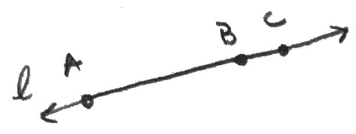
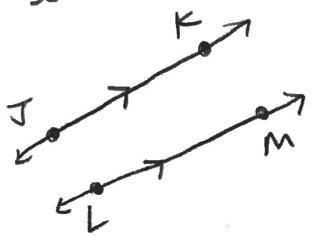
GEOMETRY REVIEW NOTES

LINES, SEGMENTS, RAYS



COLLINEAR POINTS — A, B, C

$\overleftrightarrow{AB}$, $\overleftrightarrow{AC}$, $\overleftrightarrow{BA}$, $\overleftrightarrow{CA}$, $\overleftrightarrow{BC}$, $\overleftrightarrow{CB}$ OR ℓ



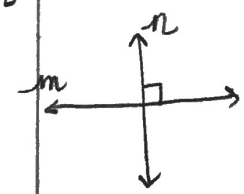
PARALLEL LINES

$\overleftrightarrow{JK} \parallel \overleftrightarrow{LM}$

coplanar lines that never intersect

equal slopes

$m_1 = m_2$



$m \perp n$

PERPENDICULAR LINES

lines that intersect at 90°

opposite reciprocal slope

ex. $\frac{a}{b} \rightarrow -\frac{b}{a}$

⇒ FINDING EQ OF A LINE

① DETERMINE SLOPE IF PARALLEL OR PERPENDICULAR

② PLUG IN GIVEN POINT TO $y = mx + b$, solve for b

③ WRITE FINAL EQ.

$\overline{DE}$ OR $\overline{ED}$

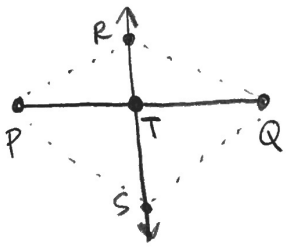
midpoint

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

dividing by g:h

$x = x_1 + \frac{g}{g+h}(x_2 - x_1)$

$y = y_1 + \frac{g}{g+h}(y_2 - y_1)$



PERPENDICULAR BISECTOR

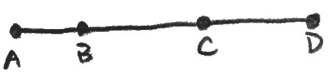
$\overleftrightarrow{RS}$ is the perpendicular bisector of $\overline{PQ}$

* $\overline{PR} \cong \overline{QR}$ and $\overline{PS} \cong \overline{QS}$

ALSO. BISECTOR CUTS $\overline{PQ}$ IN HALF

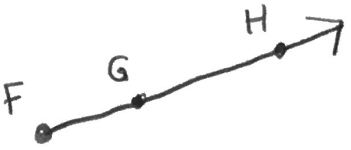
$\overline{PT} \cong \overline{TQ}$

SEGMENT ADDITION



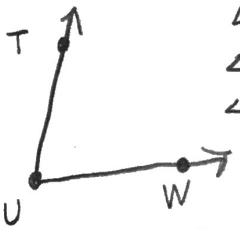
$\overline{AB} + \overline{BC} + \overline{CD} = \overline{AD}$

$\overline{AB} + \overline{BC} = \overline{AC}$



$\overrightarrow{FG}$, $\overrightarrow{FH}$ NOT $\overrightarrow{GH}$ or $\overrightarrow{HG}$ or $\overrightarrow{HF}$

ANGLES



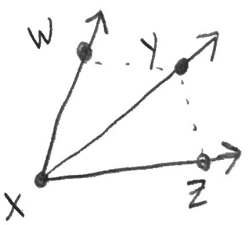
$\angle TUW$

$\angle WUT$

$\angle U$ (only if one angle)

formed by 2 rays, which meet @ the vertex

measured in degrees, using a protractor



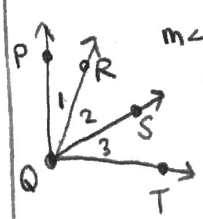
*all points on $\overrightarrow{XY}$ are equal distance from the angle sides

ANGLE BISECTOR

$\overrightarrow{XY}$ bisects $\angle WXZ$

$\angle WXY \cong \angle YXZ$

ANGLE ADDITION



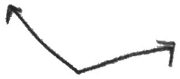
$m\angle PQR + m\angle RQS + m\angle SQT = m\angle PQT$

$\angle 1 + \angle 2 + \angle 3 = \angle PQT$

TYPES OF ANGLES

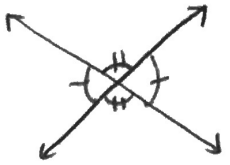
RIGHT (90°)

ACUTE (<90°)

