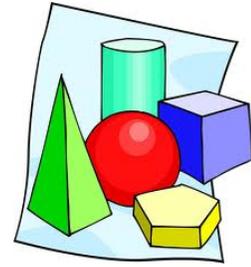




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# Geometry Midterm Review



\*\*Look at Study Guide and old tests

## The Midterm covers:

- Chapter 1
- Chapter 2
- Chapter 3
- Chapter 4
- Chapter 5
- Parts of Chapter 6

## CHAPTER 1

### 1.1

point: -has no dimension  
-represented by a dot

line: -has no start or finish  
-through only 2 points, there is exactly one line

plane: -has 2 dimensions  
-through only 3 non-collinear points, there is exactly one plane

collinear points: points on same line

coplanar points: - points on same plane

line segment: -have two end points

ray: - has one end point  
-goes on in one direction

opposite rays: -collinear rays that share 1 endpoint

- Planes intersect  $\rightarrow$  lines
- Lines intersect  $\rightarrow$  point
- Planes & lines intersect  $\rightarrow$  point  
\*but intersection of a line and plane that lies directly on the plane  $\rightarrow$  All points on line

## 1.2

### Postulate 1- RULER POSTULATE

The distance between points A and B is the absolute value of the difference of the coordinates of A and B. (You can measure any line segment)

### Postulate 2- SEGMENT ADDITION POSTULATE

If B is between A and C, then  $AB + BC = AC$

If  $AB + BC = AC$ , then B is between A and C.

Congruent Segments: Line segments that have the same length

## 1.3

Midpoint: point that divides a segment into 2 congruent segments.

Segment Bisector: point, line segment, plane, that intersects a segment at its midpoint.

## 1.4

Angle: two rays that share an end point

### Postulate 3- PROTRACTOR POSTULATE

\*any angle can be measured by a protractor

### Postulate 4- ANGLE ADDITION POSTULATE

If P is in the interior of  $\angle RST$ ,  $m\angle RST = m\angle RSP + m\angle PST$

Congruent angles: angles with the same measurement.

Angle Bisector: ray that divides 1 angle into two congruent angles.

## 1.5

Complementary Angles: 2 angles sum = 90 degrees

Supplementary Angles: 2 angles sum = 180 degrees

Adjacent Angles: 2 angles that share a common vertex and side.

Linear Pair: non-common sides are opposite rays.

- Linear pair made up of supplementary angles and adjacent,

Vertical Angles: sides form two pairs of opposite rays.

## 1.6

P= Add up all sides

Area:

Rectangle: L x W  
              B x H

Square: L x W  
          S x S

Triangle:  $\frac{1}{2} bh$

Circle: C=  $\pi d$   
          =  $\pi r$

Area =  $\pi r \times r$

## 1.7

Polygons:

-closed plane figure

-3 or more segments

concave: forms a cave. You can draw a line and form lines on inside.

Convex: not concave

Equilateral: All sides are equal

Regular:

-Equilateral

\_Equiangular

-Convex

# Sides	Name
3	Triangle
4	Quadrilateral
5	Pentagon
6	Hexagon
7	Septagon/ Hectagon
8	Octagon
9	Nonagon
10	Decagon
12	Dodecagon
n	n-gon



- An angle is a right angle if and only if it's  $90^\circ$ .
  1. If an angle is right, then it's  $90^\circ$
  2. If an angles measure is  $90^\circ$ , then it's a right angle.
  3. True because both statements= true

Deductive Reasoning: facts, definitions, theorems, postulates, LOGIC (Law of Detachment & Law of Syllogism)

**Law of Detachment**

If  $p \rightarrow q$  is a true conditional statement and  $p$  is true, then  $q$  is true.

**Law of Syllogism**

If  $p \rightarrow q$  and  $q \rightarrow r$  are true conditional statements, then  $p \rightarrow r$  is true.

