

# MATH LOVE INSTITUTE

Madhya Pradesh Board of Secondary Education (MPBSE)

Class 8 Mathematics - Annual Examination 2025-26

Question Paper 3 with Complete Solutions

Based on Latest NCERT Syllabus & MP Board Pattern

|               |                  |
|---------------|------------------|
| Maximum Marks | 80               |
| Time Allowed  | 3 Hours          |
| Class         | VIII (Eight)     |
| Subject       | Mathematics      |
| Board         | MP Board (MPBSE) |

## GENERAL INSTRUCTIONS:

1. This question paper contains **28 questions** divided into **Five Sections A, B, C, D and E**.
2. **Section A:** 10 Multiple Choice Questions of 1 mark each (10 marks)
3. **Section B:** 5 Very Short Answer Type questions of 2 marks each (10 marks)
4. **Section C:** 6 Short Answer Type questions of 3 marks each (18 marks)
5. **Section D:** 4 Long Answer Type questions of 5 marks each (20 marks)
6. **Section E:** 3 Case Study Based questions of 4 marks each (12 marks)
7. All questions are **compulsory**.
8. Draw neat diagrams wherever required.
9. Use of calculators is **NOT** permitted.

## SECTION A - MULTIPLE CHOICE QUESTIONS (1 × 10 = 10 Marks)

- Q1.** The multiplicative inverse of  $(-5/8)$  is: [1]  
(a)  $5/8$   
(b)  $-8/5$   
(c)  $8/5$   
(d)  $-5/8$
- Q2.** If  $4x + 7 = 31$ , then  $x$  equals: [1]  
(a) 5  
(b) 6  
(c) 7  
(d) 8
- Q3.** The number of sides in a pentagon is: [1]  
(a) 4  
(b) 5  
(c) 6  
(d) 7
- Q4.**  $\sqrt{169}$  equals: [1]  
(a) 11  
(b) 12  
(c) 13  
(d) 14
- Q5.** The value of  $5^3$  is: [1]  
(a) 15  
(b) 25  
(c) 125  
(d) 625
- Q6.** A shirt marked at ₹600 is sold at a discount of 25%. The selling price is: [1]  
(a) ₹400  
(b) ₹425  
(c) ₹450  
(d) ₹475

**Q7.** The expression  $2x(3x - 5)$  simplifies to: [1]  
(a)  $6x^2 - 10x$   
(b)  $6x^2 - 5x$   
(c)  $5x^2 - 10x$   
(d)  $6x - 10x$

**Q8.** The area of a square with side 12 cm is: [1]  
(a)  $24 \text{ cm}^2$   
(b)  $48 \text{ cm}^2$   
(c)  $144 \text{ cm}^2$   
(d)  $288 \text{ cm}^2$

**Q9.**  $10^0$  equals: [1]  
(a) 0  
(b) 1  
(c) 10  
(d) 100

**Q10.** If 12 workers can complete a work in 8 days, how many days will 16 workers take (inverse proportion)? [1]  
(a) 4 days  
(b) 6 days  
(c) 10 days  
(d) 12 days

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**SECTION B - VERY SHORT ANSWER TYPE QUESTIONS ( $2 \times 5 = 10$  Marks)**

**Q11.** Subtract:  $(5/6) - (2/3)$  [2]

**Q12.** Solve for x:  $7x + 5 = 40$  [2]

**Q13.** Find the smallest number by which 392 must be multiplied to make it a perfect cube. [2]

**Q14.** A book is sold for ₹360 at a profit of 20%. Find its cost price. [2]

**Q15.** Factorise:  $x^2 + 7x + 12$  [2]

**SECTION C - SHORT ANSWER TYPE QUESTIONS (3 × 6 = 18 Marks)**

- Q16.** Prove that the sum of angles of a triangle is  $180^\circ$ . [3]
- Q17.** Solve:  $(3x + 2)/4 - (2x - 1)/3 = 2$  [3]
- Q18.** Find the mode of the following data: 5, 8, 5, 12, 15, 5, 8, 10, 5, 12 [3]
- Q19.** The length and breadth of a rectangular field are 80 m and 50 m respectively. Find the cost of fencing it at ₹12 per metre. [3]
- Q20.** Evaluate  $(105)^2$  using the identity  $(a + b)^2 = a^2 + 2ab + b^2$ . [3]
- Q21.** Find the volume of a cuboid with dimensions 12 cm × 8 cm × 5 cm. [3]

