Objective- The students will be able to evaluate algebraic expressions.

Variable is a letter or symbol that represents a number.

Constant- is a quantity that does not change.

Algebraic expressions - is an expression has a variable and may contain operations.

Ex. $4x$ Ex. $5 + x$ Ex. $2y + 3$

**Evaluating Algebraic Expressions**

To evaluate an algebraic expression, substitute a number for the variable, then se the Order of Operations to evaluate the arithmetic expression.

Ex. If $w = 3$, evaluate $w + 5$.

$w + 5$
$=3 + 5$
$=8$

Ex. If $h = 6$, evaluate the algebraic expression $h \div 2$

$h \div 2$
$= 6 \div 2$
$= 3$

Ex. Find the value of $2b + 4$, if $b = 3$

$2b + 4$
$= 2(3) + 4$
$= 6 + 4$
$= 10$

Ex. If $x = 4$, evaluate $x^2 - 3$

$x^2 - 3$
$= 3^2 - 3$
$= 9 - 3$
$= 6$

Ex. Evaluate $2a + 3b - 4c$ when $a = 5$, $b = 10$ and $c = 7$

$2a + 3b - 4c$
$= 2(5) + 3(10) - 4(7)$
$= 10 + 30 - 28$
$= 12$

Objective- The students will be able to translate between math and English.

## Word Translations

Words that generally mean:

| | |
|---|---|
| ADD – | total, sum, in all, altogether |
| SUBTRACT- | difference, left, less than, minus, take away, words ending in “er” |
| MULTIPLY- | times, product |
| DIVIDE- | quotient, divided by, one, per. Each |

| | |
|---|---|
| three more than a number | $x + 3$ |
| seven less than a number | $x - 7$ |
| the sum of 12 and a number | $12 + x$ |
| the product of 7 and a number | $7x$ |
| 15 divided by a number | $15 \div x$ |

## Writing Expressions from Tables

To write an algebraic expression from a chart, identify a pattern (relationship) between the first set of numbers and the second set.

Ex. Write an expression to describe the relationship in the following table and find the next term.

| $1^{st}$ row | $2^{nd}$ row |
|---|---|
| 1 | 4 |
| 2 | 5 |
| 3 | 6 |
| 4 | 7 |
| 5 | _ |

Examining the second row, the numbers seem to be increasing by 1, so the next term would be 8.

Looking at the first two rows, it appears the number in the second row is always 3 more than the number in the first row. So the algebraic expression that describes this relationship is $x + 3$.

Ex. Write an expression for the following sequence and find the next term.

| Term | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Value of term | 3 | 5 | 7 | 9 | 11 | ? |

Examining the second row, the numbers seem to be increasing by 2, so the next term would be 13.

Looking for a pattern to describe the relationship between the first and second rows is not obvious, so try *trial & error* – referred to as guess & check.

If I multiply the first row by 2, that does not give me the corresponding number in the second row. But, if I add one to the doubling, that gives me 3 and that works for the value of the first term. Try multiplying each term by 2 and adding one. That seems to be working. So the algebraic expression is $2n + 1$.

When you can find the next term in a sequence by adding the same number (constant) to the preceding term, you can use a formula to find the algebraic expression.

In the previous example, the value of the next term was found by always adding 2. After you know the first value of the term, how many times will you add 2 to get to value of the second term, the third term, fourth term, fifth term and sixth term?

The answer is you will always add the constant one less time than the value of the term you are trying to find. So, the second term, you will add 2 once. For the fifth term, you will add 2 four times to the first term. For the nth term, you will add the constant $(n-1)$ times.

So to find the expression, I start with the value of the first term, which is 3, then I add the constant $(n-1)$ times

$$3 + (n-1)2 = 3 + 2n - 2$$
$$= 2n + 1 \qquad \text{Just like before.}$$

Ex. Write an expression for the following sequence described in the table and find the missing term and the 101st term.

| Term | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Value of term | 6 | 11 | 16 | 21 | 26 | 31 | _ |

The numbers in the sequence (numbers in the second row) seem to be increasing by 5. So the next term would be 36.