Properties of Algebra:

- **Addition**: (+) if  $a=b$ , then  $a+c=b+c$
- **Subtraction** (-) if  $a=b$ , then  $a-c=b-c$   
If  $x+4=y+4$ , then  $x=y$
- **Substitution**: if  $x=4$  and  $y=x+5$ , then  $x=9$
- **Multiplication**: If  $a=b$ , then  $ac=bc$
- **Reflexive**:  $a=a$
- **Symmetric**: if  $a=b$ , then  $b=a$
- **Transitive**: if  $a=b$  and  $b=c$ , then  $a=c$
- **Distributive**:  $a(b+c)=ab+ac$
- **Division**: if  $a=b$  and  $c \neq 0$ . then  $\frac{a}{c} = \frac{b}{c}$

Chapter 2 Theorems:

- **Propeties of Angle Congruence**- Angle congruence is reflexive, symmetric, and transitive.
- **Right angle congruence theorem**- All right angles are congruent
- **Congruent supplements theorem**- If two angles are supplementary to the same angle (or congruent angles) then the two angles are congruent.
- **Congruent compliments theorem**- If two angles are complementary to the same angle (or congruent angles) then the two angles are congruent
- **Linear pair postulate**- if two angles form a linear pair, then they are supplementary.
- **Vertical Angles theorem**- vertical angles are congruent.

**CHAPTER 3**

**3.1**

Parallel: two lines that do not intersect and are coplanar.

Perpendicular: two lines that intersect to form a right angle

Skew: lines that don not intersect and are not coplanar.

### 3.2

#### Angles:

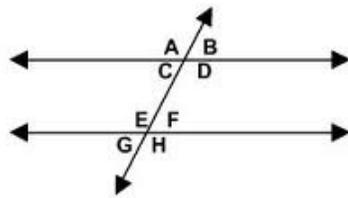
corresponding: two angles that are formed by two lines and a transversal and occupy corresponding positions.

alternate interior: two angles that are formed by two lines and a transversal and lie between the two lines and on opposite sides of the transversal.

alternate exterior: two angles that are formed by two lines and a transversal and lie outside the two lines and on opposite sides of the transversal.

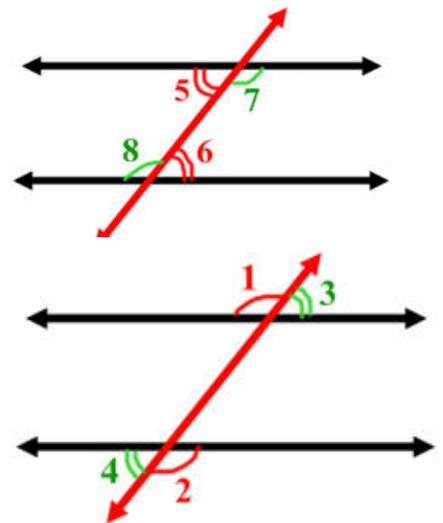
same side interior (consecutive interior): two angles that are formed by two lines and a transversal and lie between the two lines and on the same side of the transversal.

|| → corr ∠ ≅  
 || → AI ∠ ≅  
 || → AE ∠ ≅  
 || → SSI ∠ supp



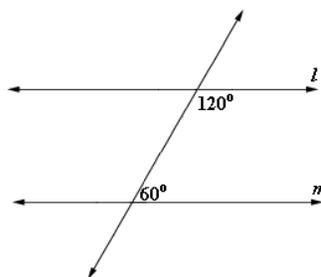
These pairs of angles are corresponding angles:

- ∠A and ∠E
- ∠C and ∠G
- ∠B and ∠F
- ∠D and ∠H



### 3.3

corr ∠ ≅ → ||  
 AI ∠ ≅ → ||  
 AE ∠ ≅ → ||  
 SSI ∠ supp → ||



### 3.4

#### finding slope

$$m = \frac{\text{rise}}{\text{run}}$$

Run

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

$x_2 - x_1$

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

### 3.5

slope intercept form: a linear equation written in the form  $y = mx + b$  where  $m$  is the slope and  $b$  is the y-intercept of the equation's graph.

standard form: a linear equation written in the form  $Ax + By = C$ , where  $A, B,$  and  $C$  are real numbers and  $A$  and  $B$  are not both zero.

### parallel & perpendicular slope relationships

*Slopes of Parallel Lines:* In a coordinate plane, two nonvertical lines are parallel if and only if they have the same slope. Any two vertical lines are parallel.

