# AIMS Reference Sheet

| Key | |
|---|---|
| $b$ = base | $d$ = diameter |
| $h$ = height | $r$ = radius |
| $l$ = length | $\ell$ = slant height |
| $w$ = width | $B$ = area of base |
| | $P$ = perimeter of base |
| Use 3.14 or $\frac{22}{7}$ for $\pi$. | |

| Formulas for Area | |
|---|---|
| Circle | $A = \pi r^2$ |
| Parallelogram | $A = bh$ |
| Rectangle | $A = lw$ |
| Trapezoid | $A = \frac{1}{2}h(b_1 + b_2)$ |
| Triangle | $A = \frac{1}{2}bh$ |

| Name | Volume ($V$) | Total Surface Area ($T$) |
|---|---|---|
| Pyramid | $V = \frac{1}{3}Bh$ | $T = B + \frac{1}{2}P\ell$ |
| Right Cone | $V = \frac{1}{3}\pi r^2 h$ | $T = \frac{1}{2}(2\pi r)\ell + \pi r^2$ or $T = \pi r\ell + \pi r^2$ |
| Right Cylinder | $V = \pi r^2 h$ | $T = 2\pi r^2 + 2\pi rh$ |
| Right Prism | $V = Bh$ | $T = 2B + Ph$ |
| Sphere | $V = \frac{4}{3}\pi r^3$ | $T = 4\pi r^2$ |

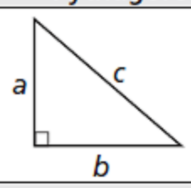
## Quadratics

For all quadratics $ax^2 + bx + c = 0$

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

The $x$-coordinate for the vertex of a quadratic: $\frac{-b}{2a}$

## Pythagorean Theorem




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

## Arithmetic Sequences

Explicit formula for an arithmetic sequence: $A_n = A_1 + d(n - 1)$

$d$ = common difference

## Interest Formulas

$I$ = interest earned, $P$ = principal,
$r$ = annual interest rate, $t$ = time in years,
$n$ = number of times compounded per year,
$A$ = total amount after time $t$

Simple Interest: $I = Prt$

$A = P(1 + r)t$

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

## Coordinate Geometry and Linear Equation Forms

Given: Points $S(x_1, y_1)$, $T(x_2, y_2)$

Distance between two points:

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

Midpoint between two points:

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

Slope of line through two points:

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

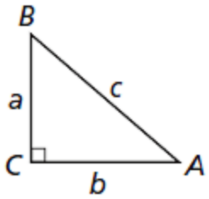
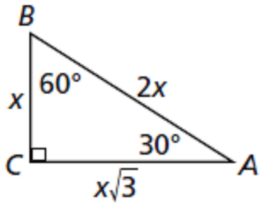
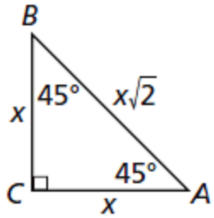
Point–Slope Form: $y - y_1 = m(x - x_1)$

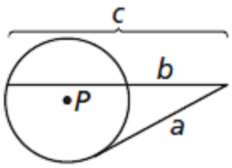
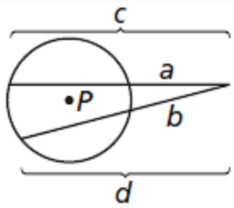
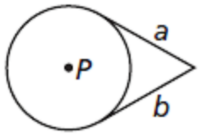
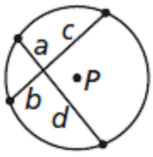
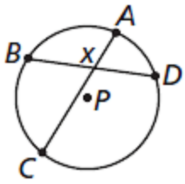
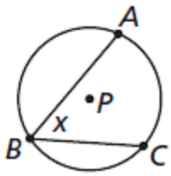
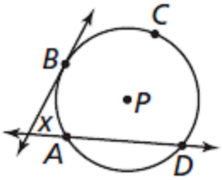
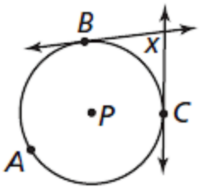
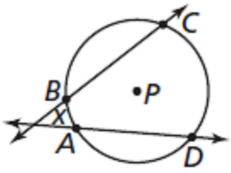
Standard or General Form: $Ax + By = C$

Slope–Intercept Form: $y = mx + b$

| Additional Formulas | |
|---|---|
| Distance, Rate, Time Formula:<br>$d$ = distance, $r$ = rate, $t$ = time<br>$d = rt$ | Sum of the measures of the interior angles of a convex polygon with $n$ sides:<br>$S = (n - 2)(180°)$ |
| Permutations of $n$ objects taken $r$ at a time:<br>${}_nP_r = \frac{n!}{(n-r)!}$ | Combinations of $n$ objects taken $r$ at a time: ${}_nC_r = \frac{n!}{(n-r)!r!}$ |
| Area of a sector:<br>$A = \pi r^2\left(\frac{\text{degrees in corresponding arc}}{360°}\right)$ | Length of a circular arc:<br>Length of $\widehat{AB} = 2\pi r\left(\frac{m\widehat{AB}}{360°}\right)$ |
| Circumference: $C = \pi d$ or $C = 2\pi r$ | Area of a circle: $A = \pi r^2$ |

## Right-Triangle Relationships

| Trigonometric Ratios | 30°–60°–90° Triangle Relationships | 45°–45°–90° Triangle Relationships |
|---|---|---|
|  $\sin A = \frac{a}{c}$<br>$\cos A = \frac{b}{c}$<br>$\tan A = \frac{a}{b}$ |  |  |

| | | |
|---|---|---|
|  <br>$\frac{c}{a} = \frac{a}{b}$ or $a^2 = bc$ |  <br>$\frac{d}{a} = \frac{c}{b}$ or $ac = bd$ |  <br>$a = b$ |
|  <br>$\frac{a}{b} = \frac{c}{d}$ or $ad = bc$ |  <br>$m\angle x = \frac{1}{2}\left(m\widehat{AB} + m\widehat{CD}\right)$ |  <br>$m\angle x = \frac{1}{2}m\widehat{AC}$ |
|  <br>$m\angle x = \frac{1}{2}\left(m\widehat{BCD} - m\widehat{AB}\right)$ |  <br>$m\angle x = \frac{1}{2}\left(m\widehat{BAC} - m\widehat{BC}\right)$ |  <br>$m\angle x = \frac{1}{2}\left(m\widehat{CD} - m\widehat{AB}\right)$ |