MATH LOVE INSTITUTE

CBSE Class 9 Mathematics (Code: 041)

Sample Paper 5 - Home Exam 2025-26 with Complete Solutions

Based on Latest CBSE Syllabus & Exam Pattern 2025-26

Maximum Marks	80 (Theory)
Time Allowed	3 Hours
Class	IX (Nine)
Subject	Mathematics (041)

📋 GENERAL INSTRUCTIONS:

1. This question paper contains **38 questions** divided into **Five Sections A, B, C, D and E**.
2. **Section A**: 20 MCQs of 1 mark each (20 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**. However, internal choices have been provided in some questions.
8. Draw neat diagrams wherever required. Take $\pi = 22/7$ wherever required.
9. Use of calculators is **NOT** permitted.

SECTION A - MULTIPLE CHOICE QUESTIONS (1 × 20 = 20 Marks)

Q1. The decimal form of 7/8 is: **[1]**

(a) Terminating

(b) Non-terminating repeating

(c) Non-terminating non-repeating

(d) Cannot be determined

Q2. $\sqrt{48}$ can be simplified as: **[1]**

(a) $4\sqrt{3}$

(b) $6\sqrt{2}$

(c) $2\sqrt{12}$

(d) $3\sqrt{16}$

Q3. If $p(x) = x^2 + 5x + 6$, then $p(-2)$ equals: **[1]**

(a) 0

(b) -4

(c) 4

(d) 20

Q4. The coefficient of x in the expansion of $(x + 3)^2$ is: **[1]**

(a) 3

(b) 6

(c) 9

(d) 1

Q5. The point (-4, 3) lies in which quadrant? **[1]**

(a) I

(b) II

(c) III

(d) IV

Q6. The ordinate of a point on x-axis is always: **[1]**

(a) 0

(b) 1

(c) Positive

(d) Negative

Q7. If two angles of a triangle are 55° and 65°, then the third angle is: **[1]**

(a) 50°

(b) 60°

(c) 70°

(d) 80°

Q8. In $\triangle ABC$, if AB = AC and $\angle B = 65°$, then $\angle A$ is: **[1]**

(a) 50°

(b) 65°

(c) 130°

(d) 115°

Q9. The sum of all angles of a quadrilateral is: **[1]**

(a) 180°

(b) 270°

(c) 360°

(d) 540°

Q10. A diameter of a circle divides it into: **[1]**

(a) Two equal arcs

(b) Two unequal arcs

(c) Three equal parts

(d) Four equal parts

Q11. The area of a rhombus with diagonals 12 cm and 16 cm is: **[1]**

(a) 192 cm^2

(b) 96 cm^2

(c) 48 cm^2

(d) 24 cm^2

Q12. The total surface area of a cube with edge 6 cm is: **[1]**

(a) 36 cm²

(b) 144 cm²

(c) 216 cm²

(d) 432 cm²

Q13. The volume of a sphere with radius 3 cm is: ($\pi = 22/7$) **[1]**

(a) 36π cm³

(b) 27π cm³

(c) 12π cm³

(d) 9π cm³

Q14. If the radius of a cone is doubled and height remains same, the volume becomes: **[1]**

(a) Double

(b) Triple

(c) Four times

(d) Eight times

Q15. The mode of data: 3, 5, 7, 5, 3, 5, 9 is: **[1]**

(a) 3

(b) 5

(c) 7

(d) 9

Q16. The class mark of class 20-30 is: **[1]**

(a) 20

(b) 25

(c) 30

(d) 50

Q17. If $a = 3$ and $b = 4$, then $a^2 + b^2$ equals: **[1]**

(a) 7

(b) 12

(c) 25

(d) 49

Q18. The graph of $y = 3$ is a line parallel to: **[1]**

(a) x-axis

(b) y-axis

(c) Both axes

(d) Neither axis

Q19. If $2x + 3y = 12$ and $x = 3$, then y equals: **[1]**

(a) 1

(b) 2

(c) 3

(d) 4

Q20. The value of $(104)^2$ using $(a + b)^2$ identity is: **[1]**

(a) 10608

(b) 10816

(c) 10824

(d) 10800

SECTION B - VERY SHORT ANSWER TYPE QUESTIONS (2 × 5 = 10 Marks)