*Slopes of Perpendicular Lines:* In a coordinate plane, two nonvertical lines are perpendicular if and only if the product of their slopes is -1. Horizontal lines are perpendicular to vertical lines.

## **3.6**

### parallel and perpendicular rules/theorems:

**Theorem 3.8:** If two lines intersect to form a linear pair of congruent angles, then the lines are perpendicular.

**Theorem 3.9:** If two lines are perpendicular, then they intersect to form four right angles.

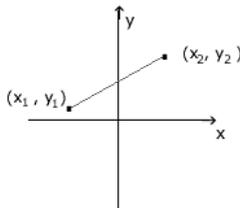
**Theorem 3.10:** If two sides of two adjacent acute angles are perpendicular, then the angles are complementary.

**Theorem 3.11 Perpendicular Transversal Theorem:** If a transversal is perpendicular to one of two lines, then it is perpendicular to the other.

**Theorem 3.12 Lines Perpendicular to a Transversal Theorem:** In a plane, if two lines are perpendicular to the same line, then they are parallel to each other.

*Find distance from point A to point C*

1. Slope
2. Perpendicular slope
3. Intersecting point
  - Start at point A
  - Use perpendicular slope until intersect line
4. Distance formula  $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

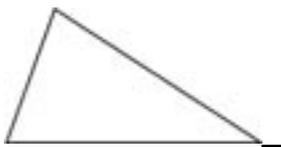


- Two lines are **parallel lines** if they do not intersect and are coplanar.
- Two lines are **skew lines** if they do not intersect and are not coplanar.
- Two planes that do not intersect are **parallel planes**.
- A **transversal** is a line that intersects two or more coplanar lines at different points.
- When two lines are cut by a transversal, two angles are **corresponding angles** if they have corresponding positions.
- When two lines are cut by a transversal, two angles are **alternate interior angles** if they lie between the two lines and on opposite sides of the transversal.
- When two lines are cut by a transversal, two angles are **alternate exterior angles** if they lie outside the two lines and on opposite sides of the transversal.
- When two lines are cut by a transversal, two angles are **consecutive interior angles** if they lie between the two lines and on the same side of the transversal.
- **Parallel Postulate** : If there is a line and a point not on the line, then there is exactly one line through the point parallel to the given line. “//”
- **Perpendicular Postulate**: If there is a line and a point not on the line, then there is exactly one line through the point perpendicular to the given line.