**SECTION D - LONG ANSWER TYPE QUESTIONS (5 × 4 = 20 Marks)**

- Q22.** Prove the identity  $(x + a)(x + b) = x^2 + (a + b)x + ab$  and use it to find the value of  $103 \times 97$ . [5]
- Q23.** Ravi borrowed ₹18,000 from a bank at 10% per annum for 3 years. Calculate: [5]
- (i) Simple Interest
  - (ii) Total amount to be paid
  - (iii) If he had taken the loan at compound interest (compounded annually), how much more would he have to pay?
- Q24.** The area of a trapezium is  $350 \text{ cm}^2$ . The parallel sides are in the ratio 2:5 and the distance between them is 10 cm. Find the lengths of the parallel sides. [5]
- OR**
- A circular garden has a radius of 35 m. Find its circumference and area. (Take  $\pi = 22/7$ )
- Q25.** A cube has a total surface area of  $726 \text{ cm}^2$ . Find its edge, volume, and lateral surface area. [5]

**SECTION E - CASE STUDY BASED QUESTIONS ( $4 \times 3 = 12$  Marks)**

**Q26.**

**[4]**

**CASE STUDY 1: Garden Design**

A square garden has a side of 30 m. A path of width 2 m is laid inside the garden along its border.

Based on the above information, answer the following:

- (i) Find the area of the garden. [1 mark]**
- (ii) Find the area of the inner square (excluding the path). [2 marks]**
- (iii) Find the area of the path. [1 mark]**

**Q27.**

**[4]**

**CASE STUDY 2: Savings Account**

Amit deposits ₹30,000 in a bank that offers 6% simple interest per annum. His sister Anita deposits the same amount in another bank that offers 6% compound interest per annum.

Based on the above information, answer the following:

- (i) Calculate Amit's interest after 2 years. [1 mark]**
- (ii) Calculate the amount Amit will receive after 2 years. [1 mark]**
- (iii) How much more will Anita receive compared to Amit after 2 years? [2 marks]**

**CASE STUDY 3: Test Scores Analysis**

The scores of 15 students in a mathematics test (out of 50) are:

42, 35, 48, 40, 38, 45, 42, 50, 35, 42, 38, 45, 40, 48, 42

Based on the above information, answer the following:

- (i) What is the highest and lowest score? [1 mark]
- (ii) Find the range of the scores. [1 mark]
- (iii) Find the mode of the scores. [2 marks]

 **END OF QUESTION PAPER** 

**Total Marks: 80**

Section A: 10 marks | Section B: 10 marks | Section C: 18 marks

Section D: 20 marks | Section E: 12 marks

**Time: 3 Hours**

 **COMPLETE DETAILED SOLUTIONS WITH STEP-BY-STEP EXPLANATIONS**

**SECTION A - SOLUTIONS (1 × 10 = 10 Marks)**

**Q1. Answer: (b) -8/5**

**Solution:**

Multiplicative inverse of a number is the reciprocal that gives product 1.

Multiplicative inverse of  $(-5/8) = -8/5$

Verification:  $(-5/8) \times (-8/5) = 40/40 = 1 \checkmark$

**Q2. Answer: (b) 6**

**Solution:**

$$4x + 7 = 31$$

$$4x = 31 - 7$$

$$4x = 24$$

$$x = 24/4$$

$$x = 6$$

**Q3. Answer: (b) 5**

**Explanation:**

A pentagon is a polygon with 5 sides.

Penta = 5

**Q4. Answer: (c) 13**

**Solution:**

$$\sqrt{169} = \sqrt{(13 \times 13)} = 13$$

**Q5. Answer: (c) 125**

**Solution:**

$$5^3 = 5 \times 5 \times 5 = 125$$

**Q6. Answer: (c) ₹450**

**Solution:**

$$\text{Marked Price} = ₹600$$

$$\text{Discount} = 25\%$$

$$\text{Discount amount} = (25/100) \times 600 = ₹150$$

$$\text{Selling Price} = \text{MP} - \text{Discount}$$

$$= 600 - 150$$

$$= ₹450$$

**Q7. Answer: (a)  $6x^2 - 10x$**

**Solution:**

$$2x(3x - 5)$$

$$= 2x \times 3x - 2x \times 5$$

$$= 6x^2 - 10x$$

**Q8. Answer: (c)  $144 \text{ cm}^2$**

**Solution:**

$$\text{Area of square} = \text{side}^2$$

$$= 12^2$$

$$= 144 \text{ cm}^2$$

**Q9. Answer: (b) 1**

**Explanation:**

Any number raised to the power 0 equals 1.

