WORTHINGTON PREP

SAT Math Formulas, Definitions

SAT: Heart of Algebra Formulas

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Lines / Linear Growth

Standard Form: $Ax + By = C$
Slope = $-A / B$

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

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

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

Parallel lines: Slope = same

Perpendicular lines: Other line's slope is negative reciprocal of 1st line

$m_1 * m_2 = -1$

Simple / Compound Interest

Compounding - Annual Rate:

$$A = P(1 \pm r)^t$$

Compounding - Non-Annual:

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

Simple Interest

$$A = Prt$$

Definitions

X-intercept: Where the line crosses the x-axis; Where y = 0

Y-intercept: Where the line crosses the y-axis; Where x = 0

Distance / Midpoint

Distance between two points:

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

Midpoint:

$$m = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

Distance / Rate

Distance = Rate * Time

SAT: Data Analysis Formulas

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Statistics

Mean:

$$Average = \frac{Sum\ of\ the\ Terms}{Number\ of\ Terms}$$

Median = Middle value in the list; Average middle numbers if even number of values

Mode = Value that appears most often

Standard Deviation = Measure of how far the numbers deviate from the mean (average)

Percents

$$Percent = \frac{Part}{Whole}$$

Probability

$$probability = \frac{number\ of\ desired\ outcomes}{number\ of\ \text{total}\ outcomes}$$

SAT: Passport to Advanced Math Formulas

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Exponents

Follow MADSPM:

- Multiply / Add
- Divide / Subtract
- Power / Multiply`

$$X^{a} \cdot X^{b} = X^{a+b}$$

$$\frac{X^{a}}{X^{b}} = X^{a-b}$$

$$(X^{a})^{b} = X^{a \cdot b}$$

$$(XY)^{a} = X^{a} \cdot Y^{a}$$

$$x^{-a} = \frac{1}{x^{a}}$$

Factoring

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

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

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

Parabola

Standard form: $y = ax^2 + bx + c$
Vertex = -b/2a

Vertex form: $f(x) = a(x-h)^2 + k$
Vertex = (h,k)

Quadratic Equation

Standard Form:

$$ax^2 + bx + c$$

Quadratic Equation:

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

Discriminant: Portion under the square root

Radicals

$$\sqrt{xy} = \sqrt{x} \cdot \sqrt{y}$$

SAT: Additional Topics

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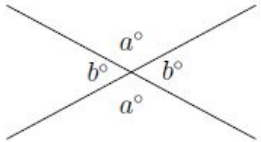
Lines / Angles

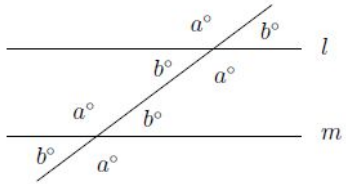
Intersecting lines

- Opposite angles are equal
- Each pair of angles along the same line sum to 180 degrees



Parallel lines

- Eight angles are formed when a line crosses two parallel lines.



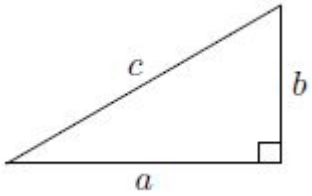
Triangles

Sum of the angles: 180 degrees

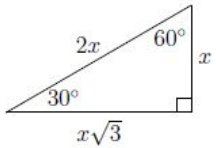
Perimeter: Sum of the three sides

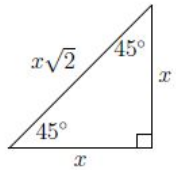
Area: 0.5 * Base * Height

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



Special right triangles (available on page 1 of Math exam)





Triangles Theorems / Definitions

Inequality theorem: The length of one side of any triangle is always less than the sum and more than the difference of the lengths of the other two sides.

Exterior angle: An exterior angle of any triangle is equal to the sum of the two remote interior angles.

