Geometry Rules

1. Two points determine exactly one line.
2. Three noncollinear points determine exactly one plane.
3. If point B is in the interior of ∟AOC, then m∟AOB + m∟BOC = m∟AOC.
4. If ∟AOC is a straight line, then m∟AOB + m∟BOC = 180°.
5. If three sides of one triangle are congruent with three sides of another triangle, then the two triangles are congruent (SSS postulate).
6. If two sides and the included angle of one triangle are congruent to the corresponding parts of another triangle, then the triangles are congruent (SAS postulate).
7. If two angles and the included side of one triangle are congruent to corresponding parts of another triangle, the triangles are congruent (ASA postulate).
8. If two angles of one triangle are congruent to two angles of another triangle, then the triangles are similar (AA postulate).
9. If the lengths of the corresponding sides of two triangles are proportional, then the triangles are similar (SSS postulate).
10. If the lengths of two pairs of corresponding sides of two triangles are proportional and the corresponding included angles are congruent, then the triangles are similar (SAS postulate).
11. If two parallel lines are cut by a transversal, then alternate interior angles are congruent.

12. If two parallel lines are cut by a transversal, then same-side interior angles are supplementary.
13. Vertical angles are congruent.
14. Pythagorean theorem: In a right triangle, the sum of the squares of the lengths of the legs is equal to the square of the length of the hypotenuse ($a^2 + b^2 = c^2$).
15. Converse of the Pythagorean theorem: If the square of the length of the longest side of atriangle is equal to the sum of the squares of the lengths of the two shorter sides, then the triangle is a right triangle.
16. If the square of the length of the longest side is greater than the sum of the squares of the lengths of the other two shorter sides, then the triangle is obtuse ($c^2 > a^2 + b^2$).
17. If the square of the length of the longest side is less than the sum of the squares of the lengths of the two other sides, then the triangle is acute ($c^2 > a^2 + b^2$).
18. The Triangle Inequality Theorem states that the sum of any 2 sides of a triangle must be greater than the measure of the third side. If A, B and C are the three sides of a triangle, then A + B > C; B + C > A and A + C > B i.e. this rule must be satisfied for all 3 conditions of the sides.

Example Question: Two sides of a triangle have lengths 12 and 5. Find all possible lengths of the third side. Answer: difference $< x <$ sum therefore $12 - 5 < x < 12 + 5$

19. The sum of interior angles of a triangle is 180°.
20. If polygon has n sides, then its angle sum is given by the formula $S = 180 \times (n - 2)$.
21. The sum of exterior angles of a polygon is always 360°.
22. Opposite sides of a parallelogram are congruent.
23. Opposite angles of a parallelogram are congruent.

24. Consecutive angles of a parallelogram are supplementary.
25. Diagonals of a parallelogram bisect each other.
26. Diagonals of a rectangle are congruent.
27. The diagonals of a rhombus are perpendicular, and they bisect the angles of the rhombus.
28. The area (A) of a rectangle is the product of its base length (b) and its height (h): $A = bh$.
29. The area of a parallelogram (A) is the product of its base length (b) and its height (h): $A = bh$.
30. The area (A) of any triangle is half the product of its base length (b) and its height (h): $A = \frac{1}{2} bh$.
31. The area of a trapezoid is half the product of the height and the sum of the base lengths ($b_1 + b_2$): $A = \frac{1}{2} h(b_1 + b_2)$.
32. The surface area (S.A.) of a rectangular prism is twice the sum of the length (l) times the width (w), the width (w) times the height (h), and the length (l) times the height (h): $S.A. = 2(lw + wh + lh)$.
33. The surface area of a cube is six times the edge (e) squared: $S.A. = 6s^2$.
34. To find the volume (V) of a rectangular prism, multiply the length (l) by the width (w) and by the height (h): $V = lwh$.
35. To find the volume (V) of any prism, multiply the area of the base (B) by the height (h): $V = Bh$.
36. The volume of a cube is determined by cubing the length of the edge: $V = s^3$.
37. The circumference of any circle is the product of its diameter and π: $C = \pi d$ or $C = 2 \pi r$.
38. The area (A) of a circle is the product of π and the square of the radius (r): $A = \pi r^2$.
39. The surface area (S.A.) of a cylinder is determined by finding the sum of the area of the bases and the product of the circumference times the height:$S.A. = 2 \pi r^2 + 2 \pi rh$.

40. The volume (V) of a cylinder is the product of the area of the base (B) and the height (h): $V = Bh$ or $V = \pi r^2 h$.

41. The surface area (S.A.) formula for a sphere is four times π times the radius squared: S.A. $= 4\pi r^2$.

42. The volume (V) of a sphere is determined by the product of $^4/_3\,\pi$ times the radius cubed: $V = {}^4/_3\,\pi r^3$.

43. Circle equation: Standard form: $(x\text{-}a)^2 + (y\text{-}b)^2 = r^2$.

General form: $x^2 + y^2 + Ax + By + C = 0$

44. 45-45-90 and 30-60-90 triangle: