

Model Question Paper 2
Half-Yearly Examination 2026-27
MATHEMATICS

Time Allowed: 3 Hours

Maximum Marks: 80

General Instructions:

1. This question paper has 5 sections: A, B, C, D and E.
2. Section A has 20 objective type questions (Multiple Choice Questions and Assertion-Reason questions) carrying 1 mark each.
3. Section B has 5 questions carrying 2 marks each. Answers to these should not exceed 40-50 words each.
4. Section C has 6 questions carrying 3 marks each. Answers to these should not exceed 60-80 words each.
5. Section D has 4 questions carrying 5 marks each. Answers to these should not exceed 120 words each.
6. Section E has 3 source/case-based questions carrying 4 marks each, with four sub-parts of 1 mark each.
7. There is no overall choice. However, internal choices have been provided in all four questions of Section D and in one sub-part of each case-based question of Section E. A student has to attempt only one of the choices in such questions.
8. Use of calculators is not permitted.
9. Wherever necessary, neat and labelled figures should be drawn.

SECTION A

Question numbers 1 to 20 carry 1 mark each. Choose the most appropriate answer.

1. Which of the following numbers is a perfect square? [1]

- (a) 45
- (b) 81
- (c) 99
- (d) 120

2. The cube root of 2744 is: [1]

- (a) 12
- (b) 13
- (c) 14
- (d) 15

3. Using the pattern $1^3=1^2=(1)^2$, $1^3+2^3=(1+2)^2$, $1^3+2^3+3^3=(1+2+3)^2$, the value of $1^3+2^3+3^3+4^3$ is: [1]

- (a) 64
- (b) 90
- (c) 100
- (d) 144

4. Simplify: $4^2 \times 4^{-5}$. [1]

- (a) $4^{-3} = 1/64$
- (b) 4^7
- (c) $4^3 = 64$
- (d) 4^{-7}

5. The standard form of 0.000029 is: [1]

- (a) 2.9×10^{-5}
- (b) 29×10^{-6}

- (c) 2.9×10^{-4}
- (d) 0.29×10^{-4}

6. Simplify: $(3^2)^3 \div 3^5$. [1]

- (a) 1
- (b) 3
- (c) 9
- (d) 27

7. The multiplicative inverse (reciprocal) of $-4/7$ is: [1]

- (a) $-4/7$
- (b) $4/7$
- (c) $-7/4$
- (d) $7/4$

8. Which of the following rational numbers lies between -2 and -1? [1]

- (a) $-3/2$
- (b) $-5/2$
- (c) 0
- (d) 1

9. This question consists of two statements — Assertion (A) and Reason (R). Choose the correct option: [1]

Assertion (A): The rational numbers are closed under subtraction.

Reason (R): For any two rational numbers a and b, $a - b$ is always a rational number.

- (a) Both A and R are true, and R is the correct explanation of A
- (b) Both A and R are true, but R is NOT the correct explanation of A
- (c) A is true, but R is false
- (d) A is false, but R is true

10. The sum of the interior angles of a quadrilateral is: [1]

- (a) 180°
- (b) 270°
- (c) 360°
- (d) 400°

11. In a parallelogram, two adjacent angles are in the ratio 5:4. The measure of the smaller angle is: [1]

- (a) 70°
- (b) 80°
- (c) 100°
- (d) 90°

12. Which of the following statements about a trapezium is correct? [1]

- (a) Both pairs of opposite sides are parallel
- (b) Only one pair of opposite sides is parallel
- (c) All four sides are equal
- (d) Diagonals always bisect each other

13. A number is divisible by 15 if it is divisible by both: [1]

- (a) 3 and 5
- (b) 2 and 5
- (c) 3 and 4
- (d) 2 and 3

14. The LCM of 15 and 20 is: [1]

- (a) 30
- (b) 45
- (c) 60
- (d) 75

15. Using the distributive law, $9 \times (15 + 5)$ is equal to: [1]

- (a) $9 \times 15 + 9 \times 5$
- (b) $9 \times 15 + 5$
- (c) $9 + 15 \times 5$
- (d) $15 + 9 \times 5$

