

# Algebra – Things to Remember!



<b>Scientific Notation:</b> $3.2 \times 10^{13}$ The first number must be $1 \leq n < 10$		<b>Exponents:</b> $(-3)^2 \neq -3^2$ $2^0 = 1$ $4^{-3} = \frac{1}{4^3}$ $x^m \cdot x^n = x^{m+n}$ $(x^n)^m = x^{n \cdot m}$ $\frac{x^m}{x^n} = x^{m-n}$ $(xy)^n = x^n \cdot y^n$		<b>Properties of Real Numbers:</b> Commutative Property: $a + b = b + a$ $ab = ba$ Associative Property: $a+(b+c) = (a+b)+c$ $a(bc) = (ab)c$ Distributive Property: $a(b+c) = ab + ac$ Identity: $a + 0 = a$ $a \cdot 1 = a$ Inverse: $a + (-a) = 0$ $a \cdot (1/a) = 1$ Zero Property: $a \cdot 0 = 0$					
<b>Factorial:</b> $5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$ $1! = 1$ FYI: $0! = 1$	<b>Absolute Value:</b> $ -5  = 5$ $ 5  = 5$ Represents distance	<b>Undefined:</b> $\frac{6}{7-x}$ is undefined when $x = 7$ since the denominator = 0.		<b>Polygons and sides:</b> triangle – 3      octagon – 8 quadrilateral – 4      nonagon – 9 pentagon – 5      decagon – 10 hexagon – 6      dodecagon – 12 septagon – 7					
<b>Multiply:</b> (distribute or FOIL) $(x+3)(x+2) = x \cdot x + x \cdot 2 + 3 \cdot x + 3 \cdot 2$ $= x^2 + 5x + 6$ $(a+b)^2 = a^2 + 2ab + b^2$ $(a-b)^2 = a^2 - 2ab + b^2$		<b>Direct Variation:</b> $y = kx$ where $k =$ constant of variation $k = y/x$		<b>Degree:</b> Degree of monomial = sum of exponents $4x^3$ is of degree 3 $x^2y^3$ is of degree 5					
<b>Add Fractions:</b> Get the common denominator: $\frac{5x}{6} + \frac{3x}{2} = \frac{5x}{6} + \frac{9x}{6} = \frac{14x}{6} = \frac{7x}{3}$		<b>Factor:</b> Look for a GCF (greatest common factor) Factor binomial or trinomial. $a^2 - b^2 = (a+b)(a-b)$		<b>Solving Equations:</b> 1. Deal with any parentheses in the problem. 2. Combine similar terms on same side of = sign. 3. Get the needed variables on the same side of = sign. 4. Isolate the needed variable by add or subtract. 5. Find the needed variable by divide or multiply.					
<b>Inequalities:</b> $5 - 3x \leq 13 + x$ Remember to $-3x \leq 8 + x$ change direction $-4x \leq 8$ of inequality when $x \geq -2$ mult/div by a negative.		<b>Factor:</b> Look for a GCF (greatest common factor) Factor binomial or trinomial. $a^2 - b^2 = (a+b)(a-b)$		<b>Quadratic Equation:</b> $x^2 - 5x + 6 = 0$ Set = 0. $(x-3)(x-2) = 0$ Factor. $x = 3; x = 2$ Find roots					
<b>Systems:</b> <table border="1" style="width: 100%;"> <tr> <td><math>y - 2x = 1</math></td> <td><i>Linear:</i> substitute; add to eliminate one variable or graph.</td> </tr> <tr> <td><math>y = x^2 - x - 6</math></td> <td><i>Linear Quadratic:</i> substitute or graph</td> </tr> </table> For inequality systems, graph.		$y - 2x = 1$	<i>Linear:</i> substitute; add to eliminate one variable or graph.	$y = x^2 - x - 6$	<i>Linear Quadratic:</i> substitute or graph	<b>Function:</b> Passes the vertical line test. A set of ordered pairs in which each $x$ element has only one $y$ element associated with it. $f(x) = 3x + 4$ $f(3) = 3 \cdot 3 + 4 = 13$		<b>Interval Notation:</b> $(1, 5) \leftrightarrow 1 < x < 5$ $[1, 5] \leftrightarrow 1 \leq x \leq 5$	
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$x =$ abscissa, $y =$ ordinate <b>Slope:</b> $m = \frac{\text{vertical change}}{\text{horizontal change}} = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$		<b>Equations of Lines:</b> $m =$ slope $y = mx + b$ slope-intercept $y - y_1 = m(x - x_1)$ point-slope		<b>Parabola:</b> $y = ax^2 + bx + c$ Axis of symmetry: $x = \frac{-b}{2a}$ Roots: where the graph crosses the $x$ -axis.					
		<b>Parallel and Perpendicular:</b> Parallel: slopes are equal. Perpendicular: slopes are negative reciprocals (flip over and negate)							