Q21. Express $0.4\overline{7}$ (0.4777...) in the form p/q. **[2]**

Q22. Factorize: $x^2 + 10x + 21$ **[2]**

Q23. If x = 2, y = -3 is a solution of $ax + 3y = 7$, find the value of a. **[2]**

Q24. The diagonals of a rhombus are in the ratio 3:4. If the area is 54 cm^2, find the lengths of diagonals. **[2]**

Q25. Find the curved surface area of a cylinder with radius 7 cm and height 10 cm. **[2]**

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

Q26. Rationalize: $1/(\sqrt{5} + \sqrt{3})$ **[3]**

Q27. If $x + y = 10$ and $xy = 21$, find $x^2 + y^2$. **[3]**

Q28. In $\triangle ABC$, D is a point on BC such that AD bisects $\angle A$. If AB = 8 cm, AC = 6 cm and BD = 4 cm, find DC. **[3]**

OR

Prove that angles opposite to equal sides of a triangle are equal.

Q29. Find the area of a triangle with sides 20 cm, 21 cm and 29 cm using Heron's formula. **[3]**

Q30. A cone, a hemisphere and a cylinder stand on equal bases and have same heights. Find the ratio of their volumes. **[3]**

Q31. Find the median of: 25, 18, 13, 20, 16, 9, 22, 8, 36 **[3]**

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

Q32. Prove that $\sqrt{7}$ is an irrational number. **[5]**

OR

Find three irrational numbers between 5 and 6.

Q33. If $a + b + c = 15$ and $a^2 + b^2 + c^2 = 83$, find the value of $ab + bc + ca$. **[5]**

Q34. ABCD is a parallelogram. E and F are mid-points of BC and AD respectively. Prove that ABEF is a parallelogram. **[5]**

OR

Prove that the diagonals of a square are equal and bisect each other at right angles.

Q35. A solid consists of a circular cylinder with an exact fitting right circular cone placed on the top. The height of the cone is h. If the total volume of the solid is 3 times the volume of the cone, find the height of the cylinder in terms of h. **[5]**

SECTION E - CASE STUDY BASED QUESTIONS (4 × 3 = 12 Marks)

Q36. **[4]**

CASE STUDY 1: School Playground

A school has a triangular playground with sides 25 m, 17 m and 12 m. The school wants to level the ground and sow grass.

Based on the above information, answer the following questions:

(i) Find the semi-perimeter of the playground. **[1 mark]**

(ii) Find the area of the playground using Heron's formula. **[2 marks]**

(iii) If leveling costs ₹15 per m², find the total cost. **[1 mark]**

Q37. **[4]**

CASE STUDY 2: Ice-cream Cone

An ice-cream vendor has cones of radius 3 cm and height 12 cm. He fills the cone completely and puts a hemispherical scoop of ice-cream on top of the same radius.

Based on the above information, answer the following questions:

(i) Find the volume of ice-cream in the cone. **[1 mark]**

(ii) Find the volume of hemispherical scoop. **[1 mark]**

(iii) Find the total volume of ice-cream. **[2 marks]**

Q38. **[4]**

CASE STUDY 3: Monthly Electricity Bills

The monthly electricity bills (in rupees) of 25 houses in a locality are given below:
320, 275, 380, 325, 310, 290, 340, 360, 295, 280, 365, 315, 330, 305, 350, 285, 375, 300, 345, 335, 370, 355, 325, 340, 390

Based on the above information, answer the following questions:

