

# Moore Catholic High School

## Math Department

### Algebra II Common Core Vocabulary

The following is a list of terms and properties which are necessary for success in an Algebra II Common Core class. You will be tested on these terms during your first week of classes:

**abscissa** - The horizontal or  $x$ -coordinate of a two-dimensional coordinate system.

**absolute value** - The distance from 0 to a number  $n$  on a number line. The absolute value of a number  $n$  is indicated by  $|n|$ .

**adjacent angles** - Two coplanar angles that share a common vertex and a common side but have no common interior points.

**algebraic equation** - A mathematical statement that is written using one or more variables and constants which contains an equal sign.

**Examples:**  $5x - 2 = 18$

**algebraic expression** - A mathematical phrase that is written using one or more variables and constants, but which does not contain the symbols  $=$ ,  $<$ ,  $>$ ,  $\leq$ ,  $\geq$ , or  $\neq$ .

**Examples:**  $a + 8$  and  $x^2$

**angle** - A geometric figure formed by two rays that have a common endpoint.

**angle of depression** - The angle formed by the horizontal and the line of sight when looking downward.

**angle of elevation** - The angle formed by the horizontal and the line of sight when looking upward.

**base of an exponential function** - The number  $b$  in the exponential function  $y = b^x$ .

**biased sample** - A sample having a distribution that is determined not only by the population from which it is drawn, but also by some property that influences the distribution of the sample.

**Example:** A poll about your favorite baseball team might be biased if the sample polled consisted only of people entering Yankee Stadium.

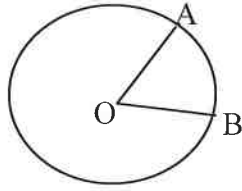
**bivariate data** - Data involving two variables.

**center-radius equation of a circle** - The form of the equation of a circle with center  $(h, k)$  and radius  $r$  given by the formula  $(x - h)^2 + (y - k)^2 = r^2$

**Example:** If the coordinates of the center of the circle are  $(3, -8)$  and the length of the radius is 6, then the equation of the circle is  $(x - 3)^2 + (y + 8)^2 = 36$ .

**central angle** - An angle in a circle with vertex at the center of the circle and sides that are radii.

**Example:** Central angle  $AOB$



**circle** - The set of all points (or locus of points) in a plane that are a fixed distance, (called the radius) from a fixed point, (called the center).

**coefficient** - The numerical factor of a term in a polynomial.

**Example:** 9 is the coefficient of  $9x^5$

**common factor** - A number, polynomial, or quantity that divides evenly into two or more numbers or algebraic expressions.

**Example:** 1, 3, 5, 15, are common factors of 15 and 30  
 $2x$  is a common factor of  $4xy$  and  $6x^2$   
 $x - 2$  is a common factor of  $x^2 - x - 2$  and  $x^2 - 6x + 8$

**conjugate** - Two binomials whose first terms are equal and last terms are opposites.

**Example:**  $x + 4$  and  $x - 4$  are conjugates

**correlation coefficient** - A number,  $r$ , between  $-1$  and  $1$  that indicates the strength and direction of the linear relationship between two sets of numbers.

**Example:** If  $r=1$ , then the points lie on a line which has a positive slope and the two sets of numbers are said to be in perfect positive correlation. If  $r=-1$ , then the points lie on a line which has a negative slope and the two data sets are said to be in perfect negative correlation.

**cosine** - For a given acute angle in a right triangle, the ratio of the length of the side adjacent to an acute angle to the length of the hypotenuse.

**degree of a monomial** - The sum of the exponents of the variables in the monomial.

**Example:** The degree of the monomial  $3x^5$  is five.  
The degree of the monomial  $x^3y^4$  is seven.  
The degree of  $xy$  is two.  
The degree of  $7$  is zero.

**degree of a polynomial** - The highest degree of any monomial term in the polynomial.

**difference of two perfect squares** - A binomial of the form  $a^2 - b^2$  which can be factored into  $(a - b)(a + b)$  which are conjugates.

**direct variation** - A relationship in which the ratio of two variables is constant. A direct variation has an equation of the form  $y = kx$ , where  $x$  and  $y$  are variables and  $k$  is the constant of variation.

**domain** - The set of values of the independent variable, usually  $x$  in an equation, for which a given function is defined; the set of first coordinates in the ordered pairs of a relation.

