

ALGEBRA

A Self-Tutorial

by

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SOLVING LINEAR

EQUATIONS

PART 2 – APPLICATIONS

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BEFORE YOU GET STARTED...



It is highly recommended you review the material found in:

- Basic Math: Lesson 6 – “Fractions.”
- Basic Math: Lesson 7 – “Units of Measurement.”
- Algebra Lesson: “Formulas from Geometry.”
- Algebra Lesson: “Solving Linear Equations: Part 1 – The Basics.”

FORMULAS

◆ A **Formula** is an equation consisting of two or more variables that describe some rule.

◆ **Solving For a Variable** consists of using mathematical properties of equality to “isolate” (get by itself) the variable asked for on one side of the equation and all other variables and constants are on the other side of the equation.

 **EXAMPLE 1:** Solve the formula $A = 2\ell + 2w$ for w .

SOLUTION:

$$A = 2\ell + 2w$$
$$-2\ell \quad -2\ell$$

$$\frac{A - 2\ell}{2} = \frac{2w}{2}$$

$$\frac{A - 2\ell}{2} = w$$

The answer is: $w = \frac{A - 2\ell}{2}$



When manipulating formulas, there is often more than one correct way of writing the final answer. Try to create the one that makes it as compact as possible. Because of this, if doing a multiple-choice test, you may not have the exact version presented on the exam, and may erroneously select “none of the above.” So be careful!



If you get an answer that is a fraction, but does not match any of the choices, try changing the signs of all the terms (multiply the numerator and denominator by -1). This often will produce an answer available on a multiple-choice test.

Using this tip with our previous example, we would get:

$$w = \frac{A - 2\ell}{2} = \frac{-A + 2\ell}{-2} = -\frac{2\ell - A}{2}$$

 **EXAMPLE 2:** Solve the formula for x . Find any restrictions.

$$A = \frac{bx}{c} + d$$

SOLUTION: First off, since c is in the denominator, it cannot have a value of zero, so one restriction is $c \neq 0$.

Solve for x :

$$A = \frac{bx}{c} + d$$

$-d$ $-d$

$$A - d = \frac{bx}{c}$$

$$c(A - d) = c\left(\frac{bx}{c}\right)$$


$$\frac{c(A - d)}{b} = \frac{bx}{b}$$

$$\frac{c(A - d)}{b} = x$$

Since b is in the denominator, $b \neq 0$.

The answer is: $x = \frac{c(A - d)}{b}$, $b \neq 0$, $c \neq 0$.

This is not the only answer. You could have distributed the c or multiply by $\frac{c}{b}$ instead of multiplying by c , then multiply by b . $A - d$ is also $-d + A$. So there is quite a bit of variation. Again, I try to get as compact a formula as possible.

 **EXAMPLE 3:** Solve $F = \frac{9}{5}C + 32$ for C .

SOLUTION:

$$F = \frac{9}{5}C + 32$$

$$\begin{array}{r} -32 \\ -32 \end{array}$$

$$F - 32 = \frac{9}{5}C$$

This time, I will multiply both sides by $\frac{5}{9}$:

$$\frac{5}{9}(F - 32) = \frac{5}{9}\left(\frac{9}{5}C\right)$$

$$\frac{5}{9}(F - 32) = C$$

The answer is: $C = \frac{5}{9}(F - 32)$.

CONVERTING A REPEATING DECIMAL INTO A FRACTION

In Basic Math: Lesson 6 – “Fractions,” one type of conversion was not done, since knowledge of solving linear equations was needed. Now, we can do this.

Step-By-Step

- ① Let x = the repeating decimal.
- ② Multiply both sides of the equation by the power of 10 that matches the number of repeating digits.