Triangles

- **Equilateral:** Length of sides are equal; All angles are 60 degrees. The area of an equilateral triangle is A = $((\text{side})^2 * \sqrt{3})/4$.
- **Isosceles:** Two equal sides. The angles opposite the same length sides are equal.
- **Scalene:** Three unequal sides.
- **Obtuse:** Has one angle greater than 90 degrees.
- **Similar triangles:** Corresponding angles and sides are equal. Common similar triangle ratios:
  - 3/4/5
  - 5/12/13

SAT: Additional Topics

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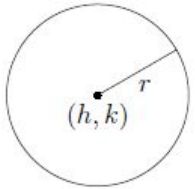
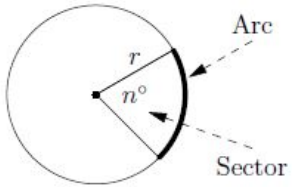
Circles



$$\text{Area} = \pi r^2$$
$$\text{Circumference} = 2\pi r$$
$$\text{Full circle} = 360°$$



$$\text{Length Of Arc} = (n°/360°) \cdot 2\pi r$$
$$\text{Area Of Sector} = (n°/360°) \cdot \pi r^2$$

Circles II

$$(x - h)^2 + (y - k)^2 = r^2$$

(*h*, *k*) = center of the circle
r = radius

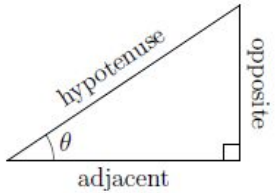
Complex Numbers

- A complex number is of the form a + bi where $i^2 = -1$
- Pattern for the value of complex numbers repeat after the first four

$$i^0 = 1 \quad i^1 = i \quad i^2 = -1 \quad i^3 = -i$$
$$i^4 = 1 \quad i^5 = i \quad i^6 = -1 \quad i^7 = -i$$

Trigonometry

- **Key Mnemonic:** SOHCAHTOA
  - **Sin =** Opposite / Hypotenuse
  - **Cos =** Adjacent / Hypotenuse
  - **Tan =** Opposite / Adjacent



$$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

"SOH"

$$\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

"CAH"

$$\tan\theta = \frac{\text{opposite}}{\text{adjacent}}$$

"TOA"

The **sine** of any acute **angle** is **equal** to the **cosine** of its **complement**.

Sin X = Cos (90 - X)
Cos X = Sin (90 - X)

Areas, Volume, and Other Formulas

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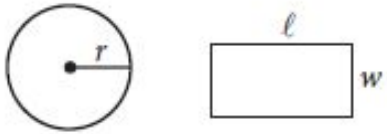
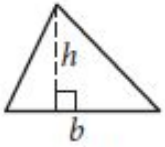
The formulas below are available for reference on Page 1 of the Math portions of the exam



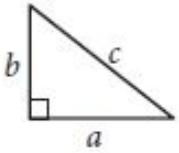
$A = \pi r^2$

$C = 2\pi r$

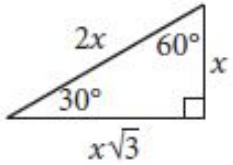
$A = \ell w$

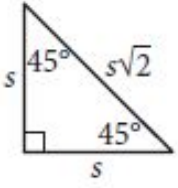


$A = \frac{1}{2}bh$

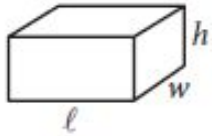


$c^2 = a^2 + b^2$

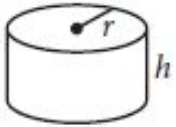




Special Right Triangles

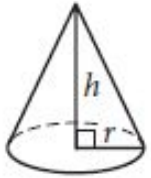


$V = \ell wh$

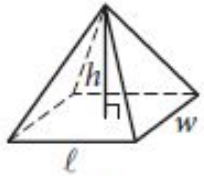


$V = \pi r^2 h$

$V = \frac{4}{3}\pi r^3$



$V = \frac{1}{3}\pi r^2 h$



$V = \frac{1}{3}\ell wh$

The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is 2π.

The sum of the measures in degrees of the angles of a triangle is 180.