MEMORIZATION REFERENCE SHEET FOR GEOMETRY EOC

TOOLS OF GEOMETRY

Midpoint Formula $= \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$ **Distance Formula** $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Complementary Angles: $\angle's$ that add to 90° **Supplementary Angles**: $\angle's$ that add to 180°

Vertical Angles: Two angles whose sides are opposite rays. They make an "x" and are ≅.

Adjacent Angles: Two angles with common side, common vertex, no common points.

Linear Pair: Two angles that share a ray and are supplementary

REASONING AND PROOF

Conditional: If p, then q **Inverse**: insert "nots" **Converse**: change order

Contrapositive: change order and add "nots"

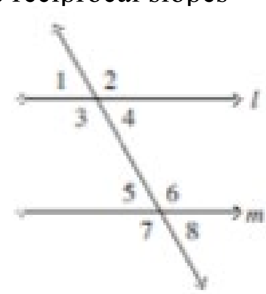
Symmetric Property of Congruence/Equality: Switch order Ex: If $\angle A \cong \angle B$, then $\angle B \cong \angle A$

Reflexive Property of Congruence/Equality: Same on both sides Ex: $\overline{AB} \cong \overline{AB}$

Transitive Property of Congruence/Equality: If $\angle A \cong \angle B$ and $\angle B \cong \angle C$, then $\angle A \cong \angle C$

LINES AND ANGLES

Parallel Lines have = slopes **Perpendicular Lines** have opposite reciprocal slopes



If $l \parallel m$,

Corresponding angles (congruent)**:** $\angle 1$ and $\angle 5$, $\angle 3$ and $\angle 7$
$\angle 2$ and $\angle 6$, $\angle 4$ and $\angle 8$
Alternative Interior Angles (congruent)**:** $\angle 3$ and $\angle 6$, $\angle 4$ and $\angle 5$
Alternate Exterior Angles (congruent)**:** $\angle 1$ and $\angle 8$, $\angle 2$ and $\angle 7$
Same-Side Interior Angles (supplementary)**:** $\angle 3$ and $\angle 5$, $\angle 4$ and $\angle 6$

The sum of the measures of the interior angles of a triangle = 180°

The measure of the exterior angle of a triangle = the sum of the two remote interior angles.

Slope Intercept Form: $y = mx + b$ **Point-Slope Form**: $y - y_1 = m(x - x_1)$

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

CONGRUENT TRIANGLES

Congruent Triangle Theorems ⇨ SSS, ASA, SAS, AAS, and HL (there is no rule for SSA or AA)

Use **CPCTC** only after proving two triangles congruent.

Isosceles Triangles – two equal legs ⇔two equal base angles

RELATIONSHIPS WITHIN TRIANGLES

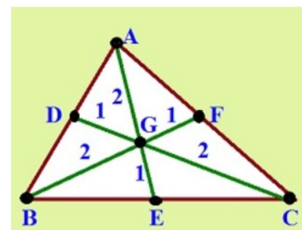
Triangle Midsegment Theorem: $2(\text{Midsegment}) = \text{Base}$ or $\frac{1}{2}(\text{Base}) = \text{Midsegment}$

Points of Concurrency: Perpendicular Bisectors: Circumcenter Angle Bisectors: Incenter

Medians: Centroid Altitudes: Orthocenter

Centroid Formula: 2(short) = long or 3(short) = whole

Triangle Inequality: the sum of the lengths of the small and medium sides of a triangle is greater than the length of the large side.



POLYGONS AND QUADRILATERLAS

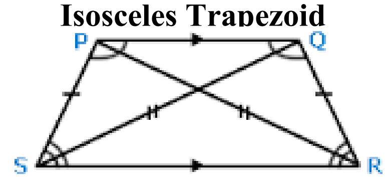
The sum of the measures of the interior angles in a quadrilateral is 360°

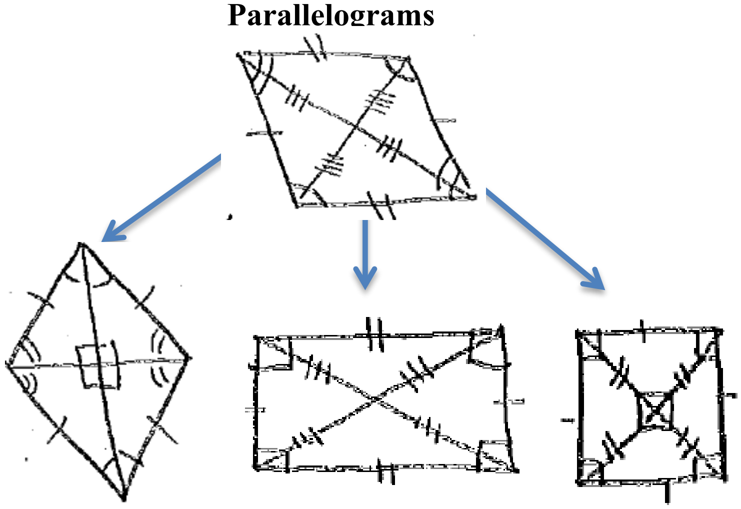
Sum of interior angles of polygon: $(n-2)180$ **Exterior angle and central angle** = $\frac{360}{n}$

