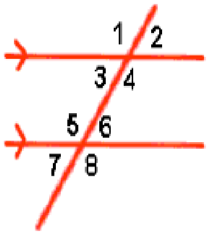
# Things to Remember from Geometry

**If two parallel lines are cut by a transversal, then …**




**Corresponding ∠s are ≅.**
∠1≅∠5, ∠2≅∠6,
∠3≅∠7, ∠4≅∠8

**Alternate Interior ∠s are ≅.**
∠3≅∠6, ∠4≅∠5

**Alternate Exterior ∠s are ≅.**
∠1≅∠8, ∠2≅∠7

**Consecutive ∠s are supplementary.**
m∠3+m∠5=180,
m∠4+m∠6=180

**Special Quadrilaterals**

**Parallelogram:**
- Opposite sides ∥ & =
- opposite ∠s ≅
- consecutive ∠s supplementary
- diagonals bisect each other

**Rectangle:**
- All characteristics of parallelograms
- 4 right ∠s
- ≅ diagonals

**Rhombus:**
- All characteristics of parallelograms
- 4 ≅ sides
- Diagonals ⊥
- Diagonals bisect ∠s

**Square:**
- All characteristics of rectangles,& rhombi

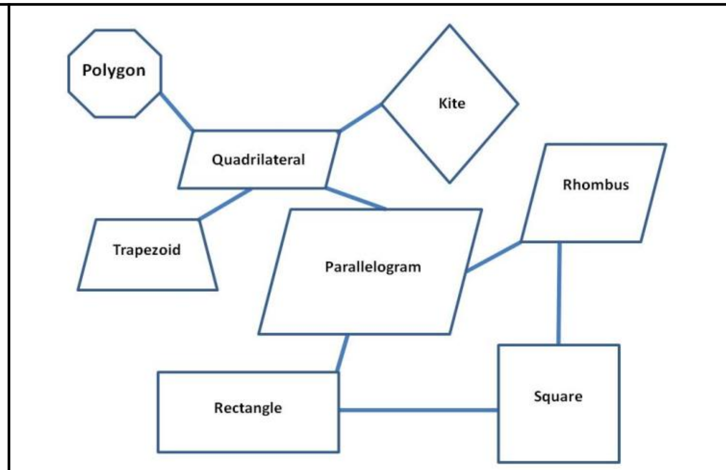
**Other Quadrilaterals**

**Trapezoid:**
•Only one set ∥ sides (bases)

**Isosceles Trapezoid:**
- ≅ legs
- base ∠s ≅
- diagonals ≅
- opposite ∠s supplementary

**Kite:**
- 2 pairs of adjacent ≅ sides
- diagonal from the vertex ∠s is ⊥ bisector of the other diagonal & ∠ bisector for the vertex ∠s

•Non-vertex ∠s ≅




**Polygons**

**Interior ∠s:**
Sum of interior ∠s = $180(n-2)$
Each interior ∠ (regular) = $\frac{180(n-2)}{n}$

**Exterior ∠s:**
Sum of exterior ∠s = 360°
Each exterior ∠ (regular) = 360 ÷ n

Slope Formula

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

Slope-Intercept Form

$$y = mx + b$$

Point-Slope Formula

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

**Triangle Inequalities:**
·Sum of the lengths of any 2 sides of a Δ is > the length of the 3rd side.
·Longest side of a Δ is opposite the largest ∠.

**Pythagorean Theorem**

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

•a and b are legs
• c is always the hypotenuse (side opposite the right angle)

Converse:
If the sides of a triangle satisfy $a^2 + b^2 = c^2$,
*then the* Δ *is a* right triangle.

**Classifying Triangles**

**By Sides:**
Scalene – no congruent sides
Isosceles – 2 congruent sides
Equilateral – 3 congruent sides

**By Angles:**
Acute – all acute angles
Right – one right angle
Obtuse – one obtuse angle

Distance Formula:

$$\sqrt{\left((x_2 - x_1)^2 + (y_2 - y_1)^2\right)}$$

Midpoint Formula

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

**Proving Triangles Congruent**
SSS SAS
ASA AAS
HL (right triangles only)
NO donkey theorem (SSA)
or car insurance (AAA)
*CPCTC (use after the triangles are ≅).

**Proving Similar Triangles**
AA, SSS, SAS
*Corresponding sides of similar triangles are proportional.

**Regular**: all angles are ≅ and all sides are ≅.
**Equiangular:** all angles are ≅.
**Equilateral**: all sides are ≅.

**Points of Concurrency**

Centroid: Medians (from vertex to midpoint)
Center of Gravity/ Balance Point

Incenter: Angle Bisectors
Equal distance from all sides

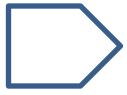
Circumcenter: Perpendicular Bisectors
Equal distance from all vertices

Orthocenter: Altitudes
(perpendicular & can be outside the Δ).