16. The product of $(-2x^2)$ and $(5x^3)$ is: [1]

- (a) $-10x^5$
- (b) $10x^5$
- (c) $-10x^6$
- (d) $-7x^5$

17. Using the distributive law, $a(b+c) - a(c)$ simplifies to: [1]

- (a) ab
- (b) ac
- (c) $ab+ac$
- (d) $a(b-c)$

18. ₹1500 is divided among P, Q and R in the ratio 3:4:5. Q's share is: [1]

- (a) ₹375
- (b) ₹450
- (c) ₹500
- (d) ₹625

19. If the cost of 12 notebooks is ₹180, find the cost of 15 notebooks (at the same rate). [1]

- (a) ₹200
- (b) ₹210
- (c) ₹225
- (d) ₹240

20. This question consists of two statements — Assertion (A) and Reason (R). Choose the correct option: [1]

Assertion (A): A marked price of ₹1200 with a discount of 25% gives a selling price of ₹900.

Reason (R): Discount = 25% of ₹1200 = ₹300, and Selling Price = Marked Price – Discount = 1200 – 300 = ₹900.

- (a) Both A and R are true, and R is the correct explanation of A
- (b) Both A and R are true, but R is NOT the correct explanation of A

- (c) A is true, but R is false
(d) A is false, but R is true

SECTION B

Question numbers 21 to 25 carry 2 marks each.

21. Find the square root of 441 by the prime factorisation method. [2]
22. Find the LCM of 12 and 30 using prime factorisation. [2]
23. Verify that multiplication of rational numbers is commutative for $-\frac{3}{4}$ and $\frac{5}{6}$, by checking that $(-\frac{3}{4}) \times (\frac{5}{6}) = (\frac{5}{6}) \times (-\frac{3}{4})$. [2]
24. Using the distributive law, find the product $4y(3y - 2x + 7)$. [2]
25. The angles of a quadrilateral are in the ratio 2:4:5:7. Find the measure of each angle. [2]

SECTION C

Question numbers 26 to 31 carry 3 marks each.

26. Find the smallest number by which 50 must be multiplied so that the product is a perfect square. Also find the square root of the resulting number. [3]
27. The ratio of red balls to blue balls in a bag is 3:7. If there are 21 red balls, find the number of blue balls and the total number of balls in the bag. [3]
28. Simplify: $\frac{3}{4} - (-\frac{2}{3}) \times \frac{3}{8}$. [3]
29. Multiply $(3x-4)(x+6)$ and simplify your answer. [3]
30. In a parallelogram PQRS, angle P = 125° . Diagonal PR bisects angle P into two equal parts. Find angle Q, angle R, angle S, and each half of the bisected angle P. [3]
31. Using divisibility tests, check whether the number 68,340 is divisible by (a) 4, and (b) 11. Show your working. [3]

SECTION D

Question numbers 32 to 35 carry 5 marks each.

32. (a) Simplify using laws of exponents: $2^3 \times 2^{-1} \div 2^{-4}$. (b) Express 7,20,00,000 in standard form. (c) Simplify: $(\frac{3}{4})^{-2}$. [5]

OR

- (a) Simplify using laws of exponents: $4^2 \times 4^{-4} \div 4^{-3}$. (b) Express 0.0000091 in standard form. (c) Simplify: $(\frac{2}{5})^{-2}$.
33. By using suitable properties, find: $\frac{3}{8} \times (-\frac{4}{9}) + \frac{3}{8} \times (-\frac{5}{9}) + \frac{3}{8} \times 1$. [5]

OR

By using suitable properties, find: $(-5/6) \times 2/7 + (-5/6) \times 5/7 + (-5/6) \times (-1)$.

