SAT® MATH CRAM SHEET

PERCENTS, FRACTIONS, AND DECIMALS

Percent Increase

$$\left(\frac{\text{new value} - \text{original value}}{\text{original value}}\right) \times 100$$

Percent Decrease

$$\left(\frac{\text{original value} - \text{new value}}{\text{original value}}\right) \times 100$$

Percent to Fraction/Decimal

$$\frac{\text{Percentage}}{100}$$

Fraction to Decimal

$$\frac{\text{numerator}}{\text{denominator}}$$

Fraction to Percent

$$\left(\frac{\text{numerator}}{\text{denominator}}\right) \times 100$$

Decimal to Fraction

$$\frac{\text{decimal}}{1} \times \frac{10^n}{10^n}$$

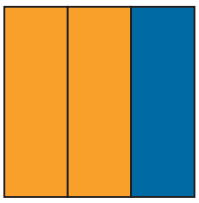
n is the number of places behind the decimal point

Decimal to Percent

decimal × 100

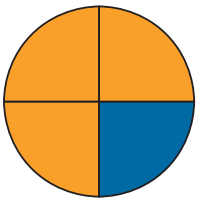
RATIOS AND PROPORTIONS

Ratios

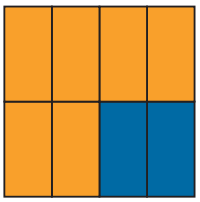


Part to part		Part to whole	
2:1	1:2	2:3	1:3
2/1	1/2	2/3	1/3
2 to 1	1 to 2	2 to 3	1 to 3

Proportions



3:4	=	6:8
3:4	::	6:8
3 is to 4	as	6 is to 8



Calculating Proportions

$$\frac{6}{2} = \frac{12}{?}$$

$$\frac{6}{2} = \frac{12}{x}$$

$24 \quad 6x$

$\div 6$

$4 = x$

$$\frac{6}{2} = \frac{12}{4}$$

METRIC CONVERSIONS

Metric units are multiples of 10s. To convert to a larger unit, divide numbers by base of 10s. To convert to a smaller unit, multiply numbers by base of 10s.

King	Henry	Died	By	Drinking	Chocolate	Milk
↓	↓	↓	↓	↓	↓	↓
kilo	hecto	deca	base	deci	centi	milli
↓	↓	↓	↓	↓	↓	↓
1,000.0	100.0	10.0	1.0	0.1	0.01	0.001
(10^3)	(10^2)	(10^1)	(10^0)	(10^{-1})	(10^{-2})	(10^{-3})

larger units ← → smaller units

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METRIC UNITS OF DISTANCE

1 kilometer (km) = 1,000 meters (m)
1 meter (m) = 100 centimeters (cm)
1 centimeter (cm) = 10 millimeters (mm)

METRIC UNITS OF VOLUME

1 liter (L) = 1,000 milliliters (mL)
1 milliliter (mL) = 1 cubic centimeter (cm^3)

TIME CONVERSIONS

1 minute = 60 seconds
1 hour = 60 minutes
1 day = 24 hours
1 week = 7 days
1 year ≈ 52 weeks
1 year = 365 days
(366 in leap year)

METRIC UNITS OF MASS

1 kilogram (kg) = 1,000 grams (g)
1 gram (g) = 1,000 milligrams (mg)

Convert 12 kilometers to centimeters

$$12 \text{ kilometers} \times \frac{1000 \text{ m}}{1 \text{ km}} \times \frac{100 \text{ cm}}{1 \text{ m}} = 1{,}200{,}000 \text{ cm}$$

