

Geometry SOL Study Sheet

1. Slope:

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

2. Midpoint:

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

3. Distance:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

4. Sum of Interior Angles (Convex Polygons):

$$\text{sum} = (n-2)180$$

where n = number of sides of polygons

5. One Interior Angle (Polygon):

$$\text{each angle} = \frac{(n-2)180}{n}$$

6. Sum of Exterior Angles (Convex Polygons):

$$\text{sum} = 360$$

** for all polygons no matter how many sides a polygon has

7. One Exterior Angle (Polygon):

$$\text{each angle} = \frac{360}{n}$$

8. Number of sides given exterior angle:

$$n = \frac{360}{\text{angle deg}}$$

9. Angles at Center of Polygon:

$$\text{sum of angles at center} = 360$$

10. Sum and Measures of Interior and Exterior Angles of Polygons:

<u>Polygon</u>	<u>Interior</u>	<u>Exterior</u>	<u>Sum (Int)</u>	<u>Sum (Ext)</u>
a. triangle	60	120	180	360
b. quadrilateral	90	90	360	360
c. pentagon	108	72	540	360
d. hexagon	120	60	720	360
e. octagon	135	45	1080	360

11. Parallelogram Properties:

- a. opposite angles are congruent
- b. opposite sides are congruent
- c. consecutive angles are supplementary
- d. diagonals bisect each other

12. Rectangle Properties:

- a. 4 right angles
- b. diagonals are congruent

** as well as all parallelogram properties

13. Rhombus Properties:

- a. 4 congruent sides
- b. diagonals are perpendicular
- c. diagonals bisect opposite angles

** as well as all parallelogram properties

14. Square Properties:

** all properties of parallelograms, rectangles, & rhombi

15. Circle Facts:

- a. measure of Central Angle = measure of intercepted arc
- b. measure of Inscribed Angle = $1/2$ of measure of intercepted arc
- c. distance from exterior point to points of tangency are equal
- d. two angles with the same intercepted arc are equal in measure
- e. given two lines, exterior part times whole length of one line = exterior part times whole length of other line
- f. the product of the two pieces of 1 chord = the product of the 2 pieces of the other chord

16. Pythagorean Triples:

- a. 3, 4, 5
- b. 5, 12, 13
- c. 6, 8, 10
- d. 7, 24, 25
- e. 8, 15, 17
- f. 15, 20, 25

*** & other multiples of the 3, 4, 5 triple

17. Triangle Inequalities:

- 1. The sum of the lengths of any two sides of a triangle is **greater than** the length of the third side.
- 2. Given two sides of a triangle, the two numbers that the third side must be between can be found by 1) adding the two known sides together and 2) subtracting the smaller known side from the larger known side.
- 3. The largest angle of a triangle is **opposite** the longest side and the smallest angle is **opposite** the shortest side.
- 4. The longest side is **opposite** the largest angle and the shortest side is **opposite** the smallest angle.

18. Congruent Triangles:

- 1. **SSS (Side-Side-Side):** All sides of one triangle are congruent to the corresponding sides of another triangle.
- 2. **SAS (Side-Angle-Side):** Two sides and the included angle between them are congruent to the corresponding two sides and included angle of another triangle.
- 3. **ASA (Angle-Side-Angle):** Two angles and the included side are congruent to the corresponding two angles and included side of another triangle.
- 4. **AAS (Angle-Angle-Side):** Two angles and a non-included side of one triangle are congruent to two angles and a non-included side of another triangle.
- 5. **HL (Hypotenuse-Leg):** The hypotenuse and one leg of one right triangle are congruent to the hypotenuse and leg of another right triangle.

19. Similar Triangles:

1. **SSS Similarity:** all sides of one triangle are proportional to the three sides of another triangle.
2. **AA Similarity:** two angles of one triangle are congruent to two corresponding angles of another triangle.
3. **SAS Similarity:** two sides of a triangle are proportional to two sides of another triangle and the included angles are congruent.
4. If two triangles are **similar**, then the following things have the same ratio as the corresponding sides:
 1. perimeter (& circumference for the circle)
 2. measures of corresponding altitudes
 3. measures of corresponding angle bisectors
 4. measures of corresponding medians
5. If two polygons are **similar**, then the ratio for the areas of the polygons is the ratio of the corresponding sides **squared** (raised to the 2nd power).
6. If two polygons are **similar**, then the ratio for the volumes of the polygons is the ratio of the corresponding sides **cubed** (raised to the 3rd power).

20. Exterior Angles of Triangles:

1. The measure of an exterior angle of a triangle **is equal to** the sum of the two remote interior angles.

21. Right Triangles:

1. To calculate the geometric mean between two numbers, multiply the two numbers together and take the square root of the product.

Ex) Find the geometric mean between 2 and 32.

$$\frac{x}{2} = \frac{32}{x} ; x^2 = 64 ; x = 8$$

2. Pythagorean Theorem:

When you know any two sides of a right triangle, use the Pythagorean theorem to find the third side.

$$a^2 + b^2 = c^2 \quad (\text{a and b are the legs \& c is the hypotenuse (the longest side)})$$

3. 45-45-90 Special Right Triangles:

- a. Both legs have the same measure.
- b. The hypotenuse is $\sqrt{2}$ times as long as a leg.

4. 30-60-90 Special Right Triangles:

- a. The longer leg is $\sqrt{3}$ times as long as the shorter leg.
- b. The hypotenuse is twice as long as the shorter leg.

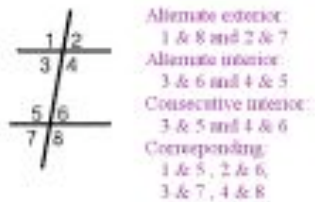
5. Trigonometric Ratios:

1. $\sin A = \text{opposite leg} / \text{hypotenuse}$
2. $\cos A = \text{adjacent leg} / \text{hypotenuse}$
3. $\tan A = \text{opposite leg} / \text{adjacent leg}$

** Remember: **SOH CAH TOA**

22. Angles:

1. **Complementary angles** - two angles that add up to 90 degrees.
2. **Supplementary angles** - two angles that add up to 180 degrees.
3. **Linear pair** - two angles that form the same line and add up to 180 degrees.
4. **Vertical angles** (Butterfly angles) - two non-adjacent angles formed by two intersecting lines that are equal to each other.
5. To prove 2 lines are parallel:



1. **Alternate interior angles** must be equal.
2. **Alternate exterior angles** must be equal.
3. **Corresponding angles** must be equal.
4. **Same side (consecutive interior) angles** must be supplementary.
5. Two lines perpendicular to the same line are parallel.

23. Logic:

- | | |
|--|------------------------------------|
| 1. If - then: If p, then q. | If we win, then we go. |
| 2. Converse: If q, then p | If we go, then we win. |
| 3. Inverse: If \sim p, then \sim q. | If we don't win, then we don't go. |
| 4. Contrapositive: If \sim q, then \sim p. | If we don't go, then we don't win. |

Laws of Logic:

1. Law of Detachment: If p, then q is true and p is true, then the conclusion is that q is true.

Ex 1) If we win, then we go.
We win.
Conclusion: We go.

Ex 2) If we win, then we go.
We go.
Conclusion: No conclusion

2. Law of Syllogism: If p, then q and If q, then r is true, then the conclusion is that If p, then r.

Ex) If we go to the store, then we will stop for dinner.
If we stop for dinner, then we will eat at Applebee's.
Conclusion: If we go to the store, then we will eat at Applebee's.

Venn Diagrams

Keywords:

1. All - one set totally inside another set.
2. Some - interlocking sets
3. No - sets (circles) not touching at all.