(i) Find the range of the data. **[1 mark]**

(ii) Calculate the mean electricity bill. **[2 marks]**

(iii) How many houses have bills less than ₹320? **[1 mark]**

📚 END OF QUESTION PAPER 📚

Total Marks: 80

Section A: 20 marks | Section B: 10 marks | Section C: 18 marks

Section D: 20 marks | Section E: 12 marks

🎯 COMPLETE DETAILED SOLUTIONS WITH STEP-BY-STEP EXPLANATIONS

SECTION A - SOLUTIONS (1 × 20 = 20 Marks)

Q1. Answer: (a) Terminating

Solution: $7/8 = 7/(2^3)$
Since denominator has only powers of 2, the decimal expansion is terminating.
$7/8 = 0.875$

Q2. Answer: (a) $4\sqrt{3}$

Solution: $\sqrt{48} = \sqrt{(16 \times 3)} = \sqrt{16} \times \sqrt{3} = 4\sqrt{3}$

Q3. Answer: (a) 0

Solution: $p(x) = x^2 + 5x + 6$
$p(-2) = (-2)^2 + 5(-2) + 6 = 4 - 10 + 6 = 0$

Q4. Answer: (b) 6

Solution: $(x + 3)^2 = x^2 + 2(x)(3) + 9 = x^2 + 6x + 9$
Coefficient of x = 6

Q5. Answer: (b) II

Explanation: Point (-4, 3) has negative x-coordinate and positive y-coordinate.
Therefore, it lies in Quadrant II.

Q6. Answer: (a) 0

Explanation: On x-axis, the y-coordinate (ordinate) is always 0.

Q7. Answer: (b) 60°

Solution: Sum of angles = 180°
Third angle = 180° - 55° - 65° = 60°

Q8. Answer: (a) 50°

Solution: In △ABC, AB = AC (isosceles)
∠B = ∠C = 65° (angles opposite to equal sides)
∠A = 180° - 65° - 65° = 50°

Q9. Answer: (c) 360°

Explanation: Sum of all angles of a quadrilateral = 360°

Q10. Answer: (a) Two equal arcs

Explanation: A diameter divides a circle into two equal semicircular arcs.

Q11. Answer: (b) 96 cm²

Solution: Area of rhombus = $(1/2) \times d_1 \times d_2$
$= (1/2) \times 12 \times 16 = 96$ cm²

Q12. Answer: (c) 216 cm²

Solution: TSA of cube = $6a^2$
$= 6 \times (6)^2 = 6 \times 36 = 216$ cm²

Q13. Answer: (a) 36π cm³

Solution: Volume of sphere = $(4/3)\pi r^3$
$= (4/3)\pi(3)^3 = (4/3)\pi \times 27 = 36\pi$ cm³

Q14. Answer: (c) Four times

Solution: $V = (1/3)\pi r^2 h$
If r becomes 2r: $V' = (1/3)\pi(2r)^2 h = (1/3)\pi \times 4r^2 h = 4V$

Q15. Answer: (b) 5

Solution: Mode is the most frequently occurring value.
5 appears 3 times (most frequent), so Mode = 5

Q16. Answer: (b) 25

Solution: Class mark = (Lower limit + Upper limit)/2
= (20 + 30)/2 = 50/2 = 25

Q17. Answer: (c) 25

Solution: $a^2 + b^2 = 3^2 + 4^2 = 9 + 16 = 25$

Q18. Answer: (a) x-axis

Explanation: y = 3 is a horizontal line parallel to x-axis at distance 3 units above it.