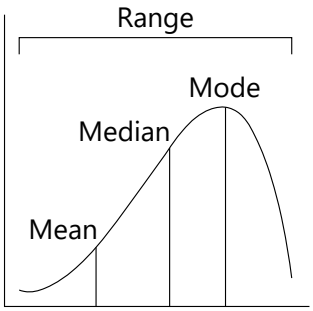
STATISTICS

Mean
$\frac{\text{sum of all items}}{\text{total number of items}}$

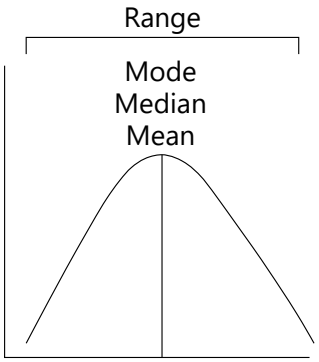
Range (Spread)
Distance between smallest and largest item

Mode
Most/common item

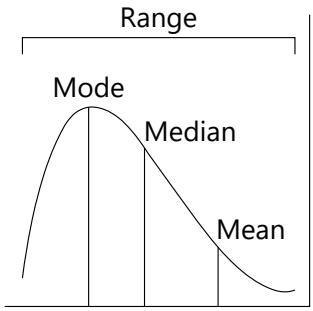
Median
Middle item when ordered from least to greatest



Left Skew (Negative)



Normal Distribution



Right Skew (Positive)

Greater spread equals greater deviation.

Margin of Error
sample statistic ± margin of error with confidence level of XX%

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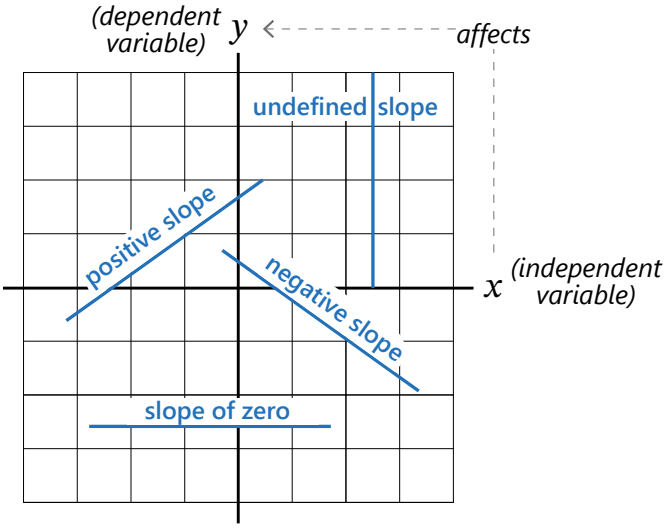
SLOPE AND LINEAR EQUATIONS



