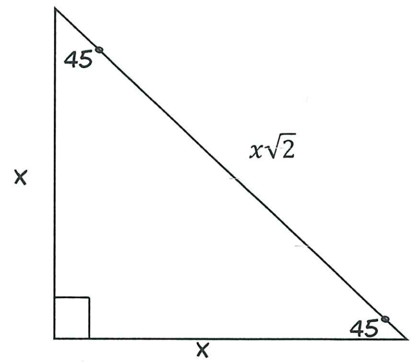
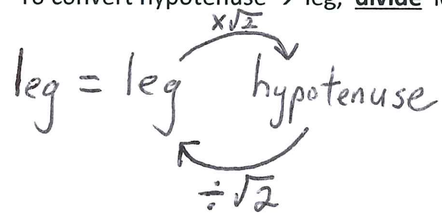
Analytic Geometry Concept Review: Units 1 – 2

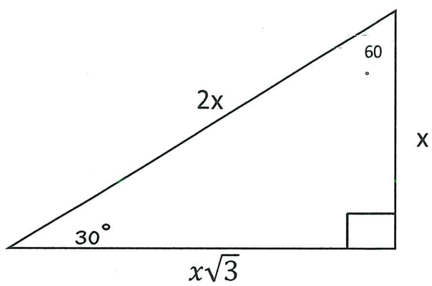
Unit 1: Trigonometry



45-45-90 Triangles

1. To convert leg → hypotenuse, **multiply** leg by $\sqrt{2}$
2. Both legs are congruent to each other
3. To convert hypotenuse → leg, **divide** leg by $\sqrt{2}$

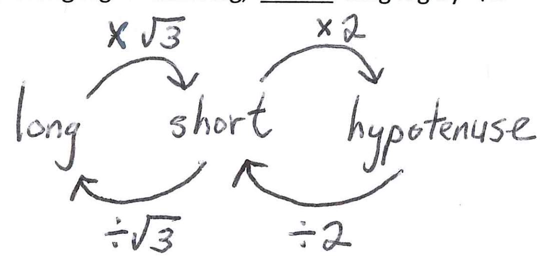




36-60-90 Triangles

1) To convert short leg → hypotenuse, **multiply** short leg by 2
2) To convert hypotenuse → short leg, **divide** hypotenuse by 2

3) To convert short leg → long leg, **multiply** short leg by $\sqrt{3}$
4) To convert long leg → short leg, **divide** long leg by $\sqrt{3}$



Recall the below Trig ratios: SOH – CAH - TOA

$$Sin\ \angle A = \frac{Opp}{Hyp} \qquad Cos\ \angle A = \frac{Adj}{Hyp} \qquad Tan\ \angle A = \frac{Opp}{Adj}$$

Steps for Solving Right Triangle:

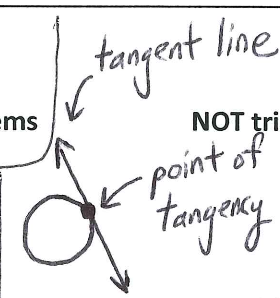
A. Find Missing Side

1. Set up trig radios and use cross product to solve for the variable
2. Use Pythagorean theorem ($a^2 + b^2 = c^2$) if only 1 side is missing

B. Find Missing Angle

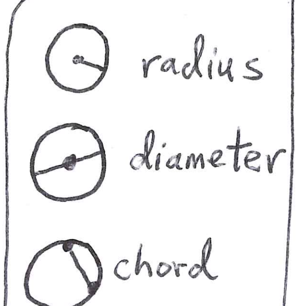
1. Set up trig ratio to use inverse trig : Example → cos A = $\frac{12}{13}$ means A = $cos^{-1}\left(\frac{12}{13}\right)$
2. Subtract the angles from 180° if only 1 angle is missing.

