

Geometry Final Study Guide

You will need to know

- 1) The different types of angles, eg. acute, obtuse, etc.
 - 2) The different types of triangles, eg. acute, right, scalene, etc.
 - 3) What a polygon and a regular polygon are, how to name them, the sums of their internal and external angles, and the measure of an internal angle of a regular polygon.
 - 4) The different types of segments associated with a triangle, eg. median, altitude etc.
 - 5) The different types of quadrilaterals, their definitions and properties.
 - 6) What a definition is, and the definitions on your definition sheet
 - 7) What a postulate is, and the postulates on your postulate sheet
 - 8) How to write a proof
 - 9) What the converse, inverse, and contra positive of a statement is
- 10) The postulates and theorems listed below. You do not need to know their numbers
- 1-1 If two angles are complements of equal angles then the two angles are equal
 - 1-2 If two angles are supplements of equal angles then the two angles are equal
 - 1-3 Vertical angles are equal
 - 2-1 If two parallel lines are cut by a transversal, then corresponding angles are equal
 - 2-2 If two parallel lines are cut by a transversal, then alternate interior angles are equal
 - 2-3 If two parallel lines are cut by a transversal, then same side interior angles are supplementary
 - 2-4 If a transversal is perpendicular to one of two parallel lines, it is perpendicular to the other
- The converse of theorems 2-1 through 2-4
- 2-10 The sum of the angles in a triangle is 180°
If two angles of one triangle are equal to two angles of another triangle, then the third angles are equal
 - 2-11 The exterior angle of a triangle is equal to the sum of the two remote interior angles
 - 2-12 The sum of the angles of a convex polygon with n sides is $(n-2)180^\circ$
 - 2-13 The sum of the exterior angles of a convex polygon, one angle at each vertex is 360°
- SSS, SAS, ASA, AAS, HL
- 3-2,3-3 The Isosceles triangle theorem and its converse
 - 3-7 A point on the perpendicular bisector of a segment is equidistant from the endpoints of the segment
 - 3-8 The converse of 3-7
 - 4-1 The opposite sides of a parallelogram are equal
 - 4-2 The opposite angles of a parallelogram are equal
- The Pythagorean theorem

Geometry Definitions

Definitions:

Note: Points, Lines, and Planes have no definitions, but we understand them from context.

1. Collinear points: points all on the same line
2. Line segment: Two points on a line and all the points between them
3. Midpoint: The point on a line segment, equidistant from each endpoint
4. Bisector or segment bisector: A line that intersects the midpoint of a segment
5. Ray: A point on a line, and all the points on one side of it
6. Vertex: A point where lines, line segments, or rays meet.
7. Angle: Two rays with the same vertex.
8. Angle bisector. A ray that divides an angle into two equal parts.
9. Adjacent angles: Two angles that share a vertex and a side, but no interior points
10. Vertical angles: Two angles, opposite each other, formed by the intersection of two lines.
11. Right Angle: angle with measure 90°
12. Perpendicular: two intersecting lines whose angles are all 90°
13. Perpendicular bisector: A segment bisector that is perpendicular to its line segment
14. Acute Angle: angle with measure less than 90°
15. Obtuse Angle: angle with measure more than 90°
16. Straight angle: angle with measure 180°
17. Complementary angles: two angles whose measure adds up to 90°
18. Supplementary angles: two angles whose measure adds up to 180°
19. Parallel lines: Two lines on the same plane that have no intersection
20. A transversal: A line that intersects two other lines
21. Skew lines: Lines not in the same plane that have no intersection
22. Alternate interior angles: two nonadjacent interior angles on opposite sides of a transversal
23. Same-side interior angles: two interior angles on the same side of a transversal
24. Corresponding angles: Two angles in corresponding positions on the same side of a transversal.
25. Triangle: A polygon formed with three line segments that have three vertices.
26. Isosceles triangle: A triangle with two sides equal
27. Equilateral triangle: A triangle with all three sides equal
28. Quadrilateral: A four sided polygon
29. Rectangle: A quadrilateral with four right angles
30. Rhombus: A quadrilateral with four equal sides
31. Parallelogram: A quadrilateral with 2 sets of opposite sides parallel.
32. Trapezoid: A quadrilateral with exactly 1 set of opposite sides parallel
33. Square: A quadrilateral with four equal sides and four right angles
34. Kite: A quadrilateral with two sets of equal adjacent sides

Geometry Postulates

1. A line contains at least two points; a plane contains at least three points, not in a line.
2. Through any two points there is exactly one line.
- 3a. Through any three points there is at least one plane.
- 3b. Through any three non-collinear points there is exactly one plane.
4. If two points are in a plane, then the line joining the points is in that plane.
5. If two planes intersect, their intersection is a line.
6. (Ruler Postulate) The points on a line can be paired with the real numbers so that
 - a. any two points can have coordinates 0 and 1
 - b. the distance between any two points is the absolute value of the difference of their coordinates.
7. A line has 180 degrees. A circle has 360 degrees.
8. If two parallel lines are crossed by a transversal, their corresponding angles are equal.
9. If two lines are crossed by a transversal, and their corresponding angles are equal, then the lines are parallel.
10. If three sides of one triangle are equal to three sides of a 2nd triangle, then the triangles are congruent. (SSS).
11. If two sides and the included angle of a triangle are equal to two sides and the included angle of a 2nd triangle, then the triangles are congruent. (SAS)
12. If two angles and the included side of a triangle are equal to two angles and the included side of a 2nd triangle, then the triangles are congruent (ASA)
13. If two angles of one triangle are equal to two angles of another triangle, then the triangles are similar.
14. The area of a square is the square of the length of a side.
15. If two figures are congruent, then they have the same area.
16. The area of a polygonal region is the sum of the areas of its non-overlapping parts.