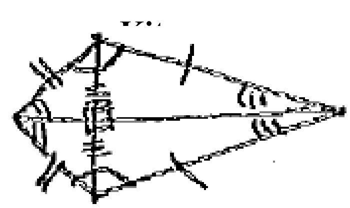
Measure of each interior angle of a polygon: $\frac{(n-2)180}{n}$ **Midsegment of a Trapezoid** = $\frac{b_1+b_2}{2}$

Parallelograms

Isosceles Trapezoid







Rhombus **Rectangle** **Square**

SIMILARITY

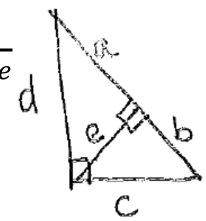
Similar polygons have congruent angles and proportional side lengths.

Three ways to prove triangles similar: AA ~, SAS ~, and SSS ~ (there is no SSA).

Geometric mean = $\frac{a}{x} = \frac{x}{b}$, so $ab = x^2$ where x is the means position of the formula.

Altitude of a right triangle: $\frac{segment\ of\ hypotenuse}{altitude} = \frac{altitude}{other\ segment\ of\ hypotenuse}$

Leg of a right triangle: $\frac{whole\ hypotenuse}{leg} = \frac{leg}{part\ of\ hypotenuse\ closest\ to\ leg}$



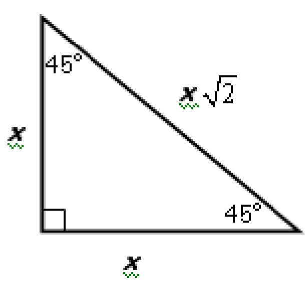
Altitude : $\frac{e}{a} = \frac{b}{e}$ **Leg** : $\frac{a+b}{c} = \frac{c}{d}$ or $\frac{a+b}{d} = \frac{d}{a}$

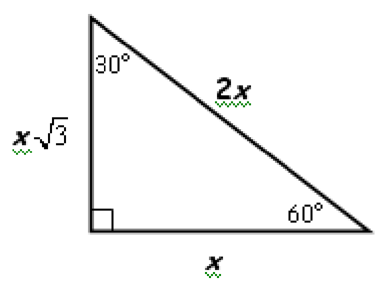
RIGHT TRIANGLES AND TRIGONOMETRY

Pythagorean Theorem = $c^2 = a^2 + b^2$ …this also can be used to prove a right triangle

Acute Triangle: $c^2 < a^2 + b^2$ **Obtuse Triangle**: $c^2 > a^2 + b^2$

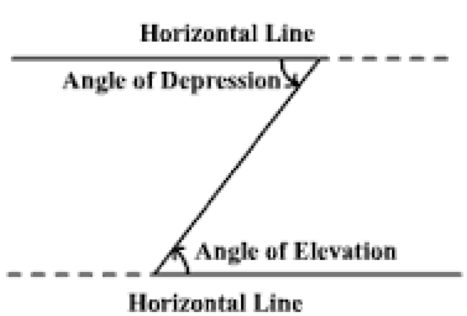
Special Right Triangles:





Trigonometric Ratios: $sin\angle A = \frac{opposite}{hypotenuse}$ $cos\angle A = \frac{adjacent}{hypotenuse}$ $tan\angle A = \frac{opposite}{adjacent}$

Regular buttons on calc to find side lengths. Inverse buttons (sin^{-1}, cos^{-1}, tan^{-1}) to find angle measures



TRANSFORMATIONS

Rotations:

r_{90} (x,y) → (-y,x)

r_{180} (x,y) → (-x,-y)

r_{270} (x,y) → (y,-x)

r_{360} (x,y) → (x,y)

Reflections:

R_{x-axis} (x,y) → (x,-y)

R_{y-axis} (x,y) → (-x,y)

$R_{y=x}$ (x,y) → (y,x)

$R_{y=-x}$ (x,y) → (-y,-x)

Dilations:

D_k (x,y) → (k•x,k•y)

Translations:

