

POLYGONS, FREQUENCY, PRISM & PARTNERSHIP

Complete SSC CGL Mathematics Notes

Comprehensive Guide with Formulas & Examples • Created by GovtExamPrep

1. REGULAR POLYGONS

Definition and Properties

Regular Polygon: A polygon that has all sides equal and all angles equal.

[Diagram: Regular polygons - triangle, square, pentagon, hexagon]

Polygon Name	Number of Sides	Interior Angle	Exterior Angle
Equilateral Triangle	3	60°	120°
Square	4	90°	90°
Regular Pentagon	5	108°	72°
Regular Hexagon	6	120°	60°
Regular Octagon	8	135°	45°

Important Formulas

For Regular Polygon with n sides:

Sum of interior angles:

$$(n - 2) \times 180^\circ$$

Each interior angle:

$$[(n - 2) \times 180^\circ] / n$$

Each exterior angle:

$$360^\circ / n$$

Number of diagonals:

$$n(n - 3) / 2$$

Area of regular polygon:

$$(1/2) \times \text{Perimeter} \times \text{Apothem}$$

Example: Find interior and exterior angles of a regular hexagon

Solution:

- Number of sides $n = 6$
- Each exterior angle $= 360^\circ/6 = 60^\circ$
- Each interior angle $= 180^\circ - 60^\circ = 120^\circ$
- Verify: Sum of interior angles $= (6-2) \times 180^\circ = 720^\circ$
- Each interior angle $= 720^\circ/6 = 120^\circ \checkmark$

2. FREQUENCY POLYGON

Definition and Construction

Frequency Polygon: A graphical representation of data using line segments connecting the midpoints of class intervals plotted against frequencies.

Steps to Construct Frequency Polygon:

1. Find class marks (midpoints) of each class interval
2. Plot points (class mark, frequency)
3. Join these points with straight lines
4. Extend the polygon to base line on both ends

Sample Data:

Class: 0-10, 10-20, 20-30, 30-40, 40-50

Frequency: 5, 8, 12, 7, 3

Example: Construct frequency polygon for given data

Given: Class: 0-10, 10-20, 20-30, 30-40; Frequency: 4, 6, 8, 2

Solution:

- Class marks: 5, 15, 25, 35
- Plot points: (5,4), (15,6), (25,8), (35,2)
- Join these points with straight lines
- Extend to (0,0) and (40,0)

Comparison with Histogram

Aspect	Histogram	Frequency Polygon
Representation	Bars	Line segments
Base	Class intervals	Class marks
Multiple Data	Difficult to compare	Easy to compare
Visual Appeal	Shows distribution clearly	Shows trends clearly

3. PRISM - 3D GEOMETRY

Definition and Types

Prism: A solid with two parallel and congruent polygonal bases connected by rectangular lateral faces.

[Diagram: Triangular prism, Rectangular prism, Pentagonal prism]

Prism Type	Base Shape	Lateral Faces	Examples
Triangular Prism	Triangle	3 Rectangles	Toblerone box
Rectangular Prism	Rectangle	4 Rectangles	Brick, Box
Pentagonal Prism	Pentagon	5 Rectangles	-
Hexagonal Prism	Hexagon	6 Rectangles	Pencil

Prism Formulas

General Formulas for Right Prism:

Lateral Surface Area (LSA):

$$\text{LSA} = \text{Perimeter of base} \times \text{Height}$$

Total Surface Area (TSA):

$$\text{TSA} = \text{LSA} + 2 \times \text{Area of base}$$

Volume:

$$\text{Volume} = \text{Area of base} \times \text{Height}$$

Example: Find volume and TSA of rectangular prism with dimensions 5cm × 4cm × 6cm

Solution:

- Length = 5cm, Width = 4cm, Height = 6cm

- Area of base = $5 \times 4 = 20\text{cm}^2$
- Volume = Area $\times$ Height = $20 \times 6 = 120\text{cm}^3$
- Perimeter of base = $2(5+4) = 18\text{cm}$
- LSA = $18 \times 6 = 108\text{cm}^2$
- TSA = $108 + 2 \times 20 = 148\text{cm}^2$

4. PARTNERSHIP BUSINESS

Basic Concepts

Partnership: An association of two or more persons who pool their resources to carry on a business and share its profits/losses in an agreed ratio.

Types of Partnership:

- **Simple Partnership:** Capital invested for same time period
- **Compound Partnership:** Capital invested for different time periods

Profit Sharing Formula:

$$\text{Profit Share} \propto (\text{Investment} \times \text{Time})$$

If A invests ₹X for T_1 months and B invests ₹Y for T_2 months:

$$\text{Profit Ratio} = (X \times T_1) : (Y \times T_2)$$

For multiple partners:

$$\text{Profit Ratio} = (\text{Capital}_1 \times \text{Time}_1) : (\text{Capital}_2 \times \text{Time}_2) : \dots : (\text{Capital}_n \times \text{Time}_n)$$

Partnership Problems

Example: A and B invest ₹6000 and ₹8000 respectively in a business. If annual profit is ₹2800, find their shares.