<p><b>Perimeter:</b> add the distances around the outside.</p> <p><b>Circumference:</b> <math>C = 2\pi r = \pi d</math></p>	<p><b>Pythagorean Theorem:</b> Right Triangles only. <math>c^2 = a^2 + b^2</math> Triples: 3, 4, 5 5, 12, 13 8, 15, 17 7, 24, 25</p>	<p><b>Trig:</b> Right triangles only <math>\sin \angle A = \frac{o}{h}</math>; <math>\cos \angle A = \frac{a}{h}</math>; <math>\tan \angle A = \frac{o}{a}</math> Angle of elevation: from horizontal line of sight up. Angle of depression: from horizontal line of sight down.</p>
<p><b>Area:</b></p> $A_{\text{triangle}} = \frac{1}{2}bh$ $A_{\text{equilateral triangle}} = \frac{s^2\sqrt{3}}{4}$ $A_{\text{rectangle}} = bh$ $A_{\text{square}} = bh = s^2$ $A_{\text{parallelogram}} = bh$ $A_{\text{rhombus}} = bh = \frac{d_1 \cdot d_2}{2}$ $A_{\text{trapezoid}} = \frac{1}{2}h(b_1 + b_2)$ $A_{\text{circle}} = \pi r^2$ $A_{\text{sector of circle}} = \frac{n}{360}\pi r^2$ $A_{\text{semicircle}} = \frac{1}{2}\pi r^2$ $A_{\text{quarter circle}} = \frac{1}{4}\pi r^2$	<p><b>Volume and Surface Area:</b></p> $V_{\text{rectangular solid}} = l \cdot w \cdot h$ $SA_{\text{rectangular solid}} = 2lh + 2hw + 2lw$ $V_{\text{cylinder}} = \pi r^2 h$ $SA_{\text{closed cylinder}} = 2\pi rh + 2\pi r^2$ <p><b>Error in Measurement:</b> Relative error = <math>\frac{\text{measure-actual}}{\text{actual}}</math> % of Error = Relative • 100%</p> <p><b>Permutations:</b> Arrangement in specific order. <math>{}_n P_r = \frac{n!}{(n-r)!}</math></p>	<p><b>Data:</b> 5 Statistical Summary: minimum, maximum, median, 1<sup>st</sup> quartile, 3<sup>rd</sup> quartile Quartiles divide data into 4 equal parts. Percentiles divide data into 100 equal parts. Percentile rank of score <math>x = \frac{\text{number of scores below } x}{n} \cdot 100</math>, where <math>n</math> is the number of scores. Mean = average. Mode = most often (may be more than one answer). Median = middle. Outliers = values that are far away from the rest of the data. Median best describes data if outliers exist. Range = difference between the maximum and minimum values.</p>
<p><b>Literal equations:</b> <math>a = b + cd</math>, solve for <math>c</math>. <math>a - b = cd</math> <math>\frac{a - b}{d} = c</math> Use same strategies as for solving equations.</p>	<p><b>Sets:</b> <math>A \cup B</math> Union - all elements in both sets. <math>A \cap B</math> Intersection - elements where sets overlap. <math>A'</math> Complement - elements not in the set. { } or <math>\emptyset</math> means null set.</p>	<p><b>Box and Whisker Plot:</b> 1<sup>st</sup> and 3<sup>rd</sup> quartiles are at the ends of the box, median is a vertical line in the box, and the max/min are at the ends of the whiskers. Helpful in interpreting the distribution of data.</p> 