Slope

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{rise}{run}$$

Slope Intercept Form

$y = mx + b$

m = slope
b = y-intercept

Distance Formula

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

Point-Slope Form

$y - y_1 = m(x - x_1)$

m = slope
(x_1, y_1) = point coordinates

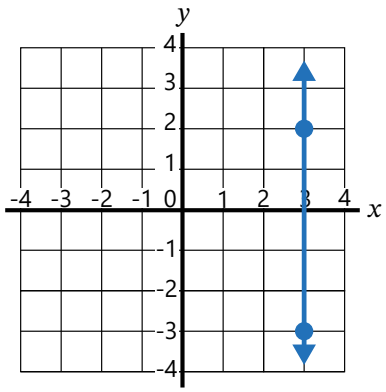
Midpoint Formula

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

Undefined Slope

$m = \frac{-3 - 2}{3 - 3} = \frac{-5}{0}$

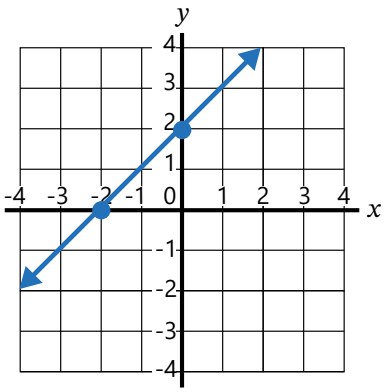
m = undefined



Positive Slope

$m = \frac{2 - 0}{0 - (-2)} = \frac{2}{2}$

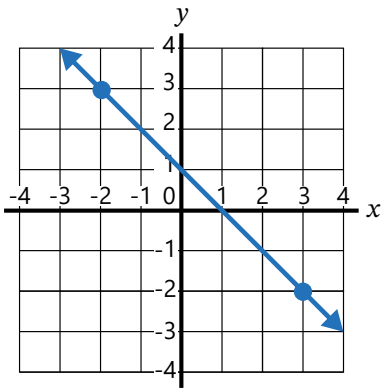
m = 1



Negative Slope

$m = \frac{-2 - 3}{3 - (-2)} = \frac{-5}{5}$

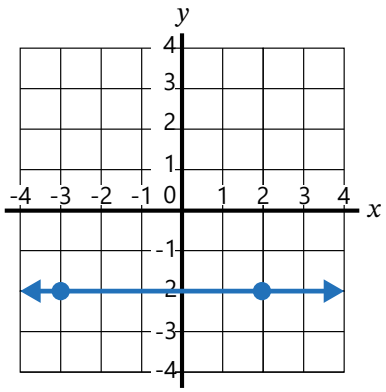
m = -1



Slope of Zero

$m = \frac{-2 - (-2)}{-3 - 2} = \frac{0}{-5}$

m = 0



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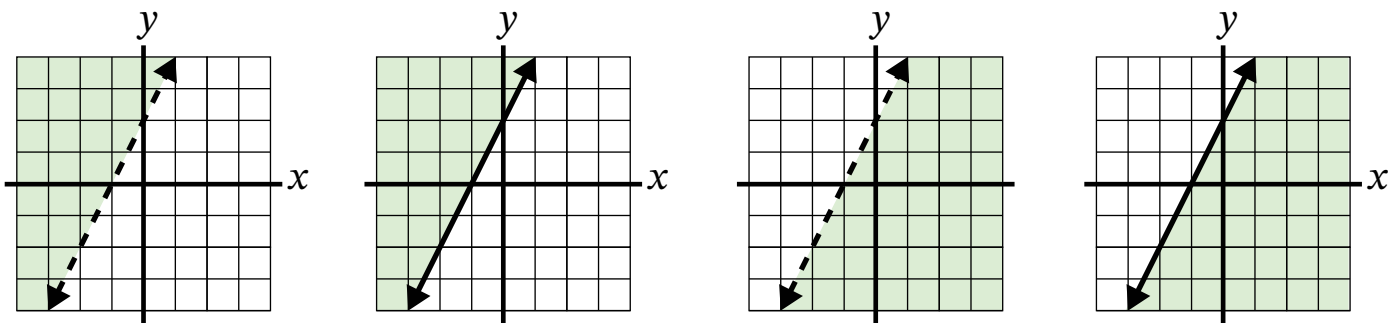
GRAPHING LINEAR EQUATIONS

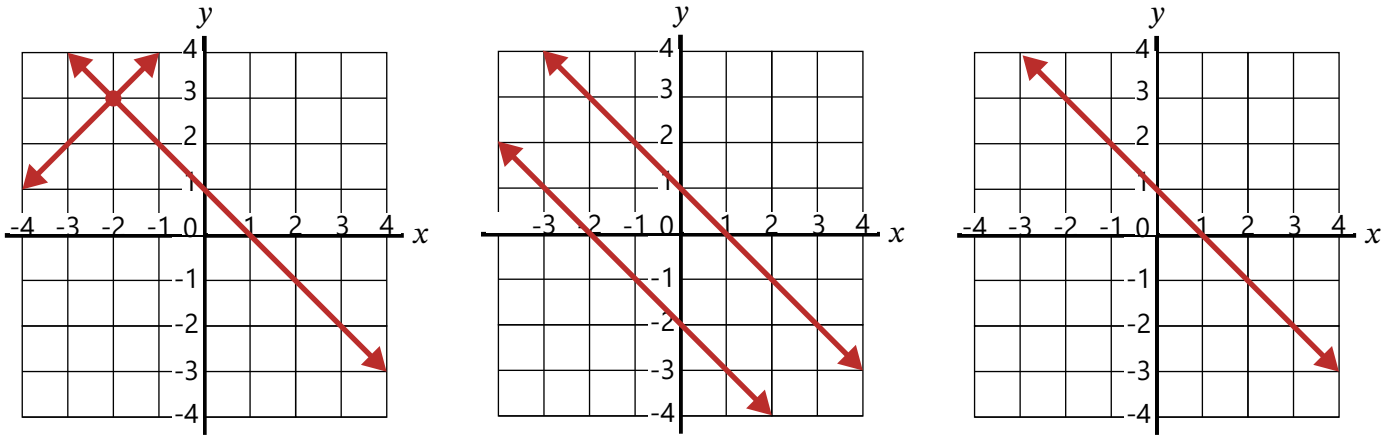
Greater Than	Greater Than or Equal To	Less Than	Less Than or Equal To
$>$	$\geq$	$<$	$\leq$



