

GEOMETRY

Study Materials: Key Concepts, Practice Questions, Answers

Mathema Contest



Name: _____

Key Concepts

1. Basic Shapes and Properties

- **Triangle:** A polygon with three sides. Types include:
 - Equilateral: All sides and angles are equal.
 - Isosceles: Two sides and two angles are equal.
 - Scalene: All sides and angles are different.
- **Quadrilateral:** A polygon with four sides. Types include:
 - Square: All sides equal and all angles 90 degrees.
 - Rectangle: Opposite sides equal and all angles 90 degrees.
 - Parallelogram: Opposite sides parallel and equal.
 - Rhombus: All sides equal and opposite angles equal.
 - Trapezoid: At least one pair of opposite sides parallel.
- **Circle:** A set of all points in a plane at a given distance (radius) from a center point.

2. Angles

- **Types of Angles:**
 - Acute: Less than 90 degrees.
 - Right: Exactly 90 degrees.
 - Obtuse: More than 90 degrees but less than 180 degrees.
 - Straight: Exactly 180 degrees.
- **Angle Relationships:**
 - Complementary Angles: Two angles whose measures add up to 90 degrees.
 - Supplementary Angles: Two angles whose measures add up to 180 degrees.

- Vertical Angles: Opposite angles formed by two intersecting lines; they are equal.
- Adjacent Angles: Two angles that share a common side and vertex.

3. Perimeter and Area

- **Perimeter:** The total distance around a polygon.
 - Triangle: $P = a + b + c$
 - Rectangle: $P = 2(l+w)$
 - Square: $P = 4s$
- **Area:**
 - Triangle: $A = \frac{1}{2} \times \text{base} \times \text{height}$
 - Rectangle: $A = l \times w$
 - Square: $A = s^2$
 - Circle: $A = \pi r^2$

4. Volume and Surface Area (3D Shapes)

- **Volume:**
 - Cube: $V = s^3$
 - Rectangular Prism: $V = l \times w \times h$
 - Cylinder: $V = \pi r^2 h$
- **Surface Area:**
 - Cube: $SA = 6s^2$
 - Rectangular Prism: $SA = 2lw + 2lh + 2wh$
 - Cylinder: $SA = 2\pi r(r + h)$



Practice Questions

1. Triangles and Angles:

- Given an isosceles triangle with base $b = 6$ cm and equal sides $a = 5$ cm, calculate the perimeter of the triangle.

2. Quadrilaterals and Area:

- A rectangle has a length of 10 cm and a width of 4 cm. Calculate the area of the rectangle.

3. Circles and Circumference:

- A circle has a radius of 7 cm. Calculate the circumference of the circle (use $\pi \approx 3.14$).

4. Volume of 3D Shapes:

- Calculate the volume of a cylinder with a radius of 3 cm and a height of 10 cm.

5. Surface Area:

- Find the surface area of a cube with a side length of 5 cm.

Answers

- Perimeter of the triangle = $a + a + b = 5 + 5 + 6 = 16$ cm
- Area of the rectangle = $l \times w = 10 \times 4 = 40$ cm²
- Circumference of the circle = $2\pi r = 2 \times 3.14 \times 7 = 43.96$ cm

Geometry -Study guide and Practice Questions



4. Volume of the cylinder = $\pi r^2 h = 3.14 \times 3^2 \times 10 = 282.6 \text{ cm}^3$
5. Surface area of the cube = $6s^2 = 6 \times 5^2 = 150 \text{ cm}$