Unit 2A



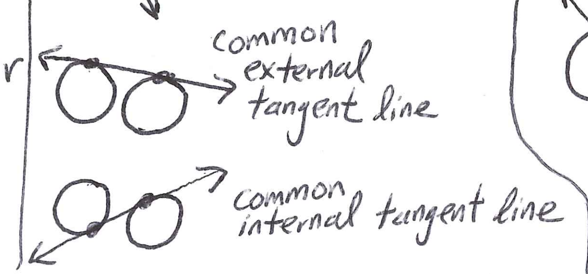
Triangle Congruence Postulates/Theorems

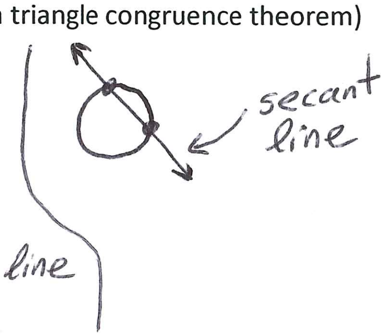
1) SSS
2) SAS
3) HL
4) ASA
5) AAS



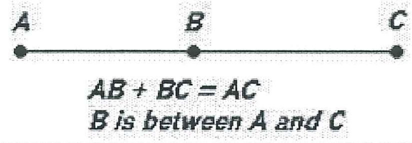
NOT triangle theorems/postulates

5) SSA (NOT a triangle congruence theorem)
6) AAA (NOT a triangle congruence theorem)



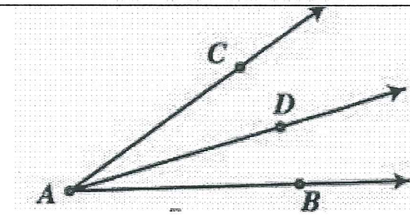


Segment Addition Postulate



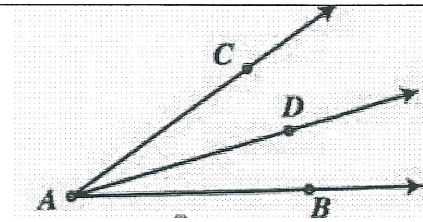
Angle Addition Postulate

$\angle CAD + \angle DAB = \angle BAC$

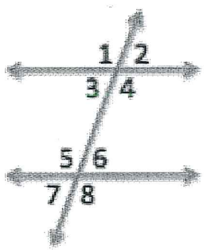


Angle Bisector

If AD is the angle bisector of $\angle CAB$, then $\angle CAD = \angle BAD$



Parallel Lines and Transversal



Corresponding Angles are Congruent:

$\angle 1 \cong \angle 5$ $\angle 2 \cong \angle 6$

$\angle 3 \cong \angle 7$ $\angle 4 \cong \angle 8$

Alt. External Angles are Congruent:

$\angle 1 \cong \angle 8$ $\angle 2 \cong \angle 7$

Linear pairs are supplementary

$\angle 1 + \angle 3 = 180^\circ$ $\angle 2 + \angle 4 = 180^\circ$

$\angle 5 + \angle 6 = 180^\circ$ $\angle 6 + \angle 8 = 180^\circ$

$\angle 7 + \angle 8 = 180^\circ$ $\angle 4 + \angle 3 = 180^\circ$

Consecutive Angles are supplementary:

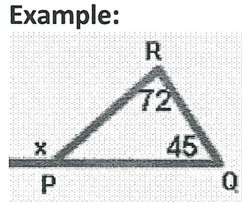
$\angle 3 + \angle 5 = 180^\circ$ $\angle 4 + \angle 6 = 180^\circ$

Alt. Interior Angles are Congruent

$\angle 3 \cong \angle 6$ $\angle 4 \cong \angle 5$

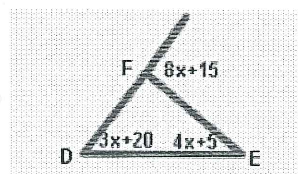
The **Exterior Angle Theorem** states that the measure of an exterior angle of a triangle is equal to the sum of the measures of the two non-adjacent interior angles.