$y > 2x + 2$	$y \geq 2x + 2$	$y < 2x + 2$	$y \leq 2x + 2$

SYSTEMS OF EQUATIONS

One Solution	No Solutions	Infinitely Many Solutions
$y = -x + 1$ $y = x + 5$	$y = -x + 1$ $y = -x - 2$	$y = -x + 1$ $3y = -3x + 3$



Consistent Independent	*Inconsistent*	*Consistent Dependent*

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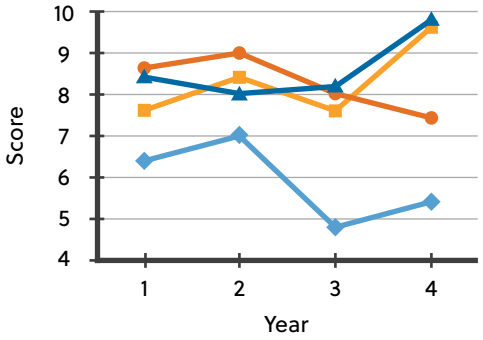
CHARTS

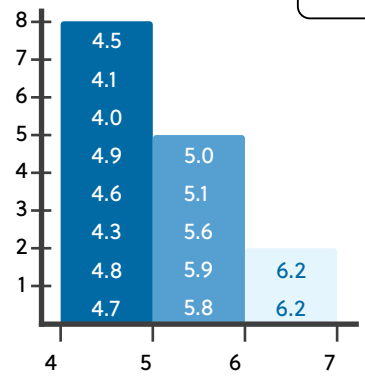
Line Graph

Shows trends in data collected over time



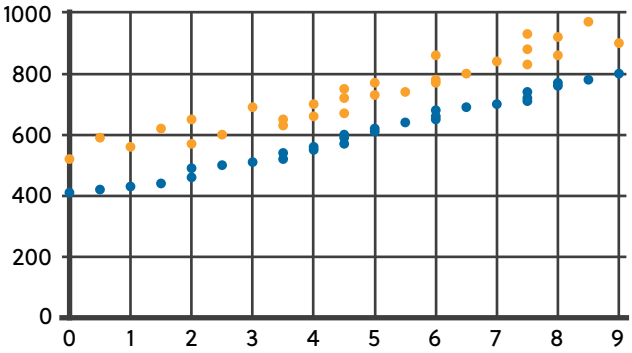
Histogram

Shows distrubtion of data collected over time



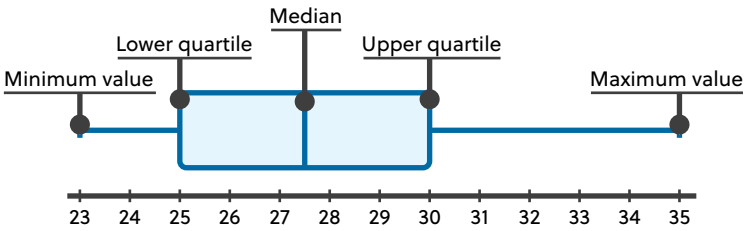
Scatter Plot

Shows relationship between two variables



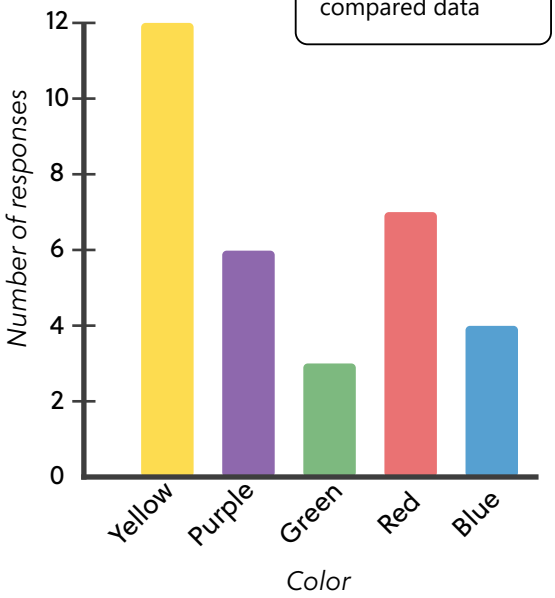
Box Plot

Shows statistical distribution



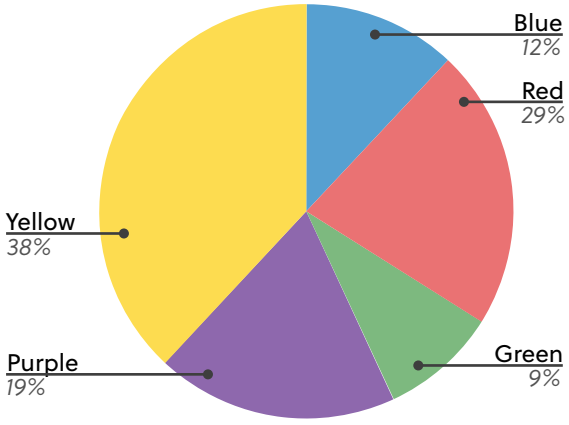
Bar Chart

Shows categorically compared data



