for r

5. $ry = py + d$ Solve for y

6. $a(x - 3w) = 1$ Solve for w

7. $A = P + Prt$ Solve for r

8. $N = an - 3yn$ Solve for n

Answers

1. $x = 2z + y$

2. $y = \frac{c-ax}{b}$ or $\frac{-ax+c}{b}$

3. $a = \frac{T}{3+2b}$

4. $r = \frac{C}{2\pi}$

5. $y = \frac{d}{r-p}$ or $\frac{-d}{p-r}$

6. $w = \frac{1-ax}{-3a}$ or $\frac{ax-1}{3a}$

7. $r = \frac{A-P}{Pt}$ or $\frac{A}{Pt} - \frac{1}{t}$

8. $n = \frac{N}{a-3y}$