

Distance Formula

$$d = \sqrt{(X_2 - X_1)^2 + (Y_2 - Y_1)^2}$$

Midpoint Formula

$$X_{mp} = \frac{X_2 + X_1}{2}$$

$$Y_{mp} = \frac{Y_2 + Y_1}{2}$$

Sum of internal Angles in polygon

$$\text{Sum} = (n - 2)180^\circ$$

Sum of External Angles in polygon

$$= 360^\circ \text{ for any polygon}$$

Number of diagonal in polygon

$$\text{diagonals} = \frac{n(n-3)}{2}$$

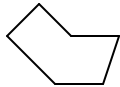
Convex polygon

All internal angles < 180°



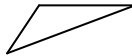
Concave polygon

At least one internal angles > 180°



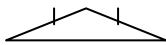
Scalene Triangle

All sides are different
All angles are different



Isoceles Triangle

Two sides are same
Two angles are same



Equilateral Triangle

All 3 sides are same
All 3 angles are same

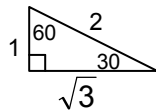


Pythagorean Formula

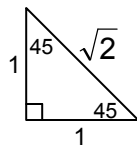
$$c = \sqrt{a^2 + b^2}$$

c = hypotenus

30-60-90 triangle

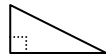


45-45-90 triangle



Right Triangle

One 90° angles



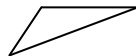
Acute Triangle

All angles < 90°

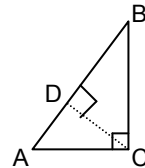


Obtuse Triangle

One angles > 90°



Right Triangle Similarity



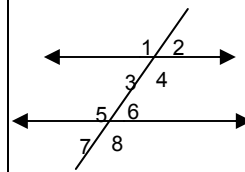
$$\Delta BAC \sim \Delta CAD \sim \Delta BCD$$

$$(CD)^2 = (AD)(BD)$$

$$(BC)^2 = (AB)(BD)$$

$$(AC)^2 = (AB)(AD)$$

Angles & Parallel Lines



Vertical Angles

$$\angle 1 = \angle 4$$

$$\angle 2 = \angle 3$$

$$\angle 5 = \angle 8$$

$$\angle 7 = \angle 6$$

Corresponding Angles

$$\angle 1 = \angle 5$$

$$\angle 2 = \angle 6$$

$$\angle 4 = \angle 8$$

$$\angle 3 = \angle 7$$

Alternate Interior Angles

$$\angle 5 = \angle 4$$

$$\angle 6 = \angle 3$$

Alternate Exterior Angles

$$\angle 1 = \angle 8$$

$$\angle 7 = \angle 2$$

Consecutive Interior Angle

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

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

Congruency Tests

SSS

SAS

ASA

AAS

HL

Similarity Tests

SSS

SAS

AA

Parallelogram

- Opposite sides are parallel
- Opposite angles are congruent
- Diagonals bisect each other
- Sum of interior angles = 360°
- Sum of adjacent angles = 180°

Rectangle

- Opposite sides are parallel
- Opposite sides are congruent
- Diagonals bisect each other
- Diagonals are congruent
- All four angles = 90°

Square

- Opposite sides are parallel
- All sides are congruent
- All angles = 90°
- Diagonals are congruent
- Diagonals are perpendicular
- Diagonals bisect each other
- Diagonals are angle bisectors

Trapezoid

- Bases are parallel
- Median is leg bisector
- Adjacent top+bottom angles = 180°

Isoceles Trapezoid

- Bases are parallel
- Legs are congruent
- Diagonals are congruent
- Lower base angles are congruent
- Upper base angles are congruent
- Adjacent top+bottom angles = 180°