Now I could try to find an expression by trial & error or, since I am adding the same number over again to find the next term, I could ask how many times am I adding the constant **<u>to the first term</u>** to get to the nth term? Answer (n–1)

$$6+(n-1)5 = 6 + 5n - 5$$
$$= 5n + 1$$

Objective- The students will be able to solve one-step linear equations and inequalities in one variable.

Equation is a mathematical statement that two quantities are equal.

Solution is a value of a variable that makes an equation true.

**<u>Properties of Equality</u>**

| | |
|---|---|
| Addition Property of Equality | If a = b, then a + c = b + c |
| Subtraction Property of Equality | If a = b, then a – c = b – c |
| Multiplication Property of Equality | If a = b, then ac = bc |
| Division Property of Equality | If a = b, c ≠ 0, then a/c= b/c |

Ex. Addition Property of Equality

If 4 quarters = 10 dimes, then I can add three nickels to both sides of the equation and maintain the equality.

4 quarters + 3nickels = 10 dimes + 3 nickels

**Solving 1–Step Equations**

Strategy – Isolate variables on one side of the equation and numbers on the other side by using the opposite operation.

Ex. Solve for x, x + 6 = 10

Isolate the x by subtracting 6 from both sides of the equation.

$$x + 6 = 10$$
$$x = 4$$

Ex. Solve for y, y – 5 = 3

Isolate the y by adding 5 to both sides of the equation

$$y - 5 = 3$$
$$y = 8$$

Ex. Solve for n, $2n = 12$

Isolate the n by dividing by 2

$$2n = 12$$
$$n = 6$$

Ex. Find the solution for $x/3 = 10$

Isolate the variable by multiplying both sides by 3

$$x/3 = 10$$
$$x = 30$$

The properties of equality allow you to manipulate those equations to isolate the variable.

*Remember – solutions are values of variables that make equations true. To ensure you have the correct solution, you can substitute the value back into the original equation. If it works, it is true, you have the right answer. If it doesn't work, its not true, then you need to go back and check your work.

Ex. Is $w = 8$ a solution to $w + 6 = 12$?

By substituting 8 into to equation for w, $8 + 6$ ?= 12. The answer is NO, so 8 is not a solution.

Ex. Is $x = 5$ a solution for $4x = 20$?

Substituting 5 for x, we have $4(5)$ ?= 20. The answer is YES, so 5 is a solution.

**Inequality Symbols – reading from left to right**

$<$ less than
$\leq$ less than or equal to
$>$ greater than
$\geq$ greater than or equal to

Ex. $3 < 4$, three is less than four
Ex. $12 > 8$, twelve is greater than 8

**Solving 1–Step Inequalities**

Strategy – Isolate variables on one side of the inequality and numbers on the other side by using the opposite operation. (same as for equations)

Ex. Solve the inequality for x, $3x \leq 27$

Isolate the variable by dividing both sides by 3 of the inequality

$3x \leq 27$
$x \leq 9$

Ex. Solve the inequality for y; $y + 6 > 10$

Isolate the variable by subtracting 6 from both sides of the inequality

$y + 6 > 10$
$y > 4$

Ex. Solve the inequality for t; $t - 6 < 3$

Isolate the variable by adding 6 to both sides of the inequality

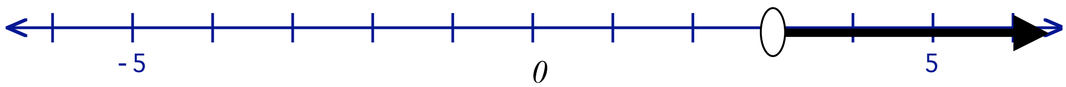
$t - 6 < 3$
$t < 9$

**Graphing Solutions of Inequalities**

To graph the solution to an inequality:

1. Place an open circle around the coordinate
2. If the coordinate is included ($\leq$ or $\geq$), then shade circle
3. Draw a ray that extends indefinitely on the side of the coordinate which show the values of the variable that make the open sentence true.

Ex. Graph $x > 3$




Ex. Graph $y \leq -2$