ASVAB MATH CRAM SHEET

MATHEMATICAL SYMBOLS

Phrase	Symbol
equal, is, was, will be, has, costs, gets to, is the same as, becomes	=
times, of, multiplied by, product of, twice, doubles, halves, triples	×
divided by, per, ratio of/to, out of	÷
plus, added to, sum, combined, and, more than, totals of	+
subtracted from, less than, decreased by, minus, difference between	−
what, how much, original value, how many, a number, a variable	x, n, etc.

Lesser Known Symbols

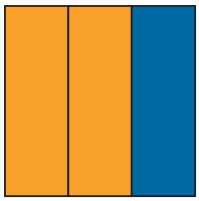
The Golden Ratio: φ
Inifinity: ∞
Euler's Number: e
Universal Quantifier: ∀
Membership Sign: ∈

RATIOS AND PROPORTIONS

Ratios of Two Items

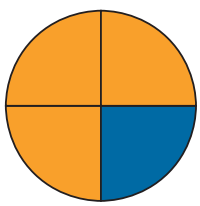
Items	Ratio	Fraction	Written	Simplified Ratio
6 oranges, 8 apples	6:8	$\frac{6}{8}$	6 oranges to 8 apples	3:4
8 trains, 14 cars	8:14	$\frac{8}{14}$	8 trains to 14 cars	4:7
4 feet, 3 feet	4:3	$\frac{4}{3}$	4 feet to 3 feet	4:3

Ratios

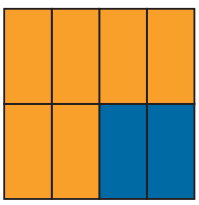


Part to part		Part to whole	
2:1	1:2	2:3	1:3
2/1	1/2	2/3	1/3
2 to 1	1 to 2	2 to 3	1 to 3

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 — 6x

÷6

$4 = x$

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

ASVAB MATH CRAM SHEET

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

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 Volume

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

Metric Units of Distance

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

Convert 12 kilometers to centimeters

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

Metric Units of Mass

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

MEASUREMENT CONVERSIONS

DISTANCE

1 ft = 12 in

1 in = 2.54 cm

1 yd = 3 ft

1 m ≈ 3.28 ft ≈ 1.09 yd

1 mi = 5,280 ft ≈ 1.61 km

CAPACITY

1 oz ≈ 28.35 g

1 cup = 8 oz

2 cups = 1 pint

2 pints = 1 quart

4 quarts= 1 gallon

1 gallon ≈ 3.8 L

WEIGHT

1 lb = 16 oz

1 kg ≈ 2.2 lb ≈ 35.27 oz

1 t = 2,000 lb ≈ 907.19 kg

TEMPERATURE

$°F = \frac{9}{5}(°C) + 32$

$°C = \frac{9}{5}(°F) - 32$

ASVAB MATH CRAM SHEET

FRACTIONS

Proper Fraction
$\frac{1}{8}$ Numerator is less than the denominator

Improper Fraction
$\frac{8}{3}$ Numerator is greater than the denominator

Mixed Number
$3\frac{1}{8}$ Whole number and proper fraction together

Add or subtract fractions with different denominators

1. Change to equivalent fractions with common denominators using a scale factor
2. Add or subtract following the rules for fractions with the same denominators

$$\frac{A}{B} + \frac{C}{D} = \frac{AD}{BD} + \frac{BC}{BD} = \frac{AD + BC}{BD}$$

$$\frac{A}{B} - \frac{C}{D} = \frac{AD}{BD} - \frac{BC}{BD} = \frac{AD - BC}{BD}$$