$$10^0 = 1$$

**Q10. Answer: (b) 6 days****Solution:**

In inverse proportion:  $w_1 \times d_1 = w_2 \times d_2$

$$12 \times 8 = 16 \times d$$

$$96 = 16d$$

$$d = 96/16$$

$$d = 6 \text{ days}$$

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**SECTION B - SOLUTIONS (2 × 5 = 10 Marks)****Q11. Solution:**

**Marking Scheme:** 1 mark for LCM + 1 mark for answer

$$(5/6) - (2/3)$$

$$\text{LCM of 6 and 3} = 6$$

$$= (5/6) - (4/6)$$

$$= (5 - 4)/6$$

$$= 1/6$$

**Answer:** 1/6

**Q12. Solution:**

**Marking Scheme:** 1 mark for steps + 1 mark for answer

$$7x + 5 = 40$$

$$7x = 40 - 5$$

$$7x = 35$$

$$x = 35/7$$

$$x = 5$$

### Q13. Solution:

**Marking Scheme:** 1 mark for prime factorization + 1 mark for answer

Prime factorization of 392:

$$392 = 2 \times 196$$

$$= 2 \times 2 \times 98$$

$$= 2 \times 2 \times 2 \times 49$$

$$= 2^3 \times 7^2$$

For perfect cube, all prime factors must appear in groups of 3

$2^3$  is already perfect (group of 3)

$7^2$  needs one more 7 to become  $7^3$

**Answer:** 7

$$(392 \times 7 = 2744 = 14^3)$$

### Q14. Solution:

**Marking Scheme:** 1 mark for formula + 1 mark for CP

$$SP = ₹360$$

$$\text{Profit} = 20\%$$

When SP and profit% are given:

$$CP = [SP \times 100]/(100 + \text{Profit}\%)$$

$$= (360 \times 100)/(100 + 20)$$

$$= 36000/120$$

$$= ₹300$$

**Answer: ₹300**

**Q15. Solution:**

**Marking Scheme:** 1 mark for splitting + 1 mark for factors

$$x^2 + 7x + 12$$

Find two numbers whose sum = 7 and product = 12

Numbers are 3 and 4 ( $3 + 4 = 7$ ,  $3 \times 4 = 12$ )

$$= x^2 + 3x + 4x + 12$$

$$= x(x + 3) + 4(x + 3)$$

$$= (x + 3)(x + 4)$$

**Answer:  $(x + 3)(x + 4)$**

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## SECTION C - SOLUTIONS ( $3 \times 6 = 18$ Marks)

**Q16. Solution:**

**Marking Scheme:** 1 mark construction + 1 mark proof + 1 mark conclusion

**Given:**  $\triangle ABC$

**To Prove:**  $\angle A + \angle B + \angle C = 180^\circ$

**Construction:** Draw a line PQ through A parallel to BC

**Proof:**

Since  $PQ \parallel BC$  and AB is a transversal:

$\angle PAB = \angle ABC$  (alternate interior angles) ... (i)

Since  $PQ \parallel BC$  and  $AC$  is a transversal:

$$\angle QAC = \angle ACB \text{ (alternate interior angles) ... (ii)}$$

$$\text{Also, } \angle PAB + \angle BAC + \angle QAC = 180^\circ \text{ (linear pair)}$$

From (i) and (ii):

$$\angle ABC + \angle BAC + \angle ACB = 180^\circ$$

$$\angle B + \angle A + \angle C = 180^\circ$$

**Hence Proved**

### Q17. Solution:

**Marking Scheme:** 1 mark LCM + 1 mark simplification + 1 mark answer

$$(3x + 2)/4 - (2x - 1)/3 = 2$$

$$\text{LCM of 4 and 3} = 12$$

Multiplying throughout by 12:

$$3(3x + 2) - 4(2x - 1) = 24$$

$$9x + 6 - 8x + 4 = 24$$

$$x + 10 = 24$$

$$x = 14$$

**Answer:  $x = 14$**

### Q18. Solution:

**Marking Scheme:** 1 mark arranging + 1 mark finding frequency + 1 mark mode

Data: 5, 8, 5, 12, 15, 5, 8, 10, 5, 12

Arranging: 5, 5, 5, 5, 8, 8, 10, 12, 12, 15

Frequency table:

5 appears 4 times (highest frequency)

8 appears 2 times

10 appears 1 time

12 appears 2 times

15 appears 1 time

Mode is the value with highest frequency.