$T_{a,b}$ (x,y) → (x+a,y+b)

Compositions: Remember always do the second transformation listed first Ex: $(r_{90,O} \circ R_{y=x})(\Delta JKL)$

AREA:

s = side length b = base length h = height d = diagonal r = radius d = diameter

Perimeter of Square: $P = 4s$ **Perimeter any shape**: Add all sides **Circumference**: $C = 2\pi r$ or πd

Area of Square: $A = s^2$ **Area of Rectangle**: $A = bh$ **Area of Parallelogram**: $A = bh$

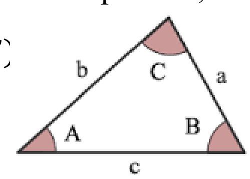
Area of a Triangle: $A = \frac{1}{2}bh$ **Area of a Rhombus**: $A = \frac{1}{2}(d_1 \cdot d_2)$ **Area of a Kite**: $A = \frac{1}{2}(d_1 \cdot d_2)$

Area of a Trapezoid: $A = \frac{1}{2}h(b_1 + b_2)$ **Area of Circle**: $A = \pi r^2$

Area of a Regular Polygon: $A = \frac{1}{2}ap$ where a = apothem length and p = perimeter of the polygon

* Use special right triangles or trig ratios to find the apothem, radius, or side length in a reg polygon.

Area of a Triangle given SAS: $A = \frac{1}{2}ab(sinC)$



SURFACE AREA AND VOLUME:

p = perimeter of base, B = area of base, h = height of figure, l = slant height r = radius

Eulers Formula = Faces + Vertices = Edges + 2

Lateral Area for Prisms, Cylinders, Pyramids, and Cones is first part of Surface Area formula

SA of Prism: $SA = ph + 2B$ **SA of Cylinder**: $2\pi rh + 2\pi r^2$ **SA of Pyramid**: $SA = \frac{1}{2}pl + B$

SA of Cone: $\pi rl + \pi r^2$ **SA of Sphere**: $SA = 4\pi r^2$

Volume of Prism: $V = Bh$ **Volume of Cylinder**: $V = \pi r^2 h$ **Volume of Pyramid**: $V = \frac{1}{3}Bh$

Volume of Cone: $V = \frac{1}{3}\pi r^2 h$ **Volume of Sphere**: $V = \frac{4}{3}\pi r^3$

Ratios of Similar Figures:

Scale Factor/Perimeter Ratio: $\frac{a}{b}$ Area/Surface Area Ratio: $\frac{a^2}{b^2}$ Volume Ratio: $\frac{a^3}{b^3}$

CIRCLES

Central Angle = angle measure that includes the center of the circle.

Minor Arc < 180° **Semicircle** = 180° **Major Arc** > 180°

Arc Measure = measure of central angle **Concentric Circles**: two circles that share a center point

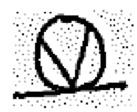
Arc Length = $\frac{m\widehat{AB}}{360} \cdot 2\pi r$ **Area Sector** (slice of pizza) = $\frac{m\widehat{AB}}{360} \cdot \pi r^2$

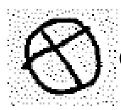
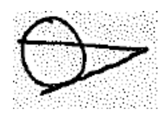
Area of Segment (crust of the pizza slice) = Area of Sector – Area of Triangle = $\frac{m\widehat{AB}}{360} \cdot \pi r^2 = \frac{1}{2}bh$

Tangent Line: Line that intersects the circle at exactly one point and is perpendicular to the radius.

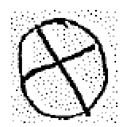
Chord: a segment whose endpoints are on the circle **Secant** = line that intersects a circle at 2 points

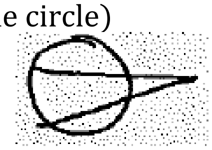
Circle Angle Formulas:

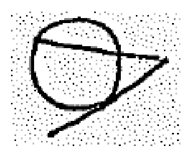
Central Angle = Intercepted Arc **Inscribed Angle** = $\frac{\text{measure of arc}}{2}$ 

Inside Angle (intersection two chords) = $\frac{\text{add arcs}}{2}$  **Outside Angle** = $\frac{\text{subtract arcs}}{2}$ 

Circle Segment Formulas:

Intersecting Chords = (seg piece $\cdot$ seg piece) = (seg piece $\cdot$ seg piece) 

Two Secants = (whole secant $\cdot$ part outside circle) = (whole secant $\cdot$ part outside circle) 

Secant – Tangent = (whole secant $\cdot$ part outside circle) = tangent^2 

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

r = radius center = (h, k) point on circle = (x , y)