Add or subtract fractions with the same denominators

1. Add or subtract the numerators
2. Keep the denominator the same
3. Simplify if possible

$$\frac{A}{B} + \frac{C}{B} = \frac{A + C}{B}$$

$$\frac{A}{B} - \frac{C}{B} = \frac{A - C}{B}$$

Multiply fractions

1. Multiply the numerators
2. Multiply the denominators
3. Simplify

$$\frac{A}{B} \times \frac{C}{D} = \frac{A \times C}{B \times D}$$

Divide fractions

1. Keep the first fraction as is
2. Change from division to multiplication
3. Flip the second fraction to its reciprocal
4. Follow multiplication of fractions rules

$$\frac{A}{B} \div \frac{C}{D} = \frac{A}{B} \times \frac{D}{C} = \frac{A \times D}{B \times C}$$

Convert Mixed Number

$$4\frac{2}{8} = \frac{(4 \times 8) + 2}{8} = \frac{34}{8} = \frac{17}{4}$$

Keep the original denominator when converting a mixed number to an impromper fraction.

Simplify if needed.

ASVAB 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

ALGEBRAIC EXPRESSION

Terms
Individual "pieces" in an algebraic expression

Variable
A symbol, typically a letter, that refers to an unspecified mathematical object

Constant
A fixed value that does not change throughout the problem or expression

$4x + 6y - 17$

Coefficients
A constant factor of a term as distinguished from a variable

Operator
A symbol or function that indicates an action to be performed on one or more values

PEMDAS

PEMDAS helps to remember that we start simplifying the expression from left to right, just like we read "PEMDAS" from left to right.

Equation

$6 + 2 \times (5 - 1)^2$

Parentheses ( )

$6 + 2 \times (5 - 1)^2 \rightarrow 6 + 2 \times 4^2$

Exponents x^2

$6 + 2 \times 4^2 \rightarrow 6 + 2 \times 16$

Multiplication/Divison × ÷

$6 + 2 \times 16 \rightarrow 6 + 32$

Addition/Subtraction + -

$6 + 32 \rightarrow 38$

Solution

38

ASVAB MATH CRAM SHEET

RULES OF EXPONENTS

Property	Description
$a^1 = a$	Any number to the power of 1 is equal to itself
$1^n = 1$	The number 1 raised to any power is equal to 1
$a^0 = 1$	Any number raised to the power of 0 is equal to 1
$a^n \times a^m = a^{n+m}$	Add exponents to multiply powers of the same base number
$a^n \div a^m = a^{n-m}$	Subtract exponents to divide powers of the same base number
$(a^n)^m = a^{n \times m}$	When a power is raised to a power, the exponents are multiplied
$(a \times b)^n = a^n \times b^n$	Multiplication operations inside parentheses can be raised to a power
$(a \div b)^n = a^n \div b^n$	Division operations inside parentheses can be raised to a power
$a^{-n} = 1/a^n$	A negative exponent is the same as the reciprocal of a positive exponent

SCIENTIFIC NOTATION

The coefficient must be greater than or equal to 1 and less than 10

Scientific Notation	Moving The Decimal	New Number
1×10^0	1	1
1.3×10^1	1 . 3	13
1.34×10^2	1 . 3 4	134
7.38×10^9	7 . 3 8 0 0 0 0 0 0 0	7,380,000,000
1×10^{-1}	0 1 .	0.1
1×10^{-2}	0 0 1 .	0.01
5.5×10^{-7}	0 0 0 0 0 0 5 . 5	0.00000055

ASVAB MATH CRAM SHEET

FOIL METHOD

Using the FOIL method on binomials: $(x + 2)$ and $(x - 3)$

F	Multiply the first terms of each binomial	$(x + 2)(x + (-3))$	→	$(x)(x)$	$= x^2$
O	Multiply the outer terms	$(x + 2)(x + (-3))$	→	$(x)(-3)$	$= -3x$
I	Multiply the inner terms	$(x + 2)(x + (-3))$	→	$(2)(x)$	$= 2x$
L	Multiply the last terms of each binomial	$(x + 2)(x + (-3))$	→	$(2)(-3)$	$= -6$