Median

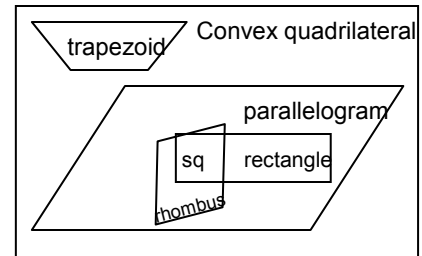
- Bisect opposite side

Altitude

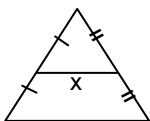
- Perpendicular to opposite side

Quadrilaterals- Family Tree

quadrilaterals



Midsegment bisector



2x

If mid-segment is bisector
Then larger base 2x smaller base

Centroid

- Intersection of medians
- Balance point or center of mass

Incenter

- Intersection of angle bisector
- Inscribed circle

-Circumcenter

- Intersection of perpendicular bisector
- circumscribed circle

Orthocenter

- Intersection of altitudes



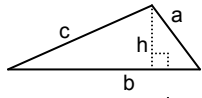
Square

$P = 4s$
 $A = s \times s$



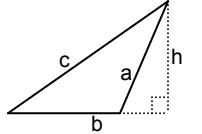
Rectangle

$P = 2L + 2w$
 $A = L \times w$



Triangle

$P = a + b + c$
 $A = \frac{b \times h}{2}$

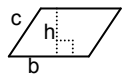


$P = a + b + c$
 $A = \frac{b \times h}{2}$



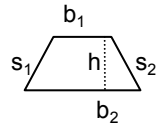
Equilateral Triangle

$P = 3s$
 $A = \frac{\sqrt{3} s^2}{4}$



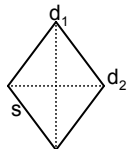
Parallelogram

$P = 2b + 2c$
 $A = b \times h$



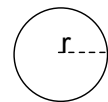
Trapezoid

$P = b_1 + b_2 + s_1 + s_2$
 $A = \frac{(b_1 + b_2) h}{2}$



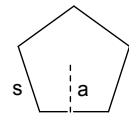
Rhombus

$P = 4s$
 $A = \frac{d_1 \times d_2}{2}$



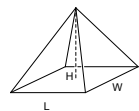
circle

$P = 2 \pi r$
 $A = \pi r^2$



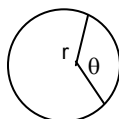
Regular Polygon

$P = (n)(s)$
 $A = \frac{(s)(a)(n)}{2}$



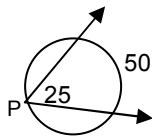
Regular Pyramid

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



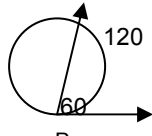
Sector of circle

$Arc = \left(\frac{\theta}{360}\right)(2\pi r)$
 $A = \left(\frac{\theta}{360}\right)(\pi r^2)$



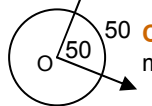
Inscribed Angle

$\angle P = \frac{\text{Outside arc}}{2}$



Inscribed Angle

$\angle P = \frac{\text{Outside arc}}{2}$

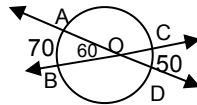


Central Angle

$m\angle O = \text{same as arc}$

Inside Circle Angle

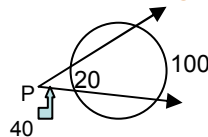
$m\angle COD = m\angle AOB = \text{vertical angle}$



$\angle AOB = \frac{\text{outside arc} + \text{outside arc}}{2}$

$\angle AOB = \frac{70 + 50}{2} = 60$

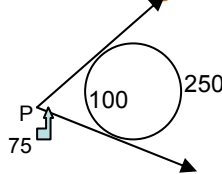
Outside Circle Angle



$\angle P = \frac{\text{outside arc} - \text{inside arc}}{2}$

$\angle P = \frac{100 - 20}{2} = 40$

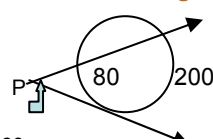
Outside Circle Angle



$\angle P = \frac{\text{outside arc} - \text{inside arc}}{2}$

$\angle P = \frac{250 - 100}{2} = 75$

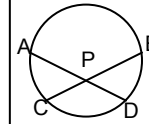
Outside Circle Angle



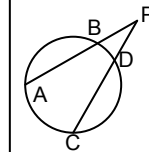
$\angle P = \frac{\text{outside arc} - \text{inside arc}}{2}$