Pie Chart

Shows proportional parts of data collected



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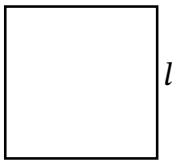
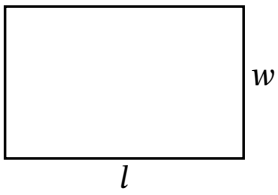
AREA

Square



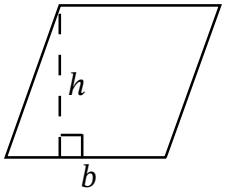
$A = l^2$

Rectangle



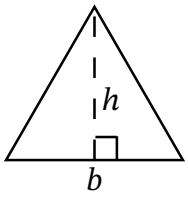
$A = lw$

Parallelogram



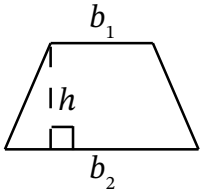
$A = bh$

Triangle



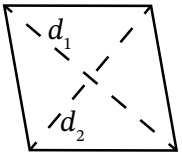
$A = \frac{1}{2}bh$

Trapezoid



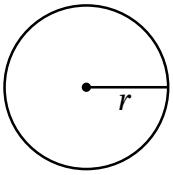
$A = \frac{1}{2}(b_1 + b_2)h$

Rhombus



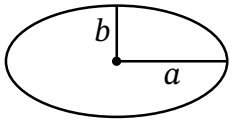
$A = \frac{1}{2}(d_1 \times d_2)$

Circle



$A = \pi r^2$

Ellipse



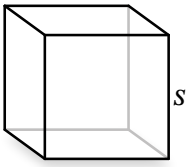
$A = \pi ab$

Perimeter
The sum of all sides of a shape

Circumference
The distance around a circle ($C=2\pi r$)