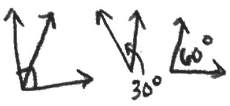


OBTUSE (>90°)

LINE (180°)



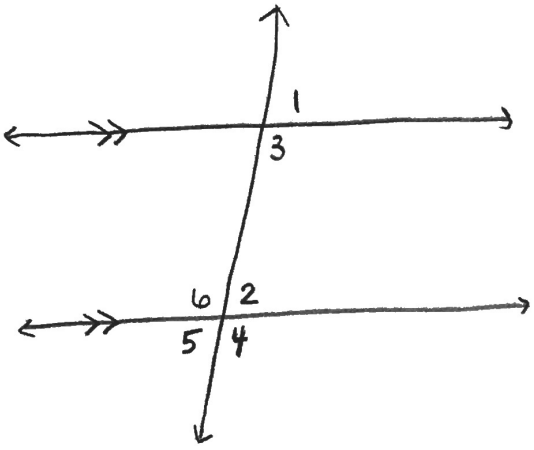
VERTICAL ANGLES
(angles across from each other on intersecting lines, CONGRUENT)



COMPLEMENTARY
(2 or more angles) that add to 90°

SUPPLEMENTARY
(2 or more angles) that add to 180°

LINEAR PAIR
(angles along the same line, add to 180°)



→ CORRESPONDING ANGLES
(same position on both parallel lines)
Ex. $\angle 1 \cong \angle 2$, $\angle 3 \cong \angle 4$

→ ALTERNATE INTERIOR ANGLES
(opposite sides of transversal, inside the parallel lines)
Ex. $\angle 3 \cong \angle 6$

→ ALTERNATE EXTERIOR ANGLES
(opposite sides of transversal, outside the parallel lines)
Ex. $\angle 1 \cong \angle 5$

CONJECTURE – a conclusion made based on inductive reasoning or investigation, usually written as an If..., then....

Ex. IF 2 parallel lines are cut by a transversal, then all corresponding angles, alt. interior angles, and alt. exterior angles are congruent.

CONVERSE – the opposite of a conjecture, formed by switching the phrases with the "If" and the "then"

Ex. If corresponding angles, alt. interior angles, or alt. exterior angles are congruent, then the lines are parallel.

TRANSFORMATIONS

RIGID (NO CHANGE IN SIZE OR SHAPE)

NON-RIGID (CHANGE IN SIZE OR SHAPE)

REFLECTIONS

* Must specify Line of reflection
* All points on original and on image are equal distance from the line of reflection

Reflection Across X-axis

$(x, y) \rightarrow (x, -y)$

Reflection Across Y-axis

$(x, y) \rightarrow (-x, y)$

Reflection Across $y = x$

$(x, y) \rightarrow (y, x)$

Reflection Across $y = -x$

$(x, y) \rightarrow (-y, -x)$

ROTATIONS

* Must specify a center of rotation and degree of rotation

Rotation 180°

$(x, y) \rightarrow (-x, -y)$

Rotation 90° CW

$(x, y) \rightarrow (y, -x)$

Rotation 90° CCW

$(x, y) \rightarrow (-y, x)$

TRANSLATIONS

* Must specify a translation vector

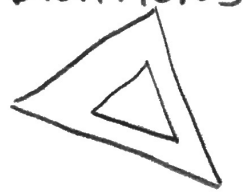
$\langle h, k \rangle$

h: how far it moves in the x-direction

k: how far it moves in the y-direction

$(x, y) \rightarrow (x+h, y+k)$

DILATIONS



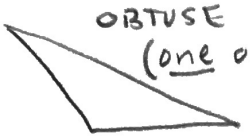
* Must specify a scale factor
* All dilations create similar figures (angles are congruent and sides are proportional by a scale factor)

$(x, y) \rightarrow (ax, ay)$

where $a \sim$ scale factor

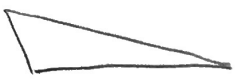
TRIANGLES

ACUTE TRIANGLE
(at least one acute angle)



OBTUSE TRIANGLE
(one obtuse angle)

RIGHT TRIANGLE
(one right angle)

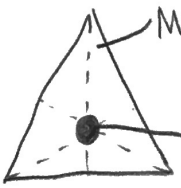


SCALENE
(no sides are congruent)

ISOSCELES
(at least 2 sides congruent)

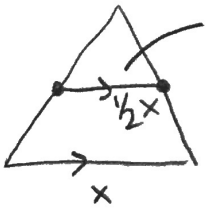
EQUILATERAL
(3 congruent sides)

ALTITUDE
(height of Δ perpendicular to the base)



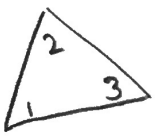
MEDIAN
(bisects angle and connects to the opposite side)