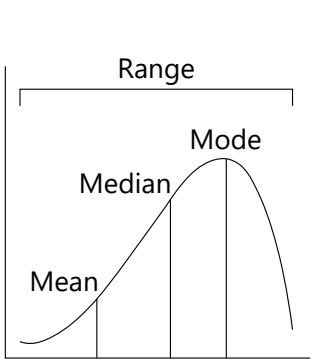
STATISTICS

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

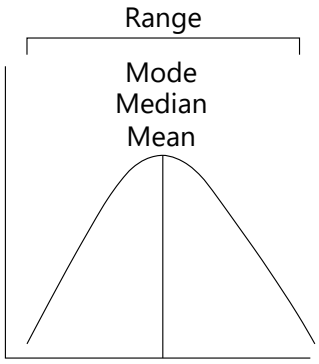
Range (Spread)
Distance between smallest and largest item

Mode
Most/common item

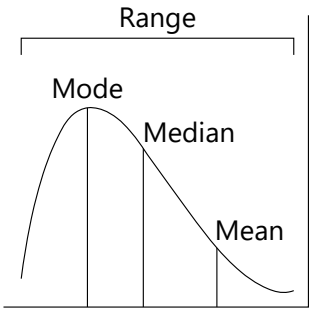
Median
Middle item when ordered from least to greatest



Left Skew (Negative)



Normal Distribution

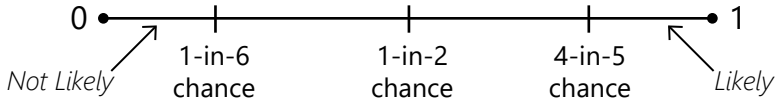


Right Skew (Positive)

PROBABILITY

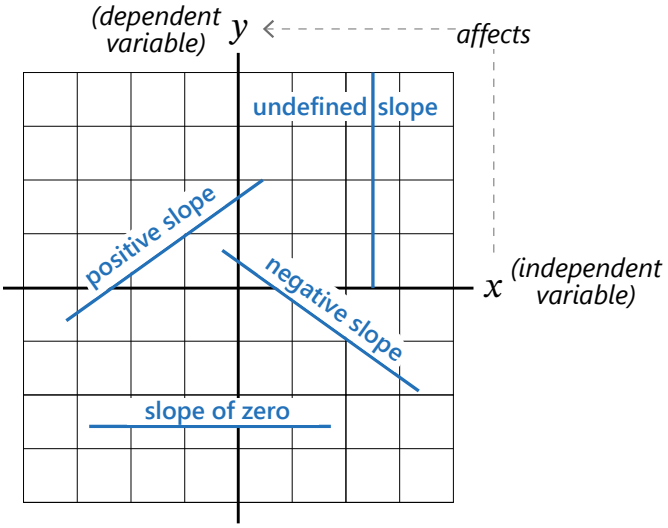
$$P(A) = \frac{\text{Number of acceptable outcomes}}{\text{Number of possible outcomes}}$$

Impossible Event	The Probability of an Event	Certain Event
P(A) = 0	0 ≤ P(A) ≤ 1	If P(A) = 1



