**Midyear Exam broken down by Chapters**

**Chapter 1:**

***Section 1: Patterns and Inductive Reasoning***

* Patterns
* Counterexample
	+ An example for which the conjecture is incorrect

***Section 2- SKIPPED***

***Section 3: Points lines, and Planes***

* Point
	+ A location. It has no size and is represented by a small dot.
	+ Named using a capital letter
* Space
	+ Set of all points
* Line
	+ A series of points that extends in two opposite directions without end.
	+ Through any two points there is exactly one line.
	+ If two lines intersect, they intersect in exactly one point
* Collinear points
	+ Points that lie on the same line
* Plane
	+ A flat surface that has no thickness. It contains many lines and extends without end in the direction of all of its lines.
	+ Named by one capital letter or three noncollinear points
* Coplanar
	+ Points and lines that lie on the same plane
	+ If two planes intersect then they intersect in exactly one line

***Section 4: Segments, Rays, Parallel Lines and Planes***

* Segment
	+ A part of a line consisting of two endpoints and all the points between them.
	+ Named using the two endpoints with a line overtop.
* Ray
	+ A part of a line consisting of one endpoint and all the points of the line on one side of the endpoint
	+ Named using an endpoint and a point going in the “line” direction
		- 🡪arrow always points to the right
* Opposite rays
	+ Two collinear rays with the same endpoint. They will always form a line
* Parallel lines
	+ Are coplanar lines that do not intersect
* Skew lines
	+ Noncoplanar lines; therefore they are not parallel and do not intersect
* Parallel planes
	+ Planes that do not intersect. A line and a plane that do not intersect can also be considered parallel.

***Section 5: Measuring Segments***

* Segment Addition Postulate
	+ If three points A, B, and C are collinear, and B is between A and C then AB+BC=AC
* Midpoint
	+ A point that divides a segment into two congruent segments

***Section 6: Measuring Angles***

* Angle
	+ Formed by two rays with the same endpoint
	+ The rays are the sides of the angle and the endpoint is the vertex of the angle
	+ Be able to use a protractor
	+ Classify according to measures
		- Acute: 0<x<90
		- Right: x=90
		- Obtuse: 90<x<180
		- Straight: x=180
* Angle addition postulate
	+ If point B is in the interior of <AOC, then m<AOB+ m<BOC=m<AOC
* Vertical Angles
	+ Two angles whose sides are opposite rays
* Adjacent Angles
	+ Two coplanar angles with a common side, common vertex, and no common interior points
* Complementary Angles
	+ Two angles whose measures have sum of 90.
	+ Each angle is called the *complement* of the other.
* Supplementary angles
	+ Two angles whose measures have sum of 180.
	+ Each angle is called the supplement of the other.

***Section 7: Basic Constructions***

* Perpendicular lines
	+ Two lines that intersect to form right angles
* Perpendicular bisector
	+ A line, segment or ray that is perpendicular to the segment at its midpoint, thereby bisecting the segment into two congruent segments.
* Angle bisector
	+ A ray that divides an angle into two congruent coplanar angles.

***Section 8: The Coordinate Plane***

* Distance Formula
	+ $d=\sqrt{(x\_{2}-x\_{1})^{2}+(y\_{2}-y\_{1})^{2}}$
* Midpoint Formula
	+ $M(\frac{x\_{1}+x\_{2}}{2},\frac{y\_{1}+y\_{2}}{2})$

***Section 9: Perimeter, Circumference, and Area***

* Square
	+ Perimeter= 4s
	+ Area=$s^{2}$
* Rectangle
	+ Perimeter=2b+2h
	+ Area=bh
* Circle
	+ Circumference=πd or 2πr
	+ Area=$πr^{2}$

**Chapter 2:**

***Section 1: Conditional Statements***

* Conditional
	+ If/then statement
	+ Contains two parts
		- Hypothesis- the part following the if
		- Conclusion-the part following the then
* Truth value- a conditional can have a truth value of either true or false
	+ True- show that every time the hypothesis is true, the conclusion is also true.
	+ False- find a counterexample for which the hypothesis is true and the conclusion is false
* Converse
	+ Switches the hypothesis and conclusion

***Section 2: Biconditionals and Definitions***

* Biconditional
	+ When a conditional and converse are true, you can combine them as a true biconditional.
	+ Can be written as the conditional or as the converse replacing then with if and only if (iff)

***Section 4: Inverses, Contrapositives and Indirect Reasoning (Ch.5)***

* Negation
	+ has the opposite truth value
* Inverse
	+ Negation of the conditional- negates both the hypothesis and the conclusion
* Contrapositive
	+ Negation of the converse/flip the hypothesis and conclusion & negate both