CENTROID
(point where medians intersect)



MIDSEGMENT
(connects midpoints of 2 sides in a Δ, parallel to the third side and half its length)

TRIANGLE SUM

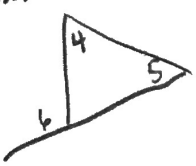


m∠1 + m∠2 + m∠3 = 180°
for all triangles

ISOSCELES Δ CONJECTURE

Base Angles are congruent

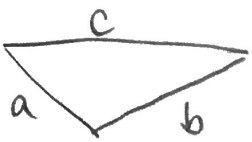
EXTERIOR ANGLE

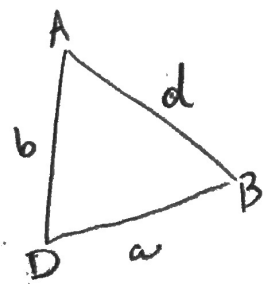


m∠6 = m∠4 + m∠5

TRIANGLE SIDE LENGTHS

a + b > c
b + c > a
a + c > b





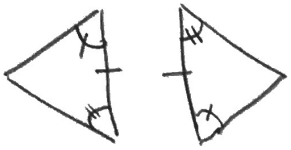
smallest angle across from smallest side

largest angle across from largest side

a > d > b, ∠A > ∠D > ∠B

TRIANGLE CONGRUENCE

ASA



SAS

AAS

SSS

AMBIGUOUS CASE → SSA

POLYGONS

Sum of interior angles $180(n-2)$ (n = number of sides)

measure of interior angle in a REGULAR polygon $\frac{180(n-2)}{n}$

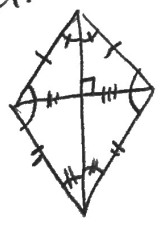
Sum of exterior angles: 360° (equal angles and sides)

measure of one exterior angle in a REGULAR polygon: $\frac{360^\circ}{n}$

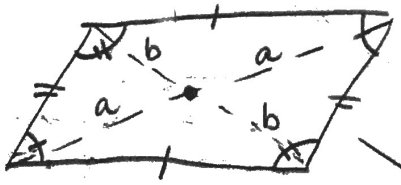
A REGULAR POLYGON HAS:

- n Lines of reflection
- n order of rotation
- $\frac{360}{n}$ degree of rotation

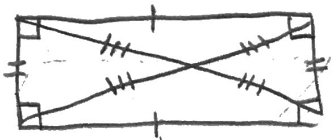
KITE



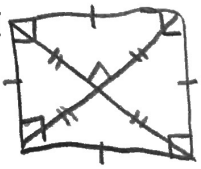
PARALLELOGRAM



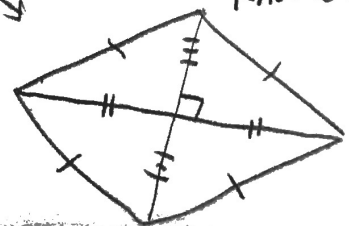
RECTANGLE



SQUARE



RHOMBUS



TRAPEZOID

ISOSCELES TRAPEZOID

diagonals are congruent

Base angles are congruent

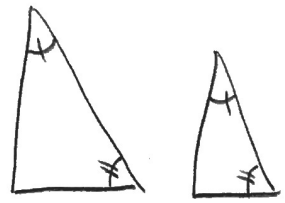
SIMILARITY

2 figures are similar if and only if all corresponding angles and corresponding sides are proportional.

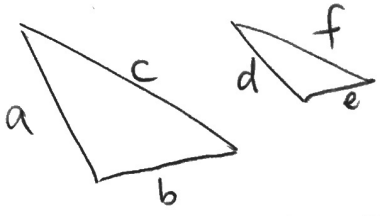
Steps to solve for unknown measures:

1. Look for corresponding angles with given measures
2. Look for one set of corresponding sides that both measures are given
3. Set up a proportion using the given set of sides on one side

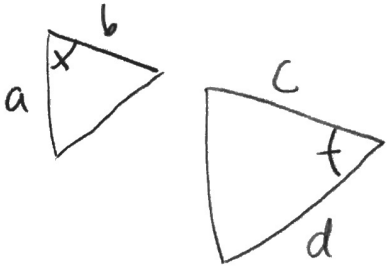
TRIANGLE SIMILARITY



AA Shortcut



SSS $\frac{a}{d} = \frac{b}{e} = \frac{c}{f}$



SAS $\frac{a}{c} = \frac{b}{d}$

Parallel Lines and Proportionality

If $\ell \parallel \overline{AB}$, then $\frac{a}{b} = \frac{c}{d}$