VOLUME AND SURFACE AREA

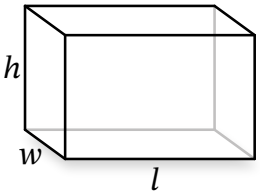
Cube



$V = s^3$

$SA = 6s^2$

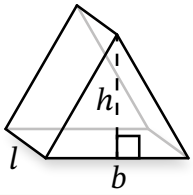
Rectangular Prism



$V = l \times w \times h$

$SA = 2(lw+lh+hw)$

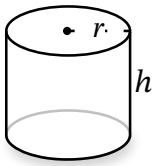
Triangular Prism



$V = \frac{b \times h \times l}{2}$

$SA = lsa + 2\ (area\ of\ base)$

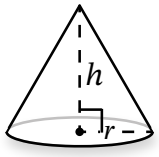
Cylinder



$V = \pi r^2 h$

$SA = 2\pi r(r + h)$

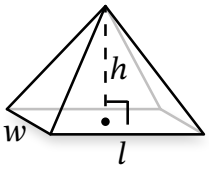
Cone



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

$SA = \pi rs + \pi r^2$

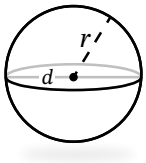
Rectangular Pyramid



$V = \frac{l \times w \times h}{3}$

$SA = lsa + area\ of\ base$

Sphere



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

$SA = 4\pi r^2$

LSA (Lateral Surface Area)
The sides of a three-dimensional shape, excluding any bases

Base
The face of a shape perpendicular to the direction height is measured

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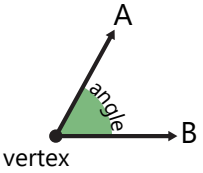
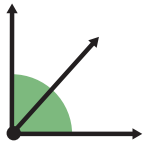
ANGLES

An angle is formed when two lines or line segments meet at a point

A vertex is the point at which two segments or rays meet to form an angle.



Complementary

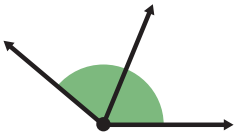


Two angles whose sum is exactly 90°

Supplementary

Two angles whose sum is exactly 180°

Adjacent



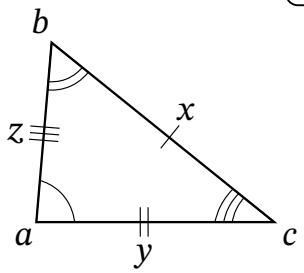
Two angles that have the same vertex and share a side

Vertical

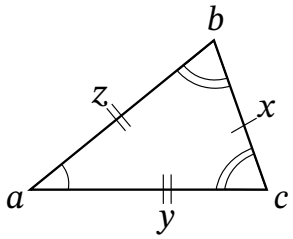
Angles that are not adjacent due to sharing a vertex and have no common side

TRIANGLES

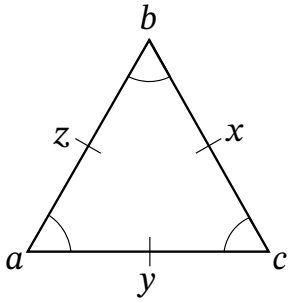
The sum of the interior angles of any triangle is always 180 degrees.