ASVAB MATH CRAM SHEET

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

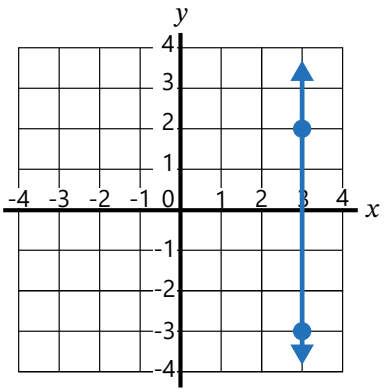
Midpoint Formula

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

Undefined Slope

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

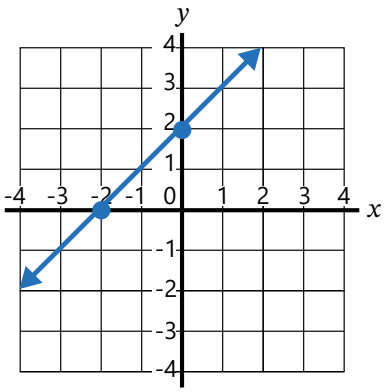
m = undefined



Positive Slope

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

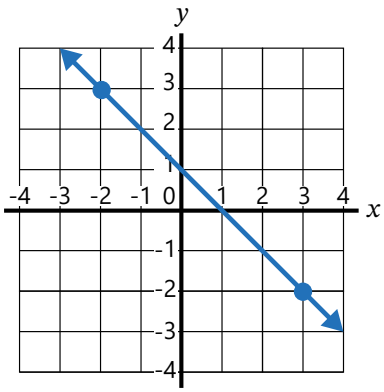
m = 1



Negative Slope

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

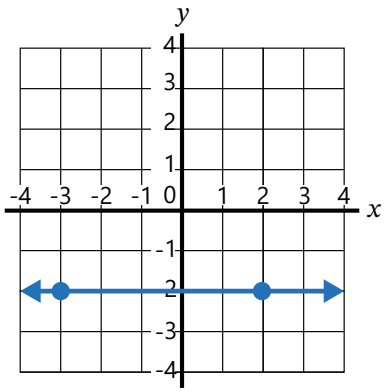
m = -1



Slope of Zero

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

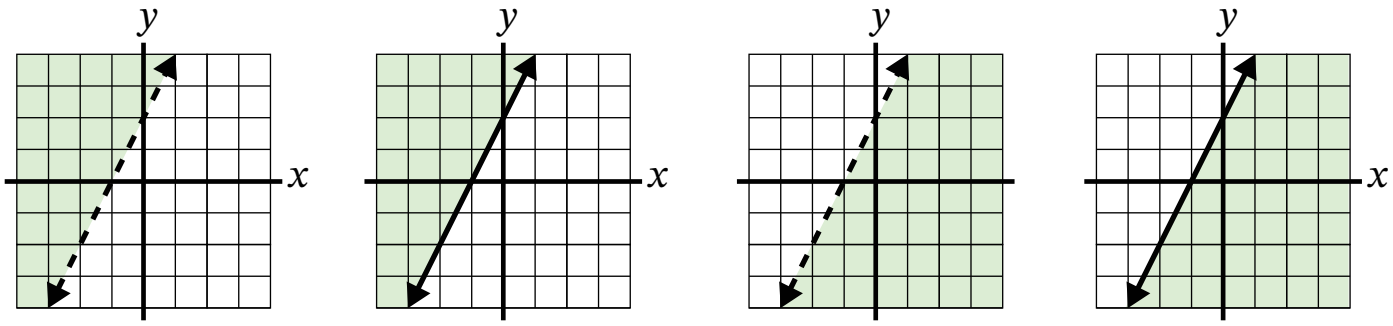
m = 0



ASVAB MATH CRAM SHEET

GRAPHING LINEAR EQUATIONS

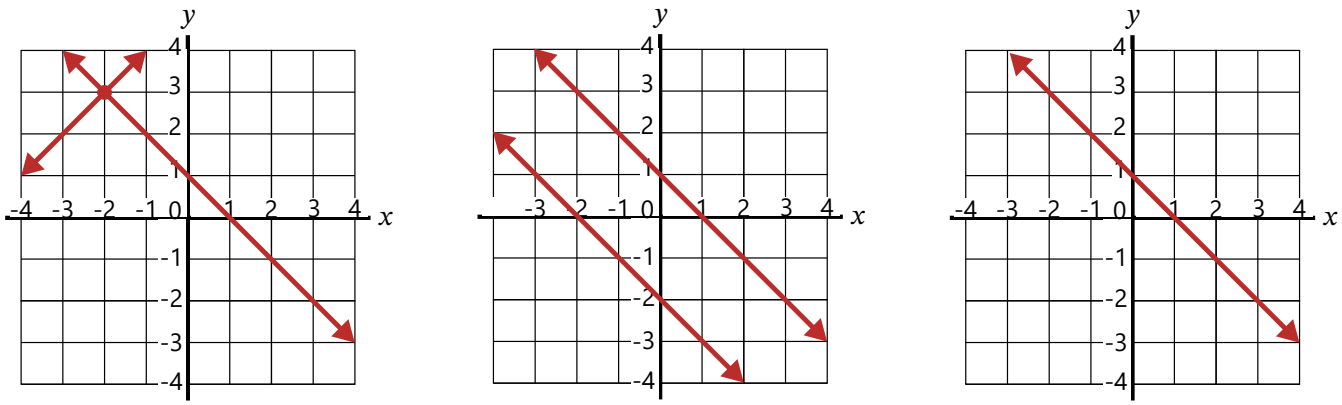
Greater Than	Greater Than or Equal To	Less Than	Less Than or Equal To
$>$	$\geq$	$<$	$\leq$



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

SYSTEMS OF EQUATIONS

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

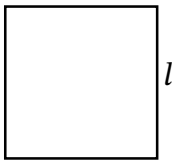


Consistent Independent	*Inconsistent*	*Consistent Dependent*

ASVAB MATH CRAM SHEET

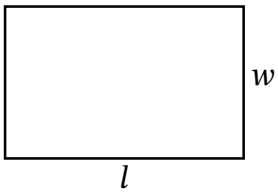
AREA

Square



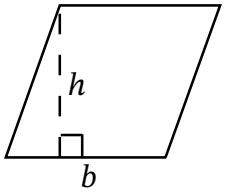
$A = l^2$

Rectangle



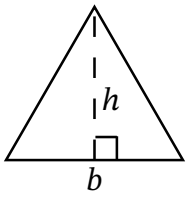
$A = lw$

Parallelogram



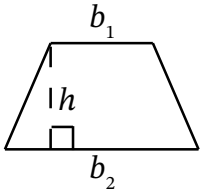
$A = bh$

Triangle



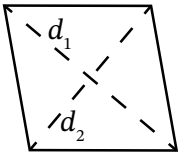