## **CHAPTER 4**

### Classify triangles

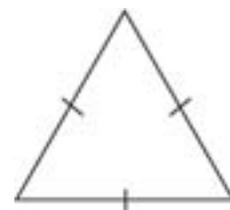
#### **Sides:**



*Scalene*  
-no equal sides

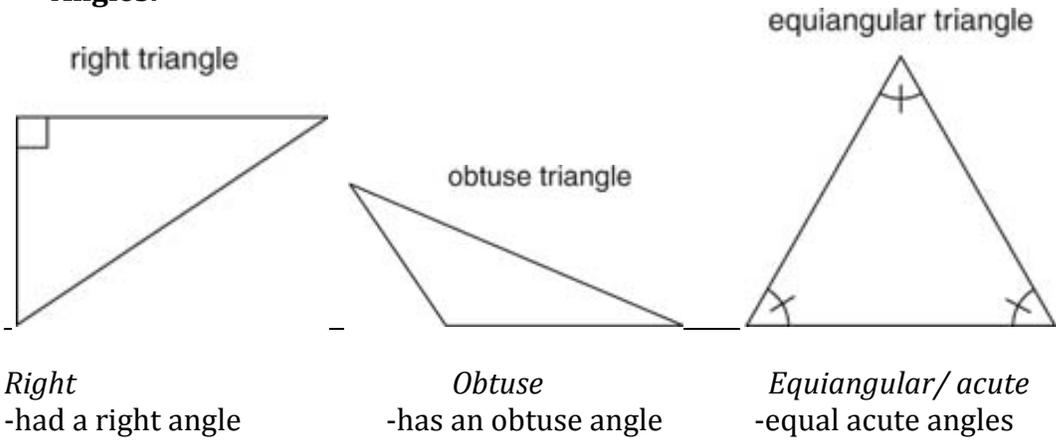


*isosceles*  
-2 sides have same length



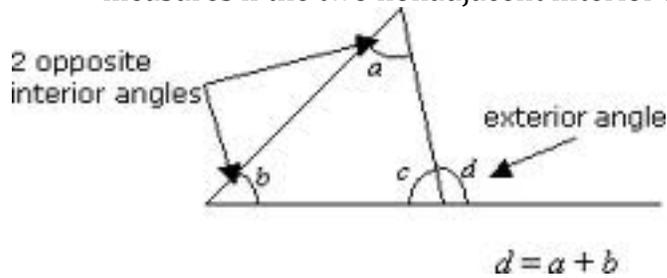
*equilateral*  
-All sides have same length

**Angles:**



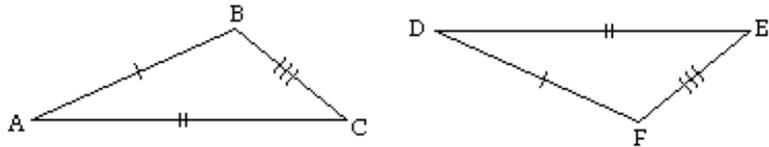
**Exterior Angle Theorem (EAT)**

- The measure of an exterior angle of a triangle is equal to the sum of the measures of the two nonadjacent interior angles.

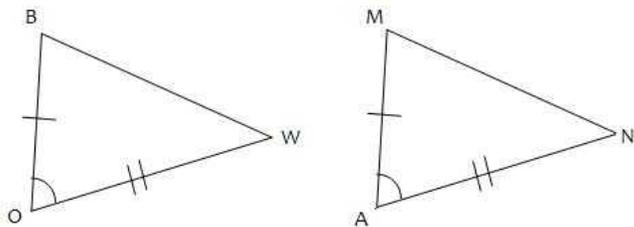


- When two geometric figures are **congruent**, there is a correspondence between their angles and sides such that **corresponding angles** are congruent and **corresponding sides** are congruent.
- No Choice Theorem:** If two angles of one triangle are congruent to two angles of another triangle, then the third angles are also congruent.

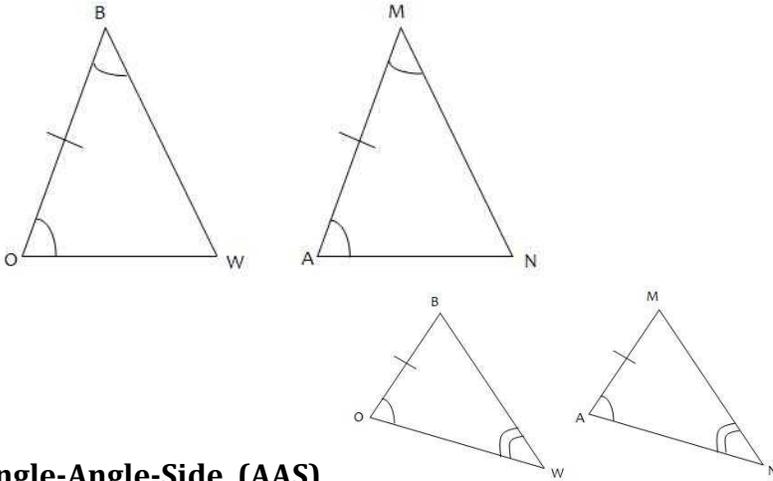
**Side-Side-Side (SSS)**



**Side-Angle-Side (SAS)**

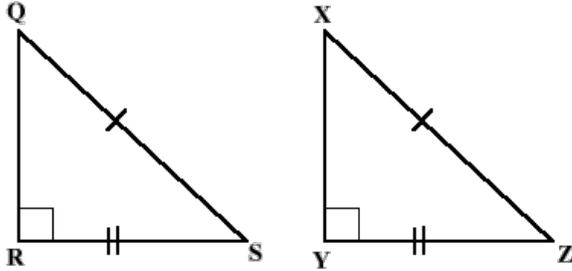


### Angle-Side-Angle (ASA)



### Angle-Angle-Side (AAS)

### Hypotenuse Leg (HL)

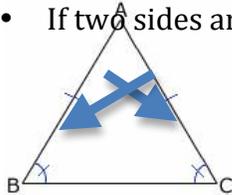


### CPCTC (Corresponding Parts of Congruent Triangles are Congruent)

#### BAT

Base Angles Theorem:

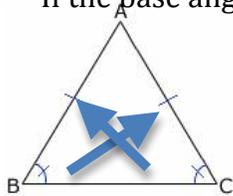
- If two sides are congruent then 2 base angles are congruent.

