

Mathematics 9

Section 6.1 - Solving Equations by Using Inverse Operations

When working with algebra, or the combination of letters and numbers, it is extremely important that you keep in mind the phrase "INVERSE OPERATIONS".

The word "INVERSE" means "OPPOSITE", and "OPERATIONS" refers to the $+$ $-$ \times \div part of an equation.

So when we say we need to do the 'INVERSE OPERATION' WE DO THE OPPOSITE OF WHICHEVER $+$ $-$ \times \div IS PRESENT

INVERSE OPERATIONS are the backbone of algebra, and getting a firm grasp on the few simple rules will help immensely both this year and in future grades.

Remember the overall goal of algebra is to SOLVE FOR THE VARIABLE

Remember

Frequently in algebra problems are given to you as words, and you must convert them into an algebraic expression/equation. You need to read the question carefully and try to decipher what the expression/equation would look like.

SIX MORE THAN A NUMBER IS TEN

$6 + n = 10$

$$6 + n = 10$$

TWICE A NUMBER LESS FOUR IS EIGHT

$2 \cdot n - 4 = 8$

$$2n - 4 = 8$$

FOUR TIMES A NUMBER IS TWELVE

$4 \cdot n = 12$

$$4n = 12$$

****Stop** Practice WS #1**

A NUMBER DIVIDED BY FIVE IS TWENTY

$n \div 5 = 20$

$$\frac{n}{5} = 20$$

New

Solving one-step equations

Whenever we solve algebra equations we need to keep "inverse operations" firmly in our heads. We must also verify our solution to check if it is correct. We verify by inserting the number we solved for back into the original question for the variable. If both sides are equal, we have the correct answer.

$$n + 4 = 10$$

OPPOSITE OF + IS -

$$\begin{array}{r} n + 4 = 10 \\ -4 \quad -4 \\ \hline n = 6 \end{array}$$

$$x - 6 = 12$$

OPPOSITE OF - IS +

$$\begin{array}{r} x - 6 = 12 \\ +6 \quad +6 \\ \hline x = 18 \end{array}$$

$$3x = 21$$

OPPOSITE OF \times IS \div

$$\begin{array}{r} 3x = 21 \\ \frac{3}{3} \quad \frac{21}{3} \\ \hline x = 7 \end{array}$$

$$\frac{y}{7} = 5$$

OPPOSITE OF \div IS \times

$$7 \cdot \frac{y}{7} = 5 \cdot 7$$

$$\frac{7y}{7} = 35$$

$$y = 35$$

Solving two-step equations

When we have more complicated algebra equations, you always need to start by moving any numbers without letters. We only deal with numbers touching letters in the final step. We still need to verify our solutions.

$$7n + 3 = 38$$

+/- First

$$\begin{array}{r} 7n + 3 = 38 \\ -3 \quad -3 \end{array}$$

$$\frac{7n}{7} = \frac{35}{7}$$

$$n = 5$$

VERIFY:

$$7(5) + 3 = 38$$

****Stop**** Practice WS #2

$$35 + 3 = 38$$

$$38 = 38 \checkmark$$

$$\frac{n}{2} + 16 = 4$$

$$\begin{array}{r} \frac{n}{2} + 16 = 4 \\ -16 \quad -16 \end{array}$$

$$\frac{n}{2} = -12$$

$$2 \cdot \frac{n}{2} = -12 \cdot 2$$

$$n = -24$$

VERIFY

$$\frac{-24}{2} + 16 = 4$$

$$-12 + 16 = 4$$

$$4 = 4 \checkmark$$