**Naming Polygons**
triangle – 3 sides
quadrilateral – 4 sides
pentagon – 5 sides
hexagon – 6 sides
heptagon – 7 sides
octagon – 8 sides
decagon – 10 sides
dodecagon – 12 sides

Concave
(a place to hide)

Convex
no diagonals lying outside



# Things to Remember from Geometry

### Conditional Statements

If – hypothesis;
Then – conclusion
p → q

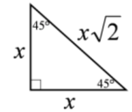
Converse: switch if and then
q → p

Inverse: negate if and then
~p → ~q

Contrapositive: negate the converse
~q → ~p

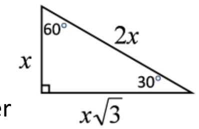
(contrapositive has the same truth value as the original statement)

### Special Right Triangles




hyp = leg * $\sqrt{2}$
leg = hyp ÷ $\sqrt{2}$

multiply →
make it bigger
divide →
make it smaller



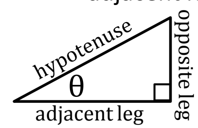

hypotenuse = short leg * 2
short leg = hypotenuse ÷ 2
long leg = short leg * $\sqrt{3}$
short leg = long leg ÷ $\sqrt{3}$

### Trigonometric Ratios

$\sin\theta = \dfrac{\text{opposite leg}}{\text{hypotenuse}}$

$\cos\theta = \dfrac{\text{adjacent leg}}{\text{hypotenuse}}$

$\tan\theta = \dfrac{\text{opposite leg}}{\text{adjacent leg}}$




*To find the angle, use 2nd key.

### Spheres

$A = 4\pi r^2$
$V = 4/3\pi r^3$

### Circles

$A = \pi r^2$

$C = d\pi = 2\pi r$

### Sector Area

$$\frac{arc\ measure}{360^o} = \frac{sector\ area}{\pi r^2}$$

### Arc Length

$$\frac{arc\ measure}{360^o} = \frac{arc\ length}{2\pi r}$$

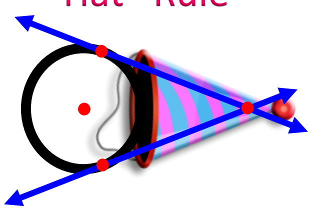
### Conics (Circle Equations):

center at (0,0)
$x^2 + y^2 = r^2$
center at $(h, k)$
$(x - h)^2 + (y - k)^2 = r^2$

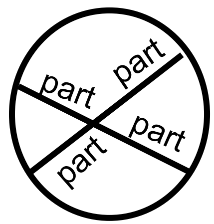
**$r$ is the radius

## Segment Lengths

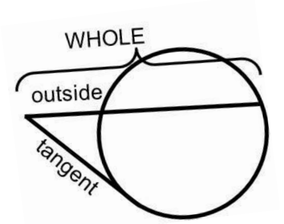
tangent = tangent
"Hat" Rule



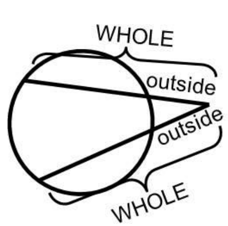
2 intersecting chords
part · part = part · part




tangent & secant
$(\text{tangent})^2$ = outside · whole

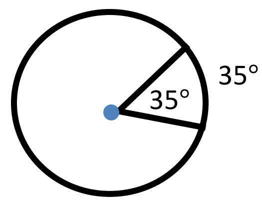



2 secants
outside · whole = outside · whole

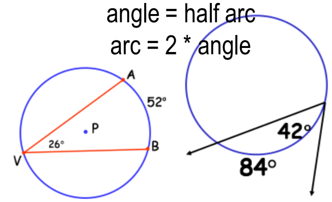



## Arc and Angle Measures

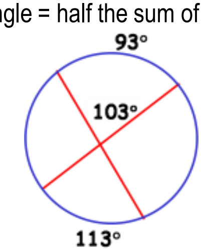
**VERTEX IS THE CENTER**
central angle = intercepted arc



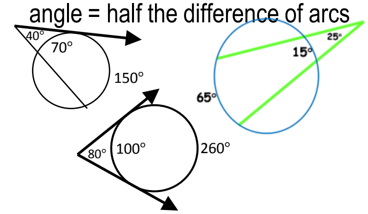

**VERTEX ON THE CIRCLE**
Angle formed by 2 chords or chord/secant & tangent
angle = half arc
arc = 2 * angle



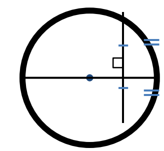

**VERTEX IN THE CIRCLE**
Angle formed by 2 chords
angle = half the sum of arcs




**VERTEX OUTSIDE THE CIRCLE**
Angle formed by 2 tangents, or 2 secants, or tangent/secant
angle = half the difference of arcs

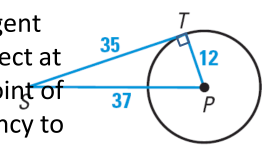


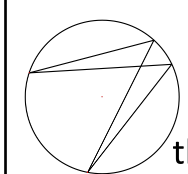

### Other circle theorems



A radius or diameter perpendicular to a chord bisects the chord & its arc.

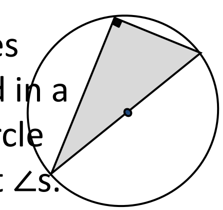
A radius & tangent intersect at the point of tangency to form a right angle.



2 inscribed ∠s that intercept the same arc are ≅.

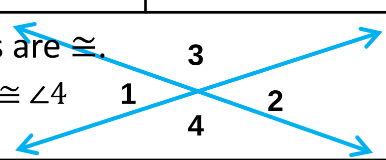
Angles inscribed in a semicircle are right ∠s.



### Perimeter

the distance around
(add all sides)

All vertical ∠s are ≅.
∠1 ≅ ∠2; ∠3 ≅ ∠4




minor arc – named with 2 letters – < 180°
major arc – named with 3 letters – > 180°
Sum of all ∠s in a circle = 360°
semicircle = 180°