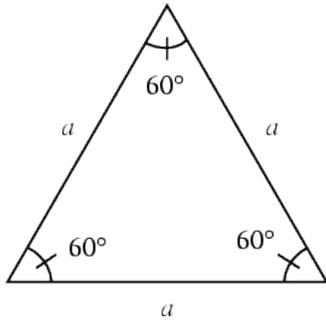


#### CBAT

Converse of Base Angles Theorem:

- If the base angles are congruent then the 2 sides are congruent.





Equiangular → Equilateral  
 Equilateral → Equiangular

## Coordinate Plane Proofs

### CHAPTER 5

- **Midsegment of a triangle:** is a segment that connects the midpoints of two sides of a triangle.
- **Midsegment Theorem:** The segment connecting the midpoints of two sides of a triangle is parallel to the third side and is half as long.
- **Perpendicular bisector:** A segment, ray, line, or plane that is perpendicular to a segment at its midpoint.
- **Perpendicular Bisector Theorem (PBT):** In a plane, if a point is on the perpendicular bisector of a segment, then it is equidistant from the endpoints of the segment.
- **Converse of the Perpendicular Bisector Theorem:** In a plane, if a point is equidistant from the endpoints of the segment.
- When three or more lines, rays, or segments intersect in the same point, they are called **concurrent** lines, rays, or segments. The point of intersection of the lines, rays, or segments is called the **point of concurrency**.
- **Concurrency of Perpendicular Bisectors of a Triangle:** The perpendicular bisectors of a triangle intersect at a point that is equidistant from the vertices of the triangle.
- The point of concurrency of the three perpendicular bisectors of a triangle is called the **circumcenter** of the triangle.
- The point of concurrency of the three angle bisectors of a triangle is called the **incenter** of the triangle.
- **Angle Bisector Theorem (ABT):** If a point is on the bisector of an angle, then it is equidistant from the two sides of the triangle.

- **Converse of the Angle Bisector Theorem:** If a point is in the interior of an angle and is equidistant from the sides of the angle, then it lies on the bisector of the angle.
- **Concurrency of Angle Bisectors of a Triangle:** The angle bisectors of a triangle intersect at a point that is equidistant from the sides of the triangle. (incenter)
- **Median of a Triangle:** is a segment whose endpoints are a vertex of the triangle and the midpoint of the opposite side.
- **Centroid of the Triangle;** the point of concurrency of the three medians of a triangle.
- **Altitude of a triangle:** is the perpendicular segment from a vertex to the opposite side or the line that contains the opposite side,
- **Orthocenter of the triangle:** the lines containing the three altitudes are concurrent and intersect at a point.
- **Concurrency of Medians of a Triangle:** the medians of a triangle are concurrent at a point that is two thirds of the distance from the vertex to the midpoint of the opposite side.
- **Concurrency of Altitudes of a Triangle:** the lines containing the altitudes of a triangle are concurrent.
- **Hinge Theorem:** If two sides of one triangle are congruent to two sides of another triangle, and the included angle of the first is larger than the included angle of the second, then the third side of the first is larger than the third side of the second.
- **Converse of Hinge Theorem:** If two sides of one triangle of one triangle are congruent to two sides of another triangle, and the third side of the second, then the included angle of the first is larger than the included angle of the second.

## **CHAPTER 6**

- If a and b are two numbers or quantities and  $b \neq 0$ , then the **ratio** of a and b is  $\frac{a}{b}$
- An equation that states that two ratios are equal, such as  $\frac{a}{b} = \frac{c}{d}$

is called a **Proportion**.

- **Geometric mean**

- **Scale:** is the ratio that describes how the dimensions in the drawing are related to the actual dimensions of the object.
- **Similar Polygons:**
  - All angles are congruent
  - All sides are proportional