**equation** - A mathematical sentence stating that two expressions are equal.

**exact answer** - The solution to an equation that has not been rounded.

**exact value** - The value of an expression that has not been rounded.

**exponential function** - A function with a variable in the exponent; an equation in the form  $y=ab^x$ , where  $a \neq 0$ ,  $b > 0$  and  $b \neq 1$ .

**extraneous root/value** - A solution of a derived equation that is not a solution of the original equation.

**factor** - (noun) A whole number that is a divisor of another number; an algebraic expression that is a divisor of another algebraic expression.

**Example:** 3 is a factor of 12

**factor** - (verb) To find the number of algebraic expressions that give an indicated product.

**Example:** To factor  $x^2 + x - 6$ , write  $(x + 3)(x - 2)$ .

**function** - A rule that assigns to each number  $x$  in the function's domain a unique number  $y$  in the range.

**geometry** - Branch of mathematics that deals with the properties, measurement, and relationships of points, lines, angles, surfaces, and solids.

**greatest common factor (GCF)** - The greatest number or expression that is a factor of two or more numbers or expressions.

**Example:** 12 is the GCF of 24 and 36.

5xy is the GCF of  $25x^2y$  and  $10xy^2$

**index of a radical** - The letter  $n$  in the expression  $\sqrt[n]{\quad}$

**interquartile range** - The difference between the first and third quartiles.

**irrational number** - A number that cannot be expressed as the ratio of two integers, that is, in  $\frac{a}{b}$  form.

An irrational number, in decimal form, is non-repeating and non-terminating.

**Example:** The numbers  $\pi$  and  $\sqrt{2}$  are irrational numbers.

**laws of exponents** - Rules involving operations on expressions with like bases.

**Example:** Multiplication Law:  $x^4x^2 = x^6$

Division Law:  $\frac{x^8}{x^3} = x^5$

Power Law:  $(x^5)^3 = x^{15}$

**linear equation** - A first degree equation.

**Examples:**  $y = 6x + 8$

$12n - 19 = 23 + 7n$

**linear system** - A set of two or more linear equations with common variables.

**mean** - A measure of central tendency denoted by  $\bar{x}$ , read “x bar”, that is calculated by adding the data values and then dividing the sum by the number of values; also known as the arithmetic mean or arithmetic average.

**measure of central angle** - The measure equal to the degree measure of the arc intercepted by the angle.

**measure of central tendency** - A summary statistic that indicates the typical value or center of an organized data set. The three most common measures of central tendency are the mean, median, and mode.

**measures of dispersion** - An indication of the spread, or variation, of data values about the mean. Some common measures of dispersion are range, quartiles, interquartile range, standard deviation and variance.

**median** - A measure of central tendency that is, or indicates, the middle of a data set when the data values are arranged in ascending or descending order. If there is no middle number, the median is the average of the two middle numbers.

**Examples:**

The median of the set of numbers: {2, 4, 5, 6, 7, 10, 13} is 6

The median of the set of numbers: {6, 7, 9, 10, 11, 17} is 9.5

**minute** - A unit of degree measure equal to 1/60 of a degree.

**mode** - A measure of central tendency that is given by the data value(s) that occur(s) most frequently in the data set.

**Examples:**

The mode of the set of numbers {5, 6, 8, 6, 5, 3, 5, 4} is 5.

The modes of the set of numbers {4, 6, 7, 4, 3, 7, 9, 1, 10} are 4 and 7.

The mode of the set of numbers {0, 5, 7, 12, 15, 3} is none or there is no mode.

**negative exponent** - An exponent that is a negative number. In general,  $x^{-a} = \frac{1}{x^a}$ ,  $x \neq 0$

**opposite side in a triangle** - The side across from an angle.

**ordinate** - The vertical coordinate of a two-dimensional rectangular coordinate system. It is the y-value in a set of ordered pairs (x, y).

**parabola** - The graph of a quadratic function. It is two-dimensional and u-shaped. The equation of a parabola is in the form  $ax^2 + bx + c = 0$ .

**pi** - The irrational number equal to the length of the circumference of a circle divided by the length of its diameter. The symbol for pi is  $\pi$ .

**principal square root** - The positive square root of a number.

**Example:** The principal square root of 4 is 2.

**quadratic equation** - An equation that can be written in the form  $ax^2 + bx + c = 0$ , where  $a$ ,  $b$ , and  $c$  are real constants and  $a \neq 0$ .

