Operations

Algebra uses the same operations as arithmetic: addition, subtraction, multiplication, and division. In arithmetic, we might say $3 + 4 = 7$, while in algebra we would talk about two numbers whose values we don't know that add up to 7, or $x + y = 7$. Here's how each operation translates to algebra:

ALGEBRAIC OPERATIONS	
The sum of two numbers	$x + y$
The difference of two numbers	$x - y$
The product of two numbers	$x \times y$ or $x \bullet y$ or xy
The quotient of two numbers	$\frac{x}{y}$

Arithmetic with Positive and Negative Numbers

The table below illustrates the rules for doing arithmetic with signed numbers. Notice that when a negative number follows an operation (as it does in the second example below), it is enclosed in parentheses to avoid confusion.

RULE	EXAMPLE
Addition	
■ If both numbers have the same sign, just add them. The answer has the same sign as the numbers being added.	$3 + 5 = 8$ $-3 + (-5) = -8$
■ If both numbers have different signs, subtract the smaller number from the larger. The answer has the same sign as the larger number.	$-3 + 5 = 2$ $3 + (-5) = -2$
■ If both numbers are the same but have opposite signs, the sum is zero.	$3 + (-3) = 0$
Subtraction	
■ Change the sign of the number to be subtracted, then add as above.	$3 - 5 = 3 + (-5) = -2$ $-3 - 5 = -3 + (-5) = -8$ $-3 - (-5) = -3 + 5 = 2$
Multiplication	
■ Multiply the numbers together. If both numbers have the same sign, the answer is positive; otherwise, it is negative.	$3 \times 5 = 15$ $-3 \times (-5) = 15$ $-3 \times 5 = -15$ $3 \times (-5) = -15$
■ If one number is zero, the answer is zero.	$3 \times 0 = 0$
Division	
■ Divide the numbers. If both numbers have the same sign, the answer is positive; otherwise, it is negative.	$15 \div 3 = 5$ $-15 \div (-3) = 5$ $15 \div (-3) = -5$ $-15 \div 3 = -5$
■ If the top number is zero, the answer is zero.	$0 \div 3 = 0$

When more than one arithmetic operation appears, you must know the correct sequence in which to perform the operations. For example, do you know what to do first to calculate $2 + 3 \times 4$? You're right if you said, "multiply first." The correct answer is 14. If you add first, you will get the wrong answer of 20. The correct sequence of operations is:

1. Parentheses
2. Exponents
3. Multiplication & Division (in order from left to right)
4. Addition & Subtraction (in order from left to right)

} This saying can help you remember the order of operations:
Please Excuse My Dear Aunt Sally

It is important to remember that multiplication and division are done in order from left to right, and that sometimes multiplication will come *after* division. The same is true of addition and subtraction.

Example: $24 \div 8 \times 10$
$(24 \div 8) \times 10$ [not $24 \div (8 \times 10)$]
$3 \times 10 = 30$

If the multiplication of 8×10 had been done first, the answer would have worked out to $24 \div 80$, which is not equal to 30, and is incorrect.

Even when signed numbers appear in an equation, the step-by-step solution works exactly as it does for positive numbers. You just have to remember the arithmetic rules for negative numbers. For example, let's solve $14x + 2 = 5$.

1. Subtract 2 from both sides:
$$\begin{array}{r} -14x + 2 = -5 \\ -2 \quad -2 \\ \hline -14x = -7 \end{array}$$
2. Divide both sides by –14:
$$\begin{aligned} -14x \div -14 &= -7 \div -14 \\ x &= \tfrac{1}{2} \end{aligned}$$