$\angle P = \frac{200 - 80}{2} = 60$

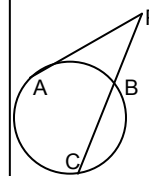
Segment Proportionalities



$(AP)(PD) = (BP)(PC)$

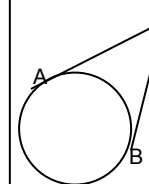


$(PB)(PA) = (PD)(PC)$

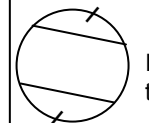


$(PA)(PA) = (PB)(PC)$

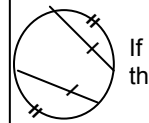
$PA = \sqrt{(PB)(PC)}$



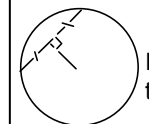
$PA = PB$



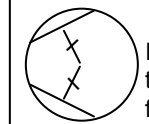
If cords parallel, then arcs are congruent



If cords congruent then arcs are congruent



If radius perpendicular then cord is bisected



If cords congruent, then equidistance from center



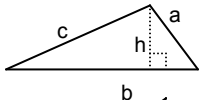
Square

$P = 4s$
 $A = s \times s$



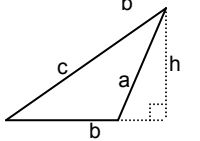
Rectangle

$P = 2L + 2w$
 $A = L \times w$



Triangle

$P = a + b + c$
 $A = \frac{b \times h}{2}$

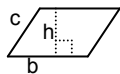


$P = a + b + c$
 $A = \frac{b \times h}{2}$



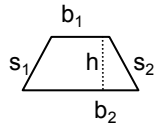
Equilateral Triangle

$P = 3s$
 $A = \frac{\sqrt{3} s^2}{4}$



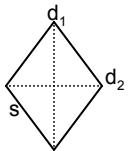
Parallelogram

$P = 2b + 2c$
 $A = b \times h$



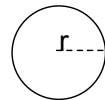
Trapezoid

$P = b_1 + b_2 + s_1 + s_2$
 $A = \frac{(b_1 + b_2) h}{2}$



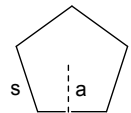
Rhombus

$P = 4s$
 $A = \frac{d_1 \times d_2}{2}$



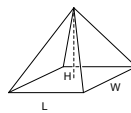
circle

$P = 2 \pi r$
 $A = \pi r^2$



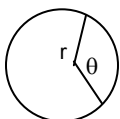
Regular Polygon

$P = (n)(s)$
 $A = \frac{(s)(a)(n)}{2}$



Regular Pyramid

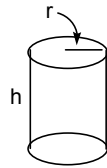
$V = \frac{L \times w \times h}{3}$



Sector of circle

$Arc = \left(\frac{\theta}{360}\right)(2\pi r)$
 $A = \left(\frac{\theta}{360}\right)(\pi r^2)$

Right Cylinder



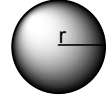
$LA = 2\pi r h$
 $SA = 2\pi r h + 2\pi r^2$
 $V = \pi r^2 h$

Prisms



$LA = \text{all sides}$
 $SA = \text{all sides} + \text{base} + \text{top}$
 $V = BH$

Spheres



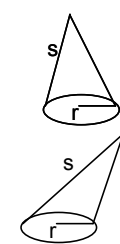
$SA = 4\pi r^2$
 $V = \frac{4\pi r^3}{3}$

Pyramids



$LA = \text{all sides}$
 $SA = \text{all sides} + \text{base}$
 $V = \frac{BH}{3}$

Cone



$LA = \pi r s$
 $SA = \pi r s + \pi r^2$
 $V = \frac{\pi r^2 H}{3}$