$A = \frac{1}{2}bh$

Trapezoid



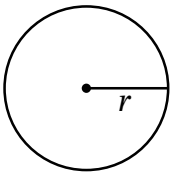
$A = \frac{1}{2}(b_1 + b_2)h$

Rhombus



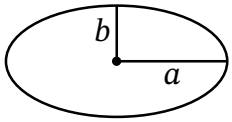
$A = \frac{1}{2}(d_1 \times d_2)$

Circle



$A = \pi r^2$

Ellipse



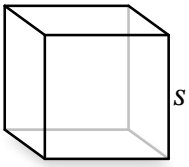
$A = \pi ab$

Perimeter
The sum of all sides of a shape

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

VOLUME AND SURFACE AREA

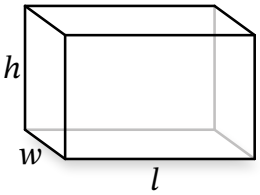
Cube



$V = s^3$

$SA = 6s^2$

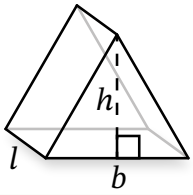
Rectangular Prism



$V = l \times w \times h$

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

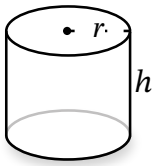
Triangular Prism



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

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

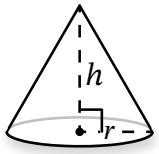
Cylinder



$V = \pi r^2 h$

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

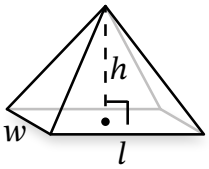
Cone



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

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

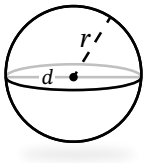
Rectangular Pyramid



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

$SA = lsa + area\ of\ base$

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

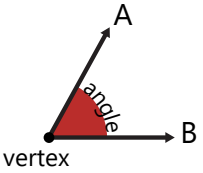
Base
The face of a shape perpendicular to the direction height is measured

