The *Ultimate* Formula Sheet for SAT Math

These formulas are provided in the reference information at the beginning of each SAT math section:

Area of a Circle: $A = \pi r^2$

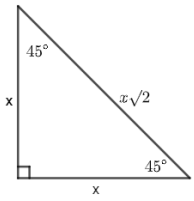
Circumference of a Circle: $C = 2\pi r$

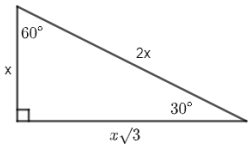
Area of a Rectangle: $A = lw$

Area of a Triangle: $A = \frac{1}{2}bh$

Pythagorean Theorem: $a^2 + b^2 = c^2$

Special Right Triangles:





Volume of a Rectangular Prism (Box): $V = lwh$

Volume of a Cylindar: $V = \pi r^2 h$

Volume of a Sphere: $V = \frac{4}{3}\pi r^3$

Volume of a Cone: $V = \frac{1}{3}\pi r^2 h$

Volume of a Pyramid: $V = \frac{1}{3}lwh$

Fractions, Decimals, and Percentages: (for this section, r is the percent in decimal form)

$$Fraction = \frac{part}{whole}$$

$$percent = \frac{part}{100}$$

Percent Increase or Decrease:

$$\frac{|old - new|}{old} \times 100\%$$

Increase by a percent: multiply by $(1 + r)$

Decrease by a percent: multiply by $(1 - r)$

Simple Interest: $A = P(1 + rt)$

Interest Compounded Annually: $A = P(1 + r)^t$

Interest Compounded n times per year:

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

Rates, Ratios, and Proportions:

General form of a conversion factor:

$$\left(\frac{ending\_units}{starting\_units}\right)$$

Example: $10 feet\left(\frac{12 inches}{1 foot}\right) = 120 inches$

Concentration of A x Volume of A
+ Concentration of B x Volume of B
= Final concentration (Vol. of A + Vol. of B)

Distance = Rate x Time

Exponents, Roots, & Polynomials:

Multiplication Rule for Exponents: $a^b \cdot a^c = a^{b+c}$

Division Rule for Exponents: $\frac{a^b}{a^c} = a^{b-c}$

Power Rule for Exponents: $\left(a^b\right)^c = a^{bc}$

Negative Exponents: $a^{-b} = \frac{1}{a^b}$

Fractional Exponents: $a^{\frac{b}{c}} = \sqrt[c]{a^b} or \left(\sqrt[c]{a}\right)^b$

$i^2 = -1$; $i^3 = -i$; $i^4 = 1$

$i^{4n} = 1$; $i^{4n+1} = i$; $i^{4n+2} = -1$; $i^{4n+3} = -i$

Parabolas:

Standard Form: $f(x) = ax^2 + bx + c$;

vertex= $\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$;

y-intercept = c;

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

Sum of solutions = $\frac{-b}{a}$

Discriminant = $b^2 - 4ac$; Pos=2 real roots Zero= 1 real root; Neg=2 imaginary roots

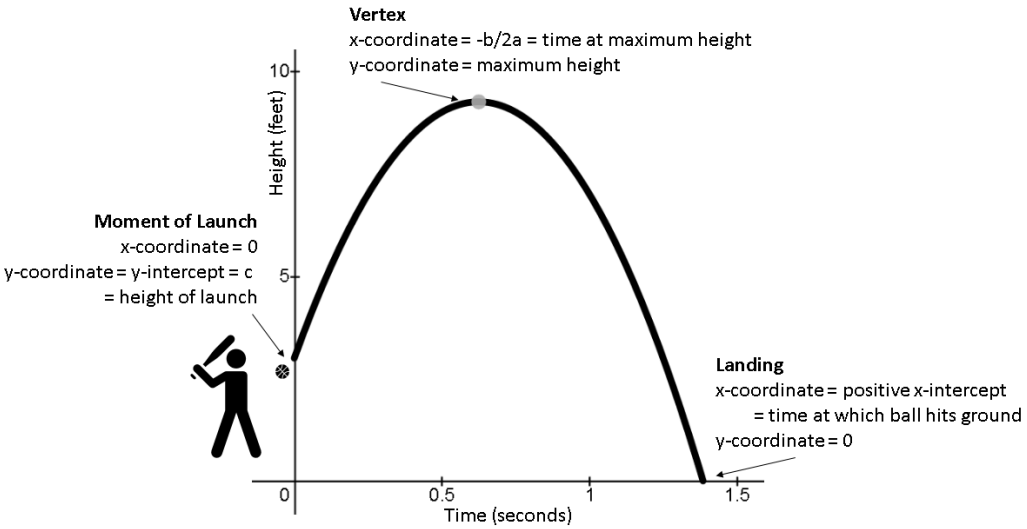
Factored Form: $f(x) = a(x-m)(x-n)$;

x-intercepts are m and n;

x-coordinate of vertex = $\frac{m+n}{2}$

Vertex Form: $f(x) = a(x-h)^2 + k$;

vertex = (h,k)