Example:



$x = 45 + 72$

$x = 117$



$8x + 15 = (4x + 5) + (3x + 20)$

$8x + 15 = 7x + 25$

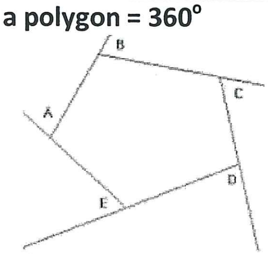
$8x = 7x + 10$

$x = 10$

Sum of Interior Angles of a polygon = **180 (n – 2)**

Measure of one interior angle of a regular polygon $= \frac{180(n-2)}{n}$

Sum of Exterior angles of a polygon = 360°

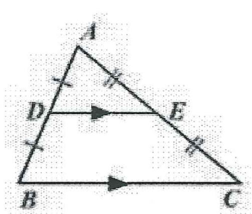


A+B+C+D+E=360

Midsegment of triangle: joins the midpoints of two sides of a triangle such that its length is **half the length of the third side** of the triangle.

2(Midsegment) = length of parallel base

2(DE) = BC



Units 3 and 4

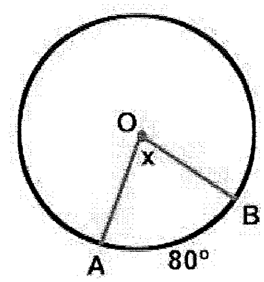
Central Angle

A central angle is an angle formed by two intersecting radii such that its vertex is at the center of the circle.

Central Angle = Intercepted Arc

$m\angle AOB = m\overset{\frown}{AD}$

$m\angle AOB = 80°$

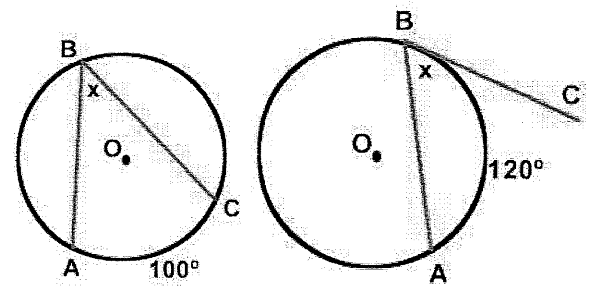


Inscribed Angle

An inscribed angle is an angle with its vertex "on" the circle, formed by two intersecting chords.

Inscribed Angle = $\frac{1}{2}$ Intercepted Arc

$m\angle ABC = \frac{1}{2} m\overset{\frown}{AC}$

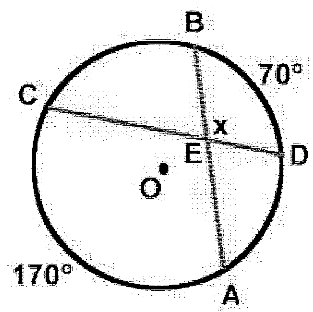


Angle formed inside circle

Angle Formed Inside by Two Chords = $\frac{1}{2}$ **Sum** of Intercepted Arcs

$m\angle BED = \frac{1}{2}\left(m\overset{\frown}{AC} + m\overset{\frown}{BD}\right)$

$m\angle BED = \frac{1}{2}(70+170) = \frac{1}{2}(240) = 120°$

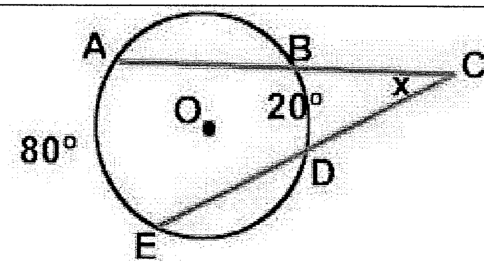


Angle formed outside circle

Angle Formed Outside = $\frac{1}{2}$ **Difference** of Intercepted Arcs

$m\angle ACE = \frac{1}{2}\left(m\overset{\frown}{AE} - m\overset{\frown}{BD}\right)$

$m\angle ACE = \frac{1}{2}(80-20) = 30°$

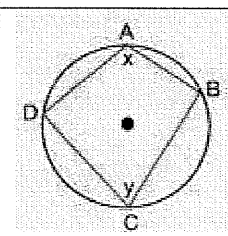


The opposite angles in a cyclic quadrilateral are supplementary.

$m\angle x = \frac{1}{2}\left(m\overset{\frown}{DCB}\right);\ m\angle y = \frac{1}{2}\left(m\overset{\frown}{DAB}\right)$

$m\angle x + m\angle y = \frac{1}{2}\left(m\overset{\frown}{DCB} + m\overset{\frown}{DAB}\right)$

$m\angle x + m\angle y = \frac{1}{2}(360°) = 180°$



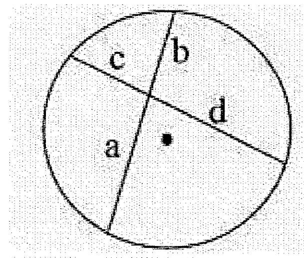
$m\angle x + m\angle y = 180°$

Units 3 and 4 (continued)

Intersecting Chords Rule

If two chords intersect in a circle, the product of the lengths of the segments of one chord equal the product of the segments of the other.

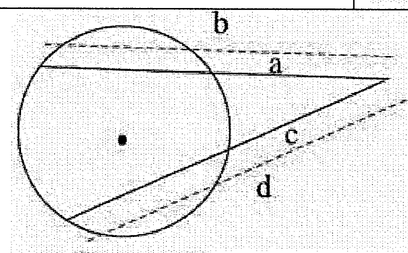
Part * Part = Part * Part



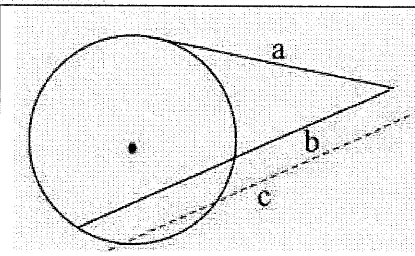
$a \cdot b = c \cdot d$

Secant and Tangent
(or Secant and Secant)

Outside * Whole = Outside * Whole



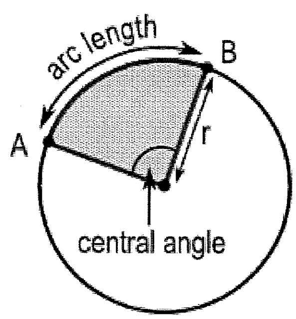
$a \cdot b = c \cdot d$



a * a = b * c

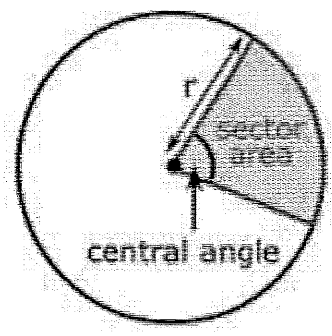
Arc Length (L)

$$\frac{L}{2\pi r} = \frac{\widehat{AB}}{360}$$



Sector Area (S)

$$\frac{S}{\pi r^2} = \frac{\widehat{AB}}{360}$$



Circles:

Circumference: C= πr C = πd

Area: $A= \pi r^2$ Diameter: d = 2r

Full circle: 360° semi-circle: 180^0

Spheres:

Surface Area: $SA = 4\pi r^2$

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

Properties of Exponents

1) Product of powers property: $a^m \times a^n = a^{m+n}$
2) Power of powers property: $(a^m)^n = a^{m*n}$
3) Quotient of powers property: $\frac{a^m}{a^n} = a^{m-n}$

4) $a^0 = 1$ 5) $a^{-m} = \frac{1}{a^m}$

Imaginary Unit:

1) $\sqrt{-1} = i$

2) $i^2 = -1$

Standard form: a + b i