34. A shopkeeper buys x chairs on rent at ₹15 each and y tables at ₹25 each for a school event, and adds a fixed delivery charge of ₹40, giving the total cost expression $15x + 25y + 40$. (a) If $x=20$ and $y=10$, find the total bill using the expression. (b) Using the distributive law, expand and simplify: $5(3x+4y) - 2(x-y)$. [5]

OR

A caterer buys x chairs on rent at ₹12 each and y tables at ₹80 each for an event, plus a fixed transport charge of ₹150, given by the expression $12x + 80y + 150$. (a) If $x=30$ and $y=8$, find the total cost. (b) Using the distributive law, expand and simplify: $6(2x+5y) - 3(x-2y)$.

35. The angles of a quadrilateral are in the ratio 3:5:7:9. (a) Find the measure of each angle. (b) Show that one pair of these (consecutive) angles is supplementary, and explain what this suggests about the quadrilateral possibly being a trapezium. (c) Find the largest angle. [5]

OR

The angles of a quadrilateral are in the ratio 5:6:7:12. (a) Find the measure of each angle. (b) Verify that the sum of the angles equals 360° . (c) Find the difference between the largest and smallest angles.

SECTION E

Question numbers 36 to 38 are source/case-based questions carrying 4 marks each, with four sub-parts of 1 mark each.

Case Study 1 — Question 36 [4 Marks]

A shopkeeper packs small cube-shaped soap boxes, each of side 5 cm, into a larger cube-shaped carton. The carton is designed to hold exactly 512 small cube boxes, arranged in a perfect $n \times n \times n$ pattern.

- (i) Is 512 a perfect cube? Find its cube root by prime factorisation, and hence find n . [1]
- (ii) Find the length of one edge of the large cube-shaped carton, given the $n \times n \times n$ arrangement ($n=8$) of small cubes of side 5 cm each. [1]
- (iii) Find the volume of the large cube-shaped carton, and verify that it equals 512 times the volume of one small cube box. [1]
- (iv) If the shopkeeper instead wants to pack 1000 such small cube boxes in a similar perfect cube arrangement ($n \times n \times n$), find n and state whether this is possible without any leftover boxes. [1]

OR If each small cube box costs ₹8, find the total cost of the 512 boxes needed to fill one large carton.

Case Study 2 — Question 37 [4 Marks]

Rohan wants to buy a bicycle worth ₹6000. The shop offers an interest-free instalment plan splitting the price into 3 monthly instalments in the ratio 2:3:5, or a 10% discount if the full amount is paid in cash upfront.

- (i) Using the ratio 2:3:5, find the amount payable in each of the three instalments (total ₹6000). [1]
- (ii) Find the ratio of the second instalment (₹1800) to the total price (₹6000), in simplest form. [1]
- (iii) If Rohan instead pays cash upfront and gets a 10% discount, find the discounted price he pays. [1]
- (iv) Find how much Rohan saves by paying cash upfront compared to paying the full ₹6000 through instalments, and express this saving as a percentage of the original price. [1]

OR If Rohan's friend buys a similar bicycle worth ₹7500 under the same instalment ratio (2:3:5), find the amount of the friend's largest instalment.

Case Study 3 — Question 38 [4 Marks]

A kite-shaped flower bed PQRS has $PQ = PS = 13$ m and $QR = RS = 15$ m, with diagonal PR as the axis of symmetry. The diagonals PR and QS intersect at right angles at point O, and it is known that in a kite, the diagonal

joining the vertices between the equal sides bisects the angles at those vertices, and the two angles between the unequal sides are equal.

(i) State two properties of the diagonals of the kite-shaped flower bed PQRS. [1]

(ii) Diagonal PR bisects angle P into two equal parts of 35° each. Find the full measure of angle P. [1]

(iii) In this kite, angle Q = angle S = 115° (the angles between the unequal sides are equal). Using the angle sum property of a quadrilateral, find angle R. [1]

(iv) Given that the diagonals intersect at O with OQ = 12 m and PQ = 13 m, find the length OP using the right triangle POQ. [1]

OR Given that OQ = 12 m and QR = 15 m, and the diagonals intersect at right angles at O, find the length OR using the right triangle QOR.