**quadratic formula** - The formula used to determine the roots of the quadratic equation.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

**quartiles** - Values that divide a data set into fourths. The median, or second quartile, divides the data into a lower half and an upper half; the first quartile is the median of the lower half; and the third quartile is the median of the upper half.

**radical** - The root of a quantity as indicated by the radical sign.

**radicand** - The quantity under a radical sign; a number or expression from which a root is extracted.

**Example:** 3 is the radicand of  $\sqrt{3}$

In the expression  $\sqrt[n]{k}$ , the radicand is  $k$ .

**random sample** - A sample in which all members of the population and all groups of a given size have an equal chance of being selected for the sample.

**range (of a function)** - The set of values of the dependent variable, usually  $y$ , of a given function; the set of second coordinates in the ordered pairs of a function.

**rational number** - Any number that can be expressed as a ratio in the form  $\frac{a}{b}$  where  $a$  and  $b$  are integers and  $b \neq 0$ . A rational number is either a terminating or repeating decimal.

**root of an equation** - A solution to an equation when  $y = 0$ .

**Example:** A root of the equation  $y = 6x - 18$  is 3 because when 3 is substituted in for  $x$ , the value of  $y = 0$ .

**Example:** The roots of  $x^2 - x - 2 = 0$  are  $x = 2$  and  $x = -1$ . The equation is true if we substitute either  $x = 2$  or  $x = -1$  into the equation.

**sine** - For a given acute angle in a right triangle, the ratio of the length of the side opposite the acute angle to the length of the hypotenuse.

**slope** - The measure of the steepness of a line; the ratio of vertical change to horizontal change; if point P is  $(x_1, y_1)$  and point Q is  $(x_2, y_2)$  the slope of  $PQ = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$ . Also called **average rate of change**.

**solution set** - Any and all value(s) of the variable(s) that satisfy an equation, inequality, system of equations, or system of inequalities.

**subset** - A set consisting of elements from a given set; it may be the empty set.

Example: if  $B = \{1, 2, 3, 4, 5, 6, 7\}$  and  $A = \{1, 2, 5\}$ , then  $A$  is a subset of  $B$ .

**substitution property** - Any quantity can be replaced by an equal quantity.

*Example:* If  $a + x = b$  and  $x = c$ , then  $a + c = b$

**tangent (of an angle)** - For a given acute angle in a right triangle, the ratio of the length of the side opposite the acute angle to the length of the side adjacent to the angle.

**trigonometric functions** - The functions, sine, cosine, tangent, cotangent, secant and cosecant.

**undefined** - An expression in mathematics which does not have meaning and therefore is not assigned a value. When the denominator of a fraction is equal to 0, the fraction is undefined.

**Example:** When  $x=4$ , the expression  $\frac{x+9}{x-4}$  is undefined.

**univariate** - A set of data involving one variable.

**variable** - A quantity whose value can change or vary; in algebra, letters often represent variables.

### Properties of Mathematics

Commutative Property of Addition

$$a + b = b + a$$

Commutative Property of Multiplication

$$ab = ba$$

Associative Property of Addition

$$a + (b + c) = (a + b) + c$$

Associative Property of Multiplication

$$a \times (b \times c) = (a \times b) \times c$$

Identity Property of Addition

$$a + 0 = a$$

Identity Property of Multiplication

$$a \times 1 = a$$

Additive Inverse Property

$$a + -a = 0$$

Multiplicative Inverse Property

$$a \times \frac{1}{a} = 1$$

Distributive Property

$$a(b + c) = ab + ac$$

$$a(b - c) = ab - ac$$

Multiplication Property of Zero

$$a \times 0 = 0$$

NAME \_\_\_\_\_

**ALGEBRA II COMMON CORE SUMMER ASSIGNMENT 2018**

This assignment is to be done on loose-leaf and all work is to be shown. It will be collected during your first math class at Moore Catholic High School. You will also be tested on this material during the first week of classes.