**Mode = 5**

### Q19. Solution:

**Marking Scheme:** 1 mark perimeter + 1 mark calculation + 1 mark cost

Length = 80 m

Breadth = 50 m

Rate = ₹12 per metre

Perimeter =  $2(l + b)$

=  $2(80 + 50)$

=  $2 \times 130$

= 260 m

Cost of fencing = Perimeter  $\times$  Rate

=  $260 \times 12$

= ₹3,120

**Answer: ₹3,120**

### Q20. Solution:

**Marking Scheme:** 1 mark identity + 1 mark substitution + 1 mark calculation

$(105)^2 = (100 + 5)^2$

Using  $(a + b)^2 = a^2 + 2ab + b^2$

where  $a = 100$ ,  $b = 5$

$$= (100)^2 + 2(100)(5) + (5)^2$$

$$= 10000 + 1000 + 25$$

$$= 11025$$

**Answer: 11025**

**Q21. Solution:**

**Marking Scheme:** 1 mark formula + 1 mark substitution + 1 mark answer

Length = 12 cm

Breadth = 8 cm

Height = 5 cm

Volume of cuboid =  $l \times b \times h$

$$= 12 \times 8 \times 5$$

$$= 480 \text{ cm}^3$$

**Answer: 480 cm<sup>3</sup>**

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## SECTION D - SOLUTIONS (5 × 4 = 20 Marks)

**Q22. Solution:**

**Marking Scheme:** 2 marks proof + 3 marks application

**Proving the identity:**

$$(x + a)(x + b)$$

$$= x(x + b) + a(x + b)$$

$$= x^2 + bx + ax + ab$$

$$= x^2 + (a + b)x + ab$$

## Identity Proved

### Application: $103 \times 97$

Write as:  $(100 + 3)(100 - 3)$

This is in the form  $(x + a)(x + b)$  where  $x = 100$ ,  $a = 3$ ,  $b = -3$

Using identity:

$$= (100)^2 + (3 + (-3))(100) + (3)(-3)$$

$$= 10000 + 0 + (-9)$$

$$= 10000 - 9$$

$$= 9991$$

### Alternatively using $(a + b)(a - b) = a^2 - b^2$ :

$$103 \times 97 = (100 + 3)(100 - 3)$$

$$= (100)^2 - (3)^2$$

$$= 10000 - 9$$

$$= 9991$$

**Answer: 9991**

## Q23. Solution:

**Marking Scheme:** 1.5 marks SI + 1.5 marks amount + 2 marks CI difference

Principal (P) = ₹18,000

Rate (R) = 10% per annum

Time (T) = 3 years

### (i) Simple Interest:

$$SI = (P \times R \times T)/100$$

$$= (18000 \times 10 \times 3)/100$$

$$= 540000/100$$

$$= ₹5,400$$

### (ii) Total Amount (SI):

$$\begin{aligned}\text{Amount} &= P + SI \\ &= 18000 + 5400 \\ &= ₹23,400\end{aligned}$$

**(iii) Compound Interest:**

$$\begin{aligned}A &= P(1 + R/100)^T \\ &= 18000(1 + 10/100)^3 \\ &= 18000(1.1)^3 \\ &= 18000 \times 1.331 \\ &= ₹23,958\end{aligned}$$

$$CI = 23958 - 18000 = ₹5,958$$

$$\begin{aligned}\text{Additional amount} &= CI - SI \\ &= 5958 - 5400 \\ &= ₹558\end{aligned}$$

**Answer: (i) ₹5,400 (ii) ₹23,400 (iii) ₹558 more**

**Q24. Solution:**

**Marking Scheme:** 2 marks setting equation + 2 marks solving + 1 mark answer

**Trapezium:**

$$\text{Area of trapezium} = 350 \text{ cm}^2$$

$$\text{Ratio of parallel sides} = 2:5$$

$$\text{Height} = 10 \text{ cm}$$

Let parallel sides be  $2x$  and  $5x$

$$\text{Area of trapezium} = (1/2) \times (\text{sum of parallel sides}) \times \text{height}$$

$$350 = (1/2) \times (2x + 5x) \times 10$$

$$350 = (1/2) \times 7x \times 10$$

$$350 = 35x$$

$$x = 350/35$$

$$x = 10 \text{ cm}$$

Parallel sides:  $2x = 20$  cm,  $5x = 50$  cm

**Answer: 20 cm and 50 cm**

**OR**

**Circular Garden:**

Radius = 35 m

$\pi = 22/7$

**Circumference:**

$C = 2\pi r$

$= 2 \times (22/7) \times 35$

$= 2 \times 22 \times 5$

$= 220$  m

**Area:**

$A = \pi r^2$

$= (22/7) \times 35 \times 35$

$= 22 \times 5 \times 35$

$= 3850$  m<sup>2</sup>

**Answer: Circumference = 220 m, Area = 3850 m<sup>2</sup>**

**Q25. Solution:**

**Marking Scheme:** 1.5 marks edge + 2 marks volume + 1.5 marks LSA

Total Surface Area = 726 cm<sup>2</sup>

**Finding edge:**

TSA of cube =  $6a^2$

$6a^2 = 726$

$a^2 = 726/6$

$a^2 = 121$

$$a = \sqrt{121}$$
$$a = 11 \text{ cm}$$

**Volume:**

$$V = a^3$$
$$= 11^3$$
$$= 1331 \text{ cm}^3$$

**Lateral Surface Area:**

$$\text{LSA} = 4a^2$$
$$= 4 \times 11^2$$
$$= 4 \times 121$$
$$= 484 \text{ cm}^2$$