ASVAB MATH CRAM SHEET

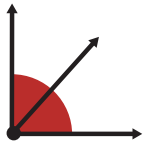
ANGLES

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

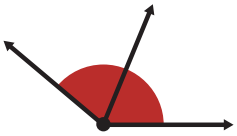


Two angles whose sum is exactly 90°

Supplementary

Two angles whose sum is exactly 180°

Adjacent



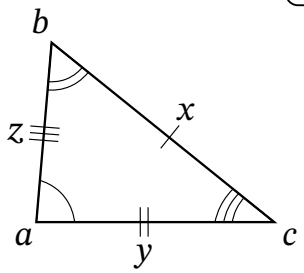
Two angles that have the same vertex and share a side

Vertical

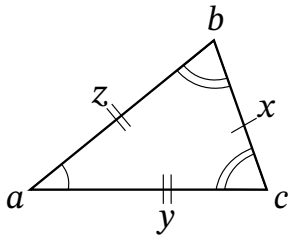
Angles that are not adjacent due to sharing a vertex and have no common side

TRIANGLES

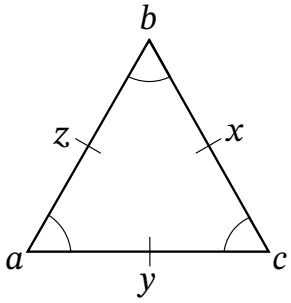
The sum of the interior angles of any triangle is always 180 degrees.



Scalene Triangle
No equal side lengths or angles

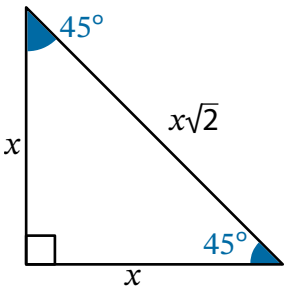


Isosceles Triangle
Two equal side lengths and angles

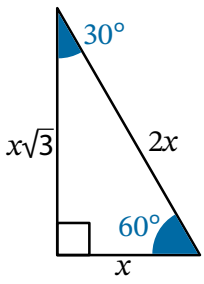


Equilateral Triangle
Three equal side lengths and angles

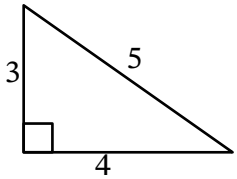
Special Right Triangles



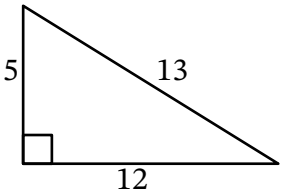
45-45-90



30-60-90



3-4-5



5-12-13

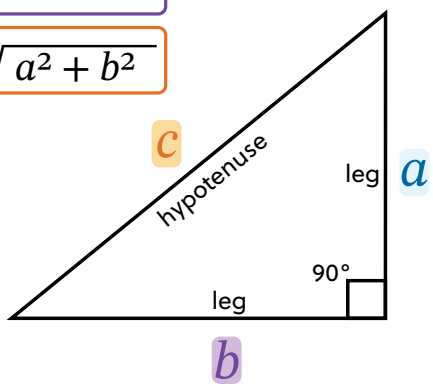
Pythagorean Theorem

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

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

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

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



ASVAB MATH CRAM SHEET

Need more resources? Scan the QR codes below to check out test prep materials from Mometrix that are specifically designed to help you ace the ACT.

You can also visit https://www.mometrix.com/academy/asvab-practice-test/ to take a ACT practice test.