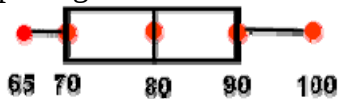


# Algebra – Things to Remember!



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

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| <b>Perimeter:</b> add the distances around the outside.<br><br><b>Circumference:</b> $C = 2\pi r = \pi d$                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Pythagorean Theorem:</b><br>Right Triangles only. $c^2 = a^2 + b^2$<br>Triples: 3, 4, 5<br>5, 12, 13<br>8, 15, 17<br>7, 24, 25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Trig:</b> Right triangles only<br>$\sin \angle A = \frac{o}{h}$ ; $\cos \angle A = \frac{a}{h}$ ; $\tan \angle A = \frac{o}{a}$<br>Angle of elevation: from horizontal line of sight up.<br>Angle of depression: from horizontal line of sight down. |
| <b>Area:</b><br>$A_{\text{triangle}} = \frac{1}{2}bh$<br>$A_{\text{equilateral triangle}} = \frac{s^2\sqrt{3}}{4}$<br>$A_{\text{rectangle}} = bh$<br>$A_{\text{square}} = bh = s^2$<br>$A_{\text{parallelogram}} = bh$<br>$A_{\text{rhombus}} = bh = \frac{d_1 \cdot d_2}{2}$<br>$A_{\text{trapezoid}} = \frac{1}{2}h(b_1 + b_2)$<br>$A_{\text{circle}} = \pi r^2$<br>$A_{\text{sector of circle}} = \frac{n}{360}\pi r^2$<br>$A_{\text{semicircle}} = \frac{1}{2}\pi r^2$<br>$A_{\text{quarter circle}} = \frac{1}{4}\pi r^2$ | <b>Volume and Surface Area:</b><br>$V_{\text{rectangular solid}} = l \cdot w \cdot h$<br>$SA_{\text{rectangular solid}} = 2lh + 2hw + 2lw$<br>$V_{\text{cylinder}} = \pi r^2 h$<br>$SA_{\text{closed cylinder}} = 2\pi rh + 2\pi r^2$                                                                                                                                                                                      | <b>Data:</b><br>5 Statistical Summary: minimum, maximum, median, 1 <sup>st</sup> quartile, 3 <sup>rd</sup> quartile<br>Quartiles divide data into 4 equal parts.<br>Percentiles divide data into 100 equal parts.<br>Percentile rank of score $x = \frac{\text{number of scores below } x}{n} \cdot 100$ , where $n$ is the number of scores.<br>Mean = average.<br>Mode = most often (may be more than one answer).<br>Median = middle.<br>Outliers = values that are far away from the rest of the data.<br>Median best describes data if outliers exist.<br>Range = difference between the maximum and minimum values. |                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Error in Measurement:</b><br>Relative error = $\frac{ \text{measure}-\text{actual} }{\text{actual}}$<br>% of Error = Relative • 100%                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Permutations:</b><br>Arrangement in specific order.<br>${}_nP_r = \frac{n!}{(n-r)!}$                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Probability:</b> $P(A') = 1 - P(A)$ complement<br>$P(A \text{ and } B) = P(A) \cdot P(B)$ independent<br>$P(A \text{ and } B) = P(A) \cdot P(B/A)$ dependent<br>$P(A \text{ or } B) = P(A) + P(B)$ mutually exclusive<br>$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ not exclusive<br>$P(B/A) = P(A \text{ and } B)/P(A)$ conditional probability<br>$P(B/A)$ means probability of B given A has occurred. | <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.<br>Helpful in interpreting the distribution of data.                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                         |
| <b>Literal equations:</b><br>$a = b + cd$ , solve for $c$ .<br>$a - b = cd$<br>$\frac{a-b}{d} = c$<br>Use same strategies as for solving equations.                                                                                                                                                                                                                                                                                                                                                                            | <b>Sets:</b><br>$A \cup B$ Union - all elements in both sets.<br>$A \cap B$ Intersection - elements where sets overlap.<br>$A'$ Complement - elements not in the set.<br>$\{ \}$ or $\emptyset$ means null set.                                                                                                                                                                                                            | <b>Exponential Growth and Decay:</b><br>Decay: $y = ab^x$ where $a > 0$ and $0 < b < 1$<br>Growth: $y = ab^x$ where $a > 0$ and $b > 1$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                         |