Difference of Squares: $a^2 - b^2 = (a+b)(a-b)$

Perfect Square Trinomial: $a^2 + 2ab + b^2 = (a+b)^2$ and $a^2 - 2ab + b^2 = (a-b)^2$

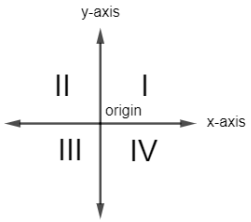
Completing the Square: $x^2 + bx + \left(\frac{b}{2}\right)^2 = \left(x + \frac{b}{2}\right)^2$

Graphing Lines:

Slope Formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$

Slope of horizontal line = 0

Slope of vertical line = undefined



Standard Form: $Ax + By = C$

Slope-Intercept Form: $y = mx + b$

Point-Slope Form: $y - y_1 = m(x - x_1)$

Distance Formula: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Midpoint Formula: $M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

Parallel lines: equal slopes

⊥ Lines: slopes are opposite reciprocals

Data and Probability:

$$average = \frac{sum\_of\_items}{number\_of\_items}$$

$$median = middle\_number$$

$$range = \text{max}imum - \text{min}imum$$

$$probability = \frac{desired\_outcomes}{possible\_outcomes}$$

Angles:

Vertical ∠'s are ≅

∠'s that form a linear pair are supplementary (add up to 180°)

∠'s that form a circle add up to 360°

When ∥ lines are cut by a transversal, all acute ∠'s are ≅ and all obtuse ∠'s are ≅

Triangles:

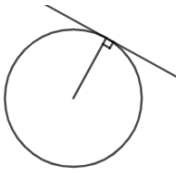
The three ∠'s of a Δ add up to 180°

An exterior ∠ is equal to the sum of the two remote interior ∠'s

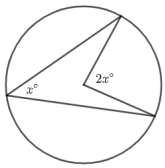
Pythagorean Triples: 3-4-5 and 5-12-13

Circles:

A radius and tangent make a right ∠



A central ∠ is double the inscribed ∠



$\frac{x}{360} = \frac{arc}{circumference}$ and $\frac{x}{360} = \frac{sector}{area\_of\_circle}$ where x = central angle

Formula for a Circle: $(x-h)^2 + (y-k)^2 = r^2$, where (h,k) is the center and r is the radius

Polygons: (for this section, n is the number of sides)

Area of a trapezoid: $\frac{1}{2}(b_1+b_2)h$

One interior angle of a regular polygon: $\frac{180(n-2)}{n}$

Sum of the interior angles: $180(n-2)$

Sum of the exterior angles: 360°

Properties of Parallelograms:

1. Opp sides are ∥ and ≅
2. Opp ∠' s are ≅
3. Consec ∠'s are supplementary
4. Each diagonal forms a pair of ≅Δ's
5. Diagonals bisect each other

➔If they are ≅ it is a rectangle

➔If they are ⊥ it is a rhombus

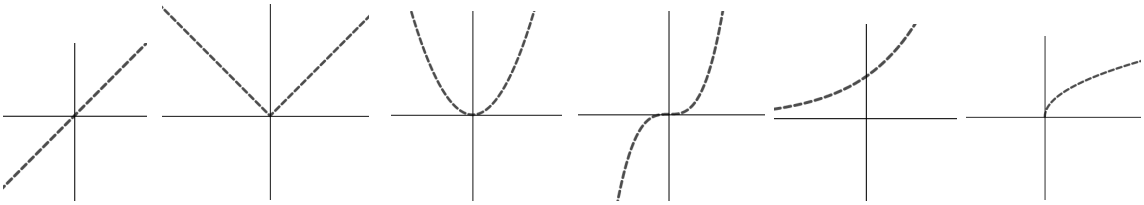
6. $Area = base \times height$

Trigonometry:

$\sin = \frac{opp}{hyp}$ $\cos = \frac{adj}{hyp}$ $\tan = \frac{opp}{adj}$ 360°=2π radians

$\sin(x) = \cos(90-x)$ The sine of an ∠ is equal to the cosine of its complement.

Parent Graphs & Transformations:



$y=x$ $y=|x|$ $y=x^2$ $y=x^3$ $y=a^x$ $y=\sqrt{x}$

Transformation	Visual effect
$f(x)+k$	Shift up by k units
$f(x)-k$	Shift down by k units
$f(x+h)$	Shift left by h units
$f(x-h)$	Shift right by h units
$-f(x)$	Reflect over the x axis (flip upside down)
$cf(x)$	Stretch vertically by a factor of c (becomes skinnier)
$\frac{1}{c}f(x)$	Shrink vertically by a factor of c (becomes fatter)