

The *Ultimate* Formula Sheet for SAT Math

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

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

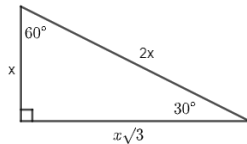
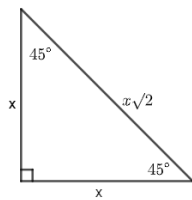
$$\text{Circumference of a Circle: } C = 2\pi r$$

$$\text{Area of a Rectangle: } A = lw$$

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

$$\text{Pythagorean Theorem: } a^2 + b^2 = c^2$$

Special Right Triangles:



$$\text{Volume of a Rectangular Prism (Box): } V = lwh$$

$$\text{Volume of a Cylinder: } V = \pi r^2 h$$

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

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

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

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

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

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

Percent Increase or Decrease:

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

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:

$$\left(\frac{\text{ending_units}}{\text{starting_units}} \right)$$

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

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: $(a^b)^c = a^{bc}$

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

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

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

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

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

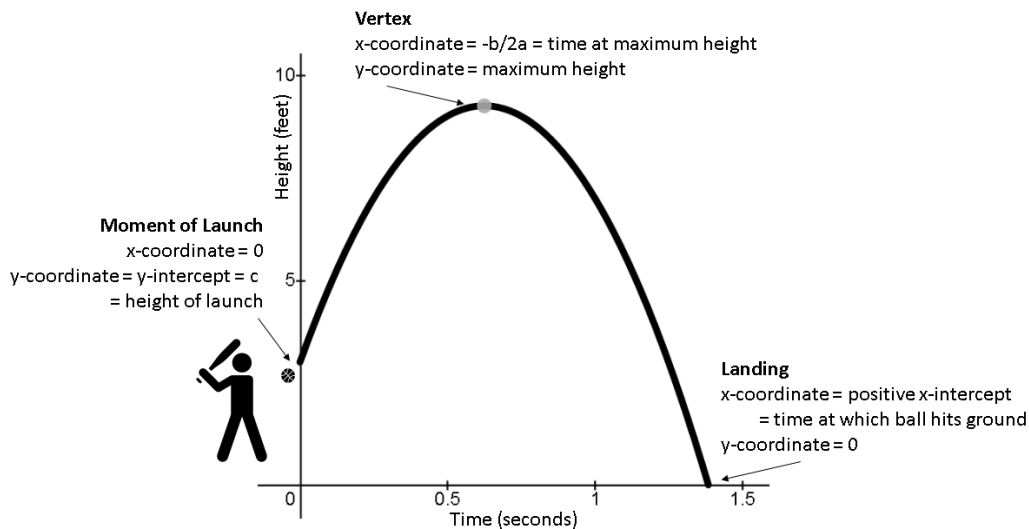
Factored Form: $f(x) = a(x - m)(x - n)$;

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 $a^2 - 2ab + b^2 = (a-b)^2$

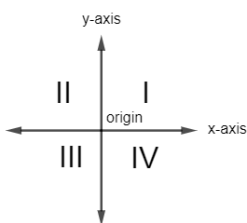
Completing the Square: $x^2 + bx + \left(\frac{b}{2}\right)^2 = (x+b)^2$

Graphing Lines:

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

Slope of horizontal line = 0

Slope of vertical line = undefined



$$\text{Standard Form: } Ax + By = C$$

$$\text{Slope-Intercept Form: } y = mx + b$$

$$\text{Point-Slope Form: } y - y_1 = m(x - x_1)$$

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

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

Parallel lines: equal slopes

⊥ Lines: slopes are opposite reciprocals

Data and Probability:

$$\text{average} = \frac{\text{sum of items}}{\text{number of items}}$$

median = middle number

range = maximum - minimum

$$\text{probability} = \frac{\text{desired outcomes}}{\text{possible outcomes}}$$

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:

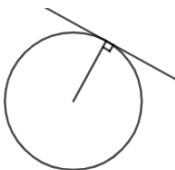
The three ∠'s of a Δ add up to 180°

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

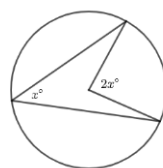
Pythagorean Triples: 3-4-5 and 5-12-13

Circles:

A radius and tangent make a right ∠



A central ∠ is double the inscribed ∠



$$\frac{x}{360} = \frac{\text{arc}}{\text{circumference}} \quad \text{and} \quad \frac{x}{360} = \frac{\text{sector}}{\text{area of circle}} \quad \text{where } x = \text{central angle}$$

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:

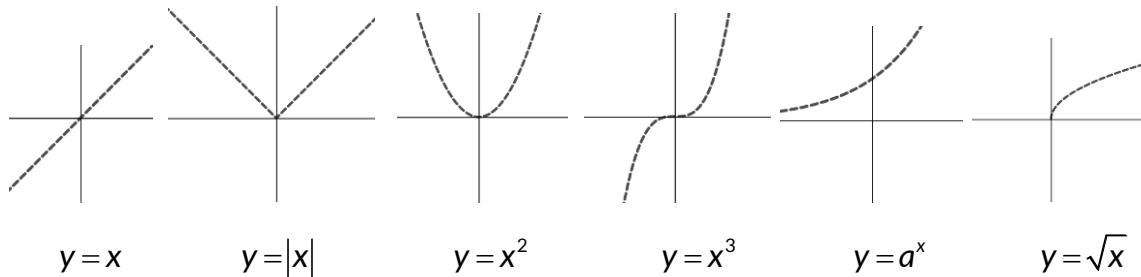
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|---|--|
| 1. Opp sides are \parallel and \cong | 5. Diagonals bisect each other |
| 2. Opp \angle 's are \cong | → If they are \cong it is a rectangle |
| 3. Consec \angle 's are supplementary | → If they are \perp it is a rhombus |
| 4. Each diagonal forms a pair of $\cong\Delta$'s | 6. <i>Area = base \times height</i> |
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Trigonometry:

$\sin = \frac{\text{opp}}{\text{hyp}}$ $\cos = \frac{\text{adj}}{\text{hyp}}$ $\tan = \frac{\text{opp}}{\text{adj}}$ $360^\circ = 2\pi$ radians

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

Parent Graphs & Transformations:



Transformation

$f(x) + k$

$f(x) - k$

$f(x + h)$

$f(x - h)$

$-f(x)$

$cf(x)$

$\frac{1}{c}f(x)$

Visual effect

Shift up by k units

Shift down by k units

Shift left by h units

Shift right by h units

Reflect over the x axis (flip upside down)

Stretch vertically by a factor of c (becomes skinnier)

Shrink vertically by a factor of c (becomes fatter)