**Answer: Edge = 11 cm, Volume = 1331 cm<sup>3</sup>, LSA = 484 cm<sup>2</sup>**

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## SECTION E - SOLUTIONS (4 × 3 = 12 Marks)

**Q26. Solution: CASE STUDY 1 - Garden Design**

**Marking Scheme:** 1 + 2 + 1 = 4 marks

**(i) Area of garden:**

$$\text{Side} = 30 \text{ m}$$
$$\text{Area} = \text{side}^2$$
$$= 30^2$$
$$= 900 \text{ m}^2$$

**Answer: 900 m<sup>2</sup>**

**(ii) Area of inner square:**

$$\text{Path width} = 2 \text{ m on all sides (inside)}$$
$$\text{Side of inner square} = 30 - 2 - 2 = 26 \text{ m}$$
$$\text{Area of inner square} = 26^2$$
$$= 676 \text{ m}^2$$

**Answer: 676 m<sup>2</sup>**

**(iii) Area of path:**

Area of path = Total area - Inner area

$$= 900 - 676$$

$$= 224 \text{ m}^2$$

**Answer: 224 m<sup>2</sup>**

### **Q27. Solution: CASE STUDY 2 - Savings Account**

**Marking Scheme:** 1 + 1 + 2 = 4 marks

P = ₹30,000, R = 6%, T = 2 years

**(i) Amit's interest (SI):**

$$SI = (P \times R \times T)/100$$

$$= (30000 \times 6 \times 2)/100$$

$$= 360000/100$$

$$= ₹3,600$$

**Answer: ₹3,600**

**(ii) Amit's total amount:**

$$\text{Amount} = P + SI$$

$$= 30000 + 3600$$

$$= ₹33,600$$

**Answer: ₹33,600**

**(iii) Anita's extra amount (CI):**

$$A = P(1 + R/100)^2$$

$$= 30000(1.06)^2$$

$$= 30000 \times 1.1236$$

$$= ₹33,708$$

Extra amount = 33708 - 33600

= ₹108

**Answer: ₹108 more**

### **Q28. Solution: CASE STUDY 3 - Test Scores**

**Marking Scheme:** 1 + 1 + 2 = 4 marks

Data: 42, 35, 48, 40, 38, 45, 42, 50, 35, 42, 38, 45, 40, 48, 42

**(i) Highest and lowest:**

Highest score = 50

Lowest score = 35

**Answer: Highest = 50, Lowest = 35**

**(ii) Range:**

Range = Highest - Lowest

= 50 - 35

= 15

**Answer: 15**

**(iii) Mode:**

Arranging: 35, 35, 38, 38, 40, 40, 42, 42, 42, 42, 45, 45, 48, 48, 50

Frequency:

35 → 2 times

38 → 2 times

40 → 2 times

42 → 4 times (highest frequency)

45 → 2 times

48 → 2 times

50 → 1 time

**Mode = 42**

## ✓ END OF COMPLETE SOLUTIONS ✓

All 28 questions solved with detailed step-by-step explanations

✓ **100% NCERT Class 8 Syllabus Compliant:**

- Rational Numbers (Multiplicative Inverse, Operations)
  - Linear Equations (Different variations)
- Understanding Quadrilaterals (Pentagon, Triangle)
  - Squares & Square Roots ( $\sqrt{169}$ )
  - Cubes & Cube Roots ( $5^3$ , Perfect Cubes)
- Comparing Quantities (Discount, Profit, SI/CI)
- Algebraic Expressions ( $2x(3x-5)$ , Factorization)
- Mensuration (Square, Rectangle, Trapezium, Circle)
- 3D Shapes: ONLY Cube & Cuboid (Class 8 approved)
  - Exponents ( $10^0 = 1$ )
- Inverse Proportions (Workers problem)
  - Data Handling (Mode, Range)
  - Identity:  $(x+a)(x+b)$ ,  $(a+b)^2$

✓ NO Heron's Formula (Removed - Class 9)

✓ NO Cone (Removed - Class 9)

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