***Section 3: SKIPPED***

***Section 4: Reasoning in Algebra***

* *Justifying Steps*
	+ Addition Property of Equality
		- If $a=b$ then $a+c=b+c$
	+ Subtraction Property of Equality
		- If $a=b$ then $a-c=b-c$
	+ Multiplication Property of Equality
		- If $a=b$ then $ac=bc$
	+ Division Property of Equality
		- If $a=b$ and $c\ne 0 $then $\frac{a}{c}=\frac{b}{c}$
	+ Reflexive Property of Equality/Congruence
		- $a=a$
		- $a≅a$
	+ Symmetric Property of Equality/Congruence
		- If $a=b $then $b=a$
		- $a≅b $then $b≅a$
	+ Transitive Property of Equality/Congruence
		- If $a=b and b=c$ then $a=c$
		- $a≅b and b≅c$ then $a≅c$
	+ Substitution
		- If $a=b, $then b can replace a in any expression
	+ Distributive Property
		- $a\left(b+c\right)=ab+ac$

***Section 5: Proving Angles Congruent***

* Vertical Angles Congruent
* All right angles are congruent

**Chapter 3:**

***Section 1: Properties of Parallel Lines***

* Transversal
	+ A line that intersects two coplanar lines at two distinct points
* Corresponding Angles- If a transversal intersects two parallel lines, then corresponding angles are congruent.
* Alternate Interior Angles-If a transversal intersects two parallel lines then alternate interior angles are congruent.
* Alternate Exterior- If a transversal intersects two parallel lines then alternate exterior angles are congruent.
* Same Side Interior- If a transversal intersects two parallel lines then same side interior angles are supplementary.
* Same Side Exterior- If a transversal intersects two parallel lines then same side exterior angles are supplementary.

***Section 2: Proving Lines Parallel***

* Corresponding, Alternate Interior/Exterior are congruent
* Same Side interior/exterior are supplementary

***Section 3: Parallel and Perpendicular Lines***

* If two lines are parallel to the same line then they are parallel to each other.
* In a plane, if two lines are perpendicular to the same line then they are parallel to each other
* In a plane, if a line is perpendicular to one of the two parallel lines, then it is also perpendicular to the other.
* \*\*\*\*Know the 7 ways to prove two lines are parallel
	+ Alternate Interior, Alternate Exterior, and Corresponding Angles Congruent
	+ Same Side Interior and Same Side Exterior Angles Supplementary
	+ Parallel to same line therefore parallel to each other
	+ Perpendicular to same line therefore parallel to each other

***Section 4: Parallel Lines and the Triangle Angle Sum Theorem***

* Triangle Angle-Sum Theorem
	+ The sum of the measures of the angles of a triangle is 180.
* Classify By Angle
	+ Equiangular- all angles congruent
	+ Acute- all angles acute
	+ Right- one right angle and the other two are acute
	+ Obtuse- one obtuse angle and the other two are acute
* Classify by Side
	+ Equilateral- All sides congruent
	+ Isosceles- At least two sides congruent
	+ Scalene- No sides congruent
* Exterior angle of a polygon
	+ An angle that is formed by a side and an extension of an adjacent side.
* Remote interior
	+ The two nonadjacent interior angles
* Triangle Exterior Angle Theorem
	+ The measure of each exterior angle of a triangle equals the sum of the measures of its two remote interior angles.

***Section 5: The Polygon Angle Sum Theorem***

* Polygon
	+ A closed plane figure with at least three sides that are segments
* Naming Polygons by sides
	+ Triangle(3), Quadrilateral(4), Pentagon(5), Hexagon(6), Heptagon/Septagon (7), Octagon(8), Nonagon(9), Decagon(10), Dodecagon(12), n-gon(11/n)
* Convex vs. Concave
	+ Convex- has no diagonal with points outside the polygon
	+ Concave- has at least one diagonal with points outside the polygon
* Polygon interior sum theorem
	+ The sum of the measure of the angles of an n-gon is (n-2)180
* Polygon exterior angle sum theorem
	+ The sum of the measures of the exterior angles of a polygon, one at each vertex is 360.
* Equilateral Polygon
	+ A polygon with all sides congruent
* Equiangular Polygon
	+ A polygon with all angles congruent
* Regular Polygon
	+ A polygon with all sides and all angles congruent.