Q19. Answer: (b) 2

Solution: 2x + 3y = 12
2(3) + 3y = 12
6 + 3y = 12
3y = 6
y = 2

Q20. Answer: (b) 10816

Solution: $(104)^2 = (100 + 4)^2$
$= (100)^2 + 2(100)(4) + (4)^2$
= 10000 + 800 + 16
= 10816

SECTION B - SOLUTIONS (2 × 5 = 10 Marks)

Q21. Solution:

Marking Scheme: 1 mark for method + 1 mark for answer

Let x = 0.4777...
10x = 4.777...
10x = $4.3\overline{7}$ where $\overline{7}$ means repeating 7
Actually, let x = $0.4\overline{7}$
10x = $4.\overline{7}$
100x = $47.\overline{7}$
100x - 10x = $47.\overline{7} - 4.\overline{7}$
90x = 43
x = 43/90
Answer: 43/90

Q22. Solution:

> **Marking Scheme:** 1 mark for splitting + 1 mark for factorization

$x^2 + 10x + 21$
$= x^2 + 7x + 3x + 21$
$= x(x + 7) + 3(x + 7)$
$= (x + 3)(x + 7)$

Q23. Solution:

> **Marking Scheme:** 1 mark for substitution + 1 mark for value

$ax + 3y = 7$
Substituting $x = 2$, $y = -3$:
$a(2) + 3(-3) = 7$
$2a - 9 = 7$
$2a = 16$
$a = 8$

Q24. Solution:

> **Marking Scheme:** 1 mark for equation + 1 mark for diagonals

Let diagonals be $3x$ and $4x$
Area $= (1/2) \times d_1 \times d_2$
$54 = (1/2) \times 3x \times 4x$
$54 = 6x^2$
$x^2 = 9$
$x = 3$ cm
Diagonals: $3x = 9$ cm and $4x = 12$ cm
Diagonals = 9 cm and 12 cm

Q25. Solution:

> **Marking Scheme:** 1 mark for formula + 1 mark for calculation

CSA of cylinder $= 2\pi rh$
$= 2 \times (22/7) \times 7 \times 10$
$= 2 \times 22 \times 10$
$= 440$ cm²
CSA = 440 cm²

SECTION C - SOLUTIONS (3 × 6 = 18 Marks)

Q26. Solution:

> **Marking Scheme:** 1 mark for conjugate + 1 mark for simplification + 1 mark for answer

$1/(\sqrt{5} + \sqrt{3})$
Multiplying by $(\sqrt{5} - \sqrt{3})/(\sqrt{5} - \sqrt{3})$:
$= (\sqrt{5} - \sqrt{3})/[(\sqrt{5} + \sqrt{3})(\sqrt{5} - \sqrt{3})]$
$= (\sqrt{5} - \sqrt{3})/(5 - 3)$
$= (\sqrt{5} - \sqrt{3})/2$
Answer: $(\sqrt{5} - \sqrt{3})/2$

Q27. Solution:

> **Marking Scheme:** 1 mark for identity + 1 mark for substitution + 1 mark for answer

Using identity: $(x + y)^2 = x^2 + y^2 + 2xy$
$(10)^2 = x^2 + y^2 + 2(21)$
$100 = x^2 + y^2 + 42$
$x^2 + y^2 = 100 - 42$
$x^2 + y^2 = 58$

Q28. Solution:

> **Marking Scheme:** 1 mark for angle bisector theorem + 1 mark for ratio + 1 mark for DC

By Angle Bisector Theorem:
$BD/DC = AB/AC$
$4/DC = 8/6$
$4/DC = 4/3$
$DC = 3$ cm
DC = 3 cm

OR

Given: $\triangle ABC$ with $AB = AC$
To Prove: $\angle B = \angle C$

Construction: Draw AD perpendicular to BC, where D is on BC

In $\triangle ABD$ and $\triangle ACD$:
$AB = AC$ (given)
$AD = AD$ (common)
$\angle ADB = \angle ADC = 90°$ (construction)
$\therefore \triangle ABD \cong \triangle ACD$ (RHS congruence)
$\therefore \angle B = \angle C$ (CPCT)

Hence Proved

Q29. Solution:

> **Marking Scheme:** 1 mark for s + 1 mark for formula + 1 mark for area

Sides: a = 20, b = 21, c = 29 cm
s = (20 + 21 + 29)/2 = 70/2 = 35 cm

Area = √[s(s-a)(s-b)(s-c)]
= √[35(35-20)(35-21)(35-29)]
= √[35 × 15 × 14 × 6]
= √[44100]
= 210 cm²