Solution:

- Investment ratio = $6000 : 8000 = 3 : 4$
- Total ratio parts = $3 + 4 = 7$
- A's share = $(3/7) \times 2800 = ₹1200$
- B's share = $(4/7) \times 2800 = ₹1600$

Example: A invests ₹5000 for 6 months, B invests ₹6000 for 4 months, C invests ₹8000 for 3 months. Find profit ratio.

Solution:

- A: $5000 \times 6 = 30000$
- B: $6000 \times 4 = 24000$

- C: $8000 \times 3 = 24000$
- Profit ratio = $30000 : 24000 : 24000$
- Simplify by dividing by 6000 = $5 : 4 : 4$

5. PRACTICAL APPLICATIONS & PROBLEM TYPES

Regular Polygon Applications

Common Problem Types:

- Finding angles of regular polygons
- Calculating area and perimeter
- Finding number of sides from angles
- Diagonal calculations

Example: If each interior angle of regular polygon is 135° , find number of sides.

Solution:

- Each interior angle = 135°
- Each exterior angle = $180^\circ - 135^\circ = 45^\circ$
- Number of sides = $360^\circ / 45^\circ = 8$
- It's a regular octagon

Partnership Advanced Problems

Advanced Scenarios:

- Partners joining/leaving at different times
- Additional investments during year
- Salary to working partners
- Interest on capital

Example: A starts business with ₹40000. After 3 months, B joins with ₹60000. After 6 more months, C joins with ₹80000. At year end, profit ₹30000. Find shares.

Solution:

- A: $40000 \times 12 = 480000$
- B: $60000 \times 9 = 540000$
- C: $80000 \times 3 = 240000$
- Ratio = $480000 : 540000 : 240000$
- Divide by 60000 = $8 : 9 : 4$
- Total parts = $8+9+4 = 21$

- A's share = $(8/21) \times 30000 = ₹11428.57$
- B's share = $(9/21) \times 30000 = ₹12857.14$
- C's share = $(4/21) \times 30000 = ₹5714.29$

6. SSC CGL PRACTICE PROBLEMS

Previous Year Question Types

Problem 1: Each exterior angle of regular polygon is 36° . Find number of sides and sum of interior angles.

Solution:

- Exterior angle = 36°
- Number of sides = $360^\circ/36^\circ = 10$
- Sum of interior angles = $(10-2) \times 180^\circ = 1440^\circ$

Problem 2: Rectangular prism has dimensions $8\text{cm} \times 5\text{cm} \times 3\text{cm}$. Find its volume and total surface area.

Solution:

- Volume = $8 \times 5 \times 3 = 120\text{cm}^3$
- TSA = $2(8 \times 5 + 8 \times 3 + 5 \times 3) = 2(40 + 24 + 15) = 2 \times 79 = 158\text{cm}^2$

Problem 3: A and B invest in 3:2 ratio. After 6 months, A withdraws half capital. If annual profit ₹20000, find B's share.

Solution:

- Let A's capital = $3x$, B's capital = $2x$
- A: First 6 months = $3x \times 6 = 18x$
- Next 6 months = $1.5x \times 6 = 9x$
- Total A = $18x + 9x = 27x$
- B: $2x \times 12 = 24x$
- Ratio = $27x : 24x = 9:8$
- B's share = $(8/17) \times 20000 = ₹9411.76$

7. QUICK FORMULAS & SHORTCUTS

Memory Tips

Regular Polygons:

- Interior + Exterior = 180°
- Sum of exteriors = 360°
- Diagonals = $n(n-3)/2$

Prism Formulas:

- Volume = Base Area $\times$ Height
- LSA = Base Perimeter $\times$ Height
- TSA = LSA + $2 \times$ Base Area

Partnership Rules:

- Profit $\propto$ Investment $\times$ Time
- Ratio determines share
- Convert all to same time unit

Important Values

Polygon	Sides	Interior Angle	Area Formula
Triangle	3	60°	$(\sqrt{3}/4) \times \text{side}^2$
Square	4	90°	side^2
Pentagon	5	108°	$(1/4) \times \sqrt{(5(5+2\sqrt{5}))} \times \text{side}^2$
Hexagon	6	120°	$(3\sqrt{3}/2) \times \text{side}^2$

8. SSC CGL PREPARATION STRATEGY

Expected Marks Distribution

Topic	Frequency	Difficulty	Marks Weightage
Regular Polygons	Medium	Easy-Medium	1-2 marks
Frequency Polygon	Low	Easy	1 mark
Prism	Medium	Medium	1-2 marks
Partnership	High	Medium	2-3 marks
Mixed Problems	High	Medium-Hard	2-3 marks

30-Day Study Plan

Week 1-2: Foundation Building

- Days 1-5: Regular polygons - concepts and formulas
- Days 6-10: Frequency polygon - construction and analysis
- Days 11-15: Prism - types and calculations

Week 3-4: Advanced Practice

- Days 16-20: Partnership - basic to advanced problems
- Days 21-25: Mixed problem solving
- Days 26-30: Previous year papers and revision

Daily Practice: 5 polygon problems, 3 frequency polygon questions, 4 prism problems, 6 partnership questions.

Polygons, Frequency, Prism & Partnership - SSC CGL Master Notes

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