***Part I: Factor each of the following completely:***

- |                           |                          |
|---------------------------|--------------------------|
| 1. $12x^2 - 108$          | 9. $3x^2 - 363$          |
| 2. $x^2 - 36$             | 10. $3x^2 + 12x + 12$    |
| 3. $x^2 - 11x + 18$       | 11. $9x^3 - 9x$          |
| 4. $x^3 - 9x$             | 12. $9x^2 - 6x + 1$      |
| 5. $49 - m^2$             | 13. $2x^2 - 17x - 9$     |
| 6. $a^2 + 2a - 8$         | 14. $7a^4b^2 - 28a^2b^2$ |
| 7. $y^2 + 5y - 6$         | 15. $x^4 - 64$           |
| 8. $x^3 - 7x^2 - 9x + 63$ | 16. $4x^2 - 8x + 4$      |

***Part II: Solve the following equations or inequalities for the variable. All fractions must be reduced completely. Be sure to show all work.***

- |                               |   |
|-------------------------------|---|
| 1. $7 = 3x - 11$              | 6. $14 + \frac{1}{2}x = -20$            |
| 2. $6x + 2x - 4 = 32$         | 7. $7x + 6 = 8 - x - 2$                 |
| 3. $5(x + 2) = 6 + 3(2x - 1)$ | 8. $\frac{x - 5}{10} = \frac{x + 4}{9}$ |
| 4. $4(x + 4) = x + 2(x + 11)$ | 9. $3x - 7 < 2 - (2x + 6)$              |
| 5. $3x + 1 \geq x - 11$       | 10. $14 + 3(x + 2) > 3 - 2(x + 9)$      |

***PART III: Write the equation of the line with the given information. Your answer must be in  $y = mx + b$  form. Show all work for full credit.***

1. Slope  $\frac{1}{2}$  and passing through the point (6, -3)
2. perpendicular to  $y = \frac{1}{4}x - 3$  and passing through the point (2, -3)
3. parallel to  $y - 6x = 1$  and passing through the point (3, -11)
4. passing through the points (3, -1) and (5, 7)
5. passing through the points (3, -1) and (5, 3)

**Part IV: Perform the following operations. All answers must be in simplest radical form.**

1.  $3\sqrt{90} - \sqrt{10}$

2.  $4\sqrt{27} + 11\sqrt{12}$

3.  $(2\sqrt{11})^2$

4.  $(2 - \sqrt{5})^2$

5.  $(2\sqrt{x})^3$

6.  $\sqrt{28} - \sqrt{63} + 2\sqrt{7}$

7.  $(5 - 2\sqrt{3})(6 + 11\sqrt{3})$

8.  $(3 + 7\sqrt{11})^2$

9.  $11\sqrt{75} - 2\sqrt{12}$

10.  $(2\sqrt{x^5})$

**Part V: Simplify each of the following.**

1.  $(x - 9)(2x + 8)$

2.  $(5x - 3)^3$

3.  $(3x + 1)(x + 3)$

4.  $x^5(x^2)$

5.  $(5a^4b^3c)^2$

6.  $2x(x - 3)^2$

7.  $(4y^2 - 5y - 4) - (y^2 - 3y - 2)$

8.  $(5x^3 - 2x^2 + 8x - 10) + 6(-2x^3 + 5x^2 - x - 1)$

9.  $(x - 1)(x^2 - 4x + 10)$

**Part VI:**

**a) Write the equation of each circle based on the given information:**

1. center (0, 0) radius = 10

4. center (-2, -7) radius =  $\sqrt{11}$

2. center (4, 7) radius = 4

5. center (5, 0) radius =  $4\sqrt{5}$

3. center (-8, 8) diameter = 18

6. center (0, -1) radius =  $\frac{1}{2}$



**b) Find the center and radius of each circle: Any radicals must be in simplest form.**

1.  $x^2 + y^2 = 81$

2.  $x^2 + y^2 = 18$

3.  $(x - 5)^2 + (y - 9)^2 = 225$

4.  $(x - 4)^2 + (y + 1)^2 = 25$

5.  $x^2 + (y - 7)^2 = 5$

6.  $(x + 12)^2 + (y + 13)^2 = 196$

***PART VII: Answer all of the following questions. Be sure to show all work or no credit will be given.***

Given:  $f(x) = x^2 - 2x - 5$     $g(x) = 2x + 8$     $m(x) = 2x^2$    and    $h(x) = 2 - 3x$

Find:

1.  $f(-2)$

2.  $g(-3)$

3.  $h(-4)$

4.  $h(-1/3)$

5.  $g(1/2)$

6.  $f(-3)$

7.  $g(x + 2)$

8.  $h(c)$

9.  $f(x - 1)$

10.  $h(-2x)$

11.  $f(2) - g(5)$

12.  $2m(-3)$

13.  $m(\sqrt{3})$

14.  $m(4\sqrt{5})$