Scalene Triangle
No equal side lengths or angles

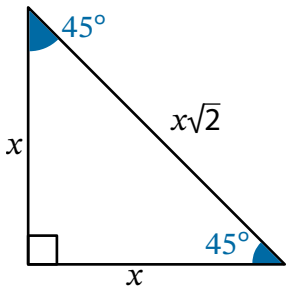


Isosceles Triangle
Two equal side lengths and angles

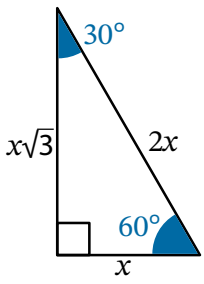


Equilateral Triangle
Three equal side lengths and angles

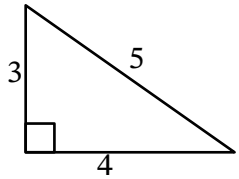
Special Right Triangles



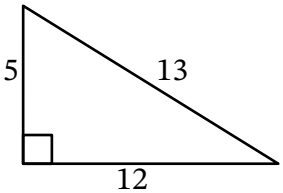
45-45-90



30-60-90



3-4-5



5-12-13

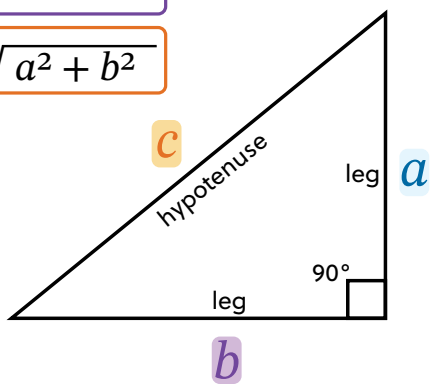
Pythagorean Theorem

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

$$a = \sqrt{c^2 - b^2}$$

$$b = \sqrt{c^2 - a^2}$$

$$c = \sqrt{a^2 + b^2}$$



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TRIGONOMETRY

SOHCAHTOA

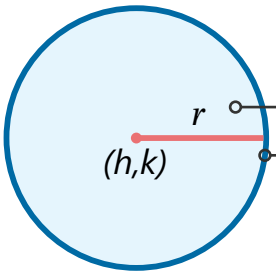
SOH	$\sin(\theta) = \frac{\text{opposite}}{\text{hypotenuse}}$
CAH	$\cos(\theta) = \frac{\text{adjacent}}{\text{hypotenuse}}$
TOA	$\tan(\theta) = \frac{\text{opposite}}{\text{adjacent}}$

CHOSHACAO

CHO	$\csc(\theta) = \frac{\text{hypotenuse}}{\text{opposite}}$
SHA	$\sec(\theta) = \frac{\text{hypotenuse}}{\text{adjacent}}$
CAO	$\cot(\theta) = \frac{\text{adjacent}}{\text{opposite}}$

CIRCLES

A full circle equals 360 degrees or 2π radians



Equations

Area = πr^2

Circumference = $2\pi r$

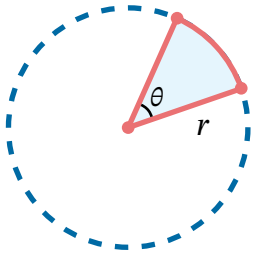
Circle Equation = $(x-h)^2+(y-k)^2 = r^2$

Degrees to Radians Conversion

$$\text{Degrees} = \left(\frac{180°}{\pi}\right) \times \text{Radians}$$

Radians to Degrees Conversion

$$\text{Radians} = \left(\frac{\pi}{180°}\right) \times \text{Degrees}$$

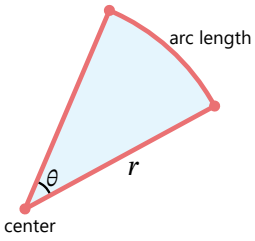


Measuring θ in degrees

$$\text{area of sector} = \frac{\theta}{360°} \times \pi r^2$$

Measuring θ in radians

$$\text{area of sector} = \frac{1}{2} \times r^2\theta$$



Measuring θ in degrees

$$\text{arc length} = \frac{\theta}{360°} \times 2\pi r$$

Measuring θ in radians

$$\text{arc length} = \theta r$$

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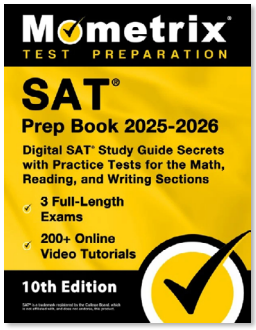

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