***Section 6: Lines in the Coordinate Plane***

* Graphing lines in standard or slope intercept form
	+ Standard Form Ax+By=C
		- Re-arrange equation and put into slope intercept form
		- Use cover-up method- graphing intercepts
	+ Slope-intercept
		- Graph the intercept and then use slope to find other points
* Writing Equations
	+ given slope and intercept-plug values into m and b
	+ Given slope and a point- plug in slope and point and solve for b, then rewrite the equation
	+ Given two points- find slope then plug in slope and one of the points to solve for b then rewrite the equation
	+ Given a line parallel and a point- slope for parallel lines will be the same then solve the same way if given the slope and a point.
	+ Given a line perpendicular and a point- slope for perpendicular lines will be opposite reciprocal then solve the same way if given slope and a point

***Section 7: Slopes and Parallel and Perpendicular Lines***

* Parallel lines=same slopes
* Perpendicular lines=opposite sign/reciprocal slopes

***Section 8: SKIPPED***

**Chapter 4:**

***Section 1: Congruent Figures***

* Congruent Polygons have congruent corresponding parts-their matching sides and angles
* If two angles of one triangle are congruent to two angles of another triangle then the third angles are congruent

***Section 2 and 3: Triangles Congruence***

* \*\*\*\*Know the 5 ways to prove two triangles congruent:
	+ Side-Side-Side (SSS)- All three sides of one triangle are congruent to all three sides of another triangle
	+ Side-Angle-Side (SAS) - Two sides and the included angle of one triangle are congruent to two sides and the included angle of another triangle (remember the angle has to be “sandwiched” between the two sides/the sides have to make up the angle)
	+ Angle-Side-Angle (ASA)- Two angles and the included side of one triangle are congruent to two angles and the included angle of another triangle (remember the side has to be “sandwiched” between the two angles/ the angles have to be on either side of the side
	+ Angle-Angle-Side (AAS)- Two angles and the non-included side of one triangle are congruent to two angles and the non-included side of another triangle (Side cannot be between the two angles)
	+ Hypotenuse-Leg (HL)- Two right triangles-remember you cannot simply have right angles but more specifically right triangles, congruent hypotenuses, one set of congruent legs
* Proofs using the 5 ways

***Section 4: Using Congruent Triangles***

* \*\*\*\*Know: CPCTC- Corresponding Parts of Congruent Figures Congruent
* CPCTC is used when you are trying to prove that two sides/two angles of congruent triangles are congruent

***Section 5: Isosceles and Equilateral Triangles***

* Isosceles Triangles
	+ Parts of isosceles triangle
		- Legs-the congruent sides of the isosceles triangle
		- Base- the third side of an isosceles triangle
		- Vertex angle- the two congruent sides form this angle
		- Base angles- the other two angles
	+ If two sides of a triangle are congruent then the angles opposite those sides are congruent
	+ If two angles of a triangle are congruent, then the sides opposite the angles are congruent.
* Equilateral Triangles
	+ If a triangle is equilateral then the triangle is equiangular
	+ If a triangle is equiangular then the triangle is equilateral

***Section 6: Congruence in Right Triangle***

* Parts of Right Triangle
	+ Hypotenuse- the longest side of a right triangle.
	+ Legs- the other two sides of a right triangle.

***Section 7: SKIPPED***

**Chapter 5:**

***Section 1: Midsegments of a Triangle***

* Midsegment
	+ A segment connecting the midpoints of two sides of a triangle.
	+ A midsegment is both parallel and half of the third side

***Section 2: Bisectors of Triangle***

* Perpendicular Bisector
	+ A line, segment, or ray that is perpendicular to the segment at its midpoint.
	+ Perpendicular Bisector Theorem**-**If a point is on a perpendicular bisector of a segment, then it is equidistant from the endpoints of the segment.
	+ Converse of the Perpendicular Bisector Theorem- If a point is equidistant from the endpoints of a segment, then it is on the perpendicular bisector of the segment.
* Angle Bisector
	+ A ray that divides an angle into two congruent angles.
	+ Angle Bisector Theorem- If a point is on the bisector of an angle then the point is equidistant from the sides of the angle.
	+ Converse of the Angle Bisector Theorem- If a point in the interior of an angle is equidistant from the sides of the angle then the point is on the angle bisector.

***Section 3: Concurrent Lines, Medians, and Altitudes***

* Point of concurrency
	+ where three or more lines intersect
	+ Perpendicular bisectors=Circumcenter.
	+ Angle bisectors=Incenter
	+ Medians=centroid
	+ Altitudes=orthocenter
* Concurrent
	+ when three or more lines intersect in one point.
* Medians- 2/3 or 1/3 problems

***Section 4: SEE ABOVE-CHAPTER 2***

***Section 5: Inequalities in Triangles***

* Smallest Angles opposite smallest side🡪biggest angles opposite biggest sides
* Triangle Inequality Theorem- The sum of the lengths of any two sides of a triangle is greater than the length of the third side
	+ Determine if the three sides can make a triangle
	+ Determine the possible third side if given two triangles (answer must be written as a compound inequality)