Algebra Postulates and Theorems

1. If $a=b$ then $a+c = b+c$. (addition Postulate)
2. If $a=b$ then $a-c = b-c$ (subtraction Postulate)
3. If $a=b$, then $ca=cb$ (multiplication postulate)
4. If $a=b$ and $c \neq 0$, then $\frac{a}{c} = \frac{b}{c}$ (division postulate)
5. $a=a$ (reflexive property)
6. If $a=b$ then $b=a$ (symmetric property)
7. If $a=b$ and $b=c$ then $a=c$ (transitive property)
8. If $a=b$, then b may be substituted for a in any equation

Other Useful Postulates

1. If three points are on a line, the sum of the lengths of the smaller segments is equal to the length of the larger segment. (segment addition)
2. If an angle is cut by a ray, the sum of the measure of the two angles formed is equal to the measure of the original angle. (angle addition)
3. Any segment, angle, triangle, or polygon is congruent to itself. (reflexive).
4. If a segment, angle, triangle or polygon is congruent to a 2nd segment, angle, triangle or polygon, and the 2nd is congruent to a 3rd, then the 1st is congruent to the 3rd. (transitivity)

Geometry List of Theorems

- 1-1 If two angles are **complements** of equal angles (or of the same angle), then the two angles are equal.
- 1-2 If two angles are **supplements** of equal angles (or of the same angle), then the two angles are equal.
- 1-3 **Vertical angles** are equal
- 1-7 Every segment has exactly one **midpoint**
- 1-8 Every angle has exactly one **bisector**
- Postulate 8 If two parallel lines are cut by a transversal, then the **corresponding** angles are equal.
- 2-2 If two parallel lines are cut by a transversal then **alternate interior** angles are equal
- 2-3 If two parallel lines are cut by a transversal, then **same-side interior** angles are **supplementary**
- 2-4 If a transversal is perpendicular to one of two parallel lines, then it is perpendicular to the other one also.
- Postulate 9 If two lines are cut by a transversal and **corresponding angles** are equal, then the lines are parallel. (converse of Postulate 8)
- 2-5 If two lines are cut by a transversal and **alternate interior** angles are equal, then the lines are parallel. (converse of 2-2)
- 2-6 If two lines are cut by a transversal and **same-side interior** angles are supplementary, then the lines are parallel. (converse of 2-3)
- 2-7 If a transversal is perpendicular to two lines, then the two lines are parallel. (converse of 2-4)
- 2-8 Through a point outside a line, exactly one parallel can be drawn to the line.
- 2-9 Through a point outside a line, exactly one perpendicular can be drawn to the line.
- 2-10 The sum of the angles of a triangle is **180°**.
- Corollary If two angles of one triangle are equal to two angles of another triangle, then the third angles are equal.
- Corollary Each angle of an equiangular triangle has measure **60°**.
- Corollary In a triangle, there can be at most one right or obtuse angle.
- Corollary The acute angles of a right triangle are complementary.
- 2-11 An **exterior angle** of a triangle is equal to the sum of the two remote interior angles.
- 2-12 The sum of the angles of a convex polygon with n sides is **$(n-1)180°$** .
- 2-13 The sum of the exterior angles of any convex polygon is **360°**.
- Postulate 10 (**SSS**) If three sides of one triangle are equal to three sides of another triangle then the triangles are congruent.
- Postulate 11 (**SAS**) If two sides and the included angle of one triangle are equal to two sides and the included angle of another triangle, then the triangles are congruent.
- Postulate 12 (**ASA**) If two angles and the included side of one triangle are equal to two angles and the included side of another triangle, then the triangles are congruent.
- 3-1 (Isosceles Triangle Theorem) If two sides of a triangle are equal, then the angles opposite those sides are equal.
- Corollary An **equilateral** triangle is also equiangular.
- Corollary An equilateral triangle has three $60°$ angles.
- Corollary An **equiangular** triangle is also equilateral.
- 3-2 If two angles of a triangle are equal, then the sides opposite those angles are equal. (converse of 3-1)
- 3-3 (**AAS**) If two angles and a non-included side of one triangle are equal to the corresponding parts of another triangle, then the triangles are congruent.
- 3-4 (HL) If the hypotenuse and a leg of one right triangle are equal to the corresponding parts of another right triangle, then the triangles are congruent.