Area = 210 cm²

Q30. Solution:

> **Marking Scheme:** 1 mark each formula + 1 mark for ratio

Let radius = r, height = h

Volume of cone = $(1/3)\pi r^2 h$
Volume of hemisphere = $(2/3)\pi r^3 = (2/3)\pi r^2 \times r = (2/3)\pi r^2 h$ (since h = r)
Volume of cylinder = $\pi r^2 h$

Ratio = $(1/3)\pi r^2 h : (2/3)\pi r^2 h : \pi r^2 h$
= 1/3 : 2/3 : 1
= 1 : 2 : 3

Ratio = 1 : 2 : 3

Q31. Solution:

> **Marking Scheme:** 1 mark for arranging + 1 mark for finding middle + 1 mark for median

Data: 25, 18, 13, 20, 16, 9, 22, 8, 36

Arranging in ascending order:
8, 9, 13, 16, 18, 20, 22, 25, 36

n = 9 (odd)
Median = Middle term = 5th term
Median = 18

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

Q32. Solution:

> **Marking Scheme:** 2 marks assumption + 2 marks contradiction + 1 mark conclusion

To Prove: $\sqrt{7}$ is irrational

Proof by Contradiction:

Let us assume $\sqrt{7}$ is rational

Then $\sqrt{7} = p/q$ (where p, q are coprime, $q \neq 0$)

Squaring: $7 = p^2/q^2$

$p^2 = 7q^2$

7 divides $p^2 \rightarrow$ 7 divides p ...(i)

Let $p = 7m$

$(7m)^2 = 7q^2$

$49m^2 = 7q^2$

$7m^2 = q^2$

7 divides $q^2 \rightarrow$ 7 divides q ...(ii)

From (i) and (ii), both p and q are divisible by 7

This contradicts our assumption that p and q are coprime.

$\therefore$ $\sqrt{7}$ is irrational

Hence Proved

OR

Three irrational numbers between 5 and 6:

$\sqrt{26}$, $\sqrt{27}$, $\sqrt{28}$

(Since $5^2 = 25$ and $6^2 = 36$, any $\sqrt{n}$ where $25 < n < 36$ and n is not a perfect square)

Q33. Solution:

> **Marking Scheme:** 2 marks for identity + 2 marks for substitution + 1 mark for answer

Using identity: $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

Given: $a + b + c = 15$ and $a^2 + b^2 + c^2 = 83$

$(15)^2 = 83 + 2(ab + bc + ca)$

$225 = 83 + 2(ab + bc + ca)$

$2(ab + bc + ca) = 225 - 83$

$2(ab + bc + ca) = 142$

$ab + bc + ca = 71$

$ab + bc + ca = 71$

Q34. Solution:

Marking Scheme: 2 marks for properties + 2 marks for proof + 1 mark for conclusion

Given: ABCD is parallelogram, E and F are mid-points of BC and AD
To Prove: ABEF is a parallelogram

Proof:
In parallelogram ABCD:
AB || DC and AD || BC
Also AD = BC

Since F is mid-point of AD: AF = (1/2)AD
Since E is mid-point of BC: BE = (1/2)BC

Since AD = BC:
AF = BE

Also, since AD || BC:
AF || BE

In quadrilateral ABEF:
One pair of opposite sides (AF and BE) is equal and parallel
∴ **ABEF is a parallelogram**

Hence Proved

OR

Given: ABCD is a square
To Prove: (i) AC = BD (ii) AC and BD bisect each other at right angles

Proof:
In △ABC and △ABD:
AB = AB (common)
BC = AD (sides of square)
∠ABC = ∠BAD = 90°
∴ △ABC ≅ △ABD (SAS)
∴ AC = BD (CPCT) ...(i) proved

Let diagonals intersect at O
In △AOB and △COB:
AB = CB (sides of square)
AO = CO and BO = DO (diagonals of square bisect each other)
∴ Diagonals bisect each other ...(ii) proved

Also, ∠AOB = 90° (property of square)
∴ Diagonals bisect at right angles

Hence Proved

Q35. Solution:

> **Marking Scheme:** 2 marks for volumes + 2 marks for equation + 1 mark for answer

Let radius of cone and cylinder = r
Height of cone = h
Let height of cylinder = H

Volume of cone = $(1/3)\pi r^2 h$
Volume of cylinder = $\pi r^2 H$
Total volume = $(1/3)\pi r^2 h + \pi r^2 H$

Given: Total volume = 3 × Volume of cone
$(1/3)\pi r^2 h + \pi r^2 H = 3 \times (1/3)\pi r^2 h$
$(1/3)\pi r^2 h + \pi r^2 H = \pi r^2 h$
$\pi r^2 H = \pi r^2 h - (1/3)\pi r^2 h$
$\pi r^2 H = (2/3)\pi r^2 h$
$H = (2/3)h$

Height of cylinder = (2/3)h or 2h/3

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

Q36. Solution: CASE STUDY 1 - School Playground

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

(i) Semi-perimeter:
s = (25 + 17 + 12)/2 = 54/2 = 27 m
s = 27 m

(ii) Area using Heron's formula:
Area = $\sqrt{[s(s-a)(s-b)(s-c)]}$
= $\sqrt{[27(27-25)(27-17)(27-12)]}$
= $\sqrt{[27 \times 2 \times 10 \times 15]}$
= $\sqrt{[8100]}$
= 90 m²
Area = 90 m²

(iii) Total cost of leveling:
Cost = Area × Rate
= 90 × 15
= ₹1350
Cost = ₹1350

Q37. Solution: CASE STUDY 2 - Ice-cream Cone

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

r = 3 cm, h = 12 cm

(i) Volume of ice-cream in cone:

$V = (1/3)\pi r^2 h$

$= (1/3) \times (22/7) \times 3^2 \times 12$

$= (1/3) \times (22/7) \times 9 \times 12$

$= (1/3) \times (22/7) \times 108$

$= 792/7$

$= 113.14 \text{ cm}^3$

$\approx$ **113 cm³**

(ii) Volume of hemispherical scoop:

$V = (2/3)\pi r^3$

$= (2/3) \times (22/7) \times 3^3$

$= (2/3) \times (22/7) \times 27$

$= 396/7$

$= 56.57 \text{ cm}^3$

$\approx$ **57 cm³**

(iii) Total volume of ice-cream:

Total = 792/7 + 396/7

= 1188/7

$= 169.71 \text{ cm}^3$

$\approx$ **170 cm³**

Q38. Solution: CASE STUDY 3 - Electricity Bills

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

Data: 320, 275, 380, 325, 310, 290, 340, 360, 295, 280, 365, 315, 330, 305, 350, 285, 375, 300, 345, 335, 370, 355, 325, 340, 390

(i) Range:

Range = Highest - Lowest

= 390 - 275

= 115

Range = ₹115

(ii) Mean electricity bill:

Sum = 320+275+380+325+310+290+340+360+295+280+365+315+330+305+350+285+375+300+345+335+370+355+325+340+3

= 8260

Mean = 8260/25

= 330.4

Mean = ₹330.40

(iii) Houses with bills < ₹320:

Bills < 320: 275, 310, 290, 295, 280, 315, 305, 285, 300

Count = 9 houses

9 houses

✅ END OF COMPLETE SOLUTIONS ✅

All 38 questions solved with detailed step-by-step explanations

Paper 5 Topics Covered:

- Number Systems & Rationalization
- Polynomials & Algebraic Identities
- Coordinate Geometry
- Triangles - Isosceles, Angle Bisector Theorem
- Quadrilaterals - Parallelogram Properties
- Heron's Formula Applications
- Surface Areas & Volumes
- Statistics - Mean, Median, Mode, Range
- Real-world Case Studies