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CBSE Class 9 Mathematics (Code: 041)

Sample Paper 3 - 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.

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

- Q1.** Every rational number is: [1]
- (a) A whole number
 - (b) A natural number
 - (c) A real number
 - (d) An integer
- Q2.** $1/(\sqrt{9} - \sqrt{8})$ when rationalized becomes: [1]
- (a) $\sqrt{9} + \sqrt{8}$
 - (b) $\sqrt{9} - \sqrt{8}$
 - (c) $9 + \sqrt{8}$
 - (d) $9 - \sqrt{8}$
- Q3.** If $p(x) = x^2 - 5x + 6$, then $p(3)$ is: [1]
- (a) 0
 - (b) 2
 - (c) -2
 - (d) 6
- Q4.** The solution of $3x + 2y = 12$ and $x = 2$ is: [1]
- (a) $x = 2, y = 3$
 - (b) $x = 2, y = 4$
 - (c) $x = 2, y = 2$
 - (d) $x = 3, y = 2$
- Q5.** In which quadrant does the point $(2, -3)$ lie? [1]
- (a) I
 - (b) II
 - (c) III
 - (d) IV
- Q6.** If one angle of a triangle is equal to the sum of the other two angles, then the triangle [1] is:
- (a) Acute angled
 - (b) Obtuse angled
 - (c) Right angled
 - (d) Equilateral

- Q7.** In $\triangle ABC$, $AB = 5$ cm, $BC = 12$ cm and $AC = 13$ cm. The triangle is: [1]
- (a) Acute angled
 - (b) Right angled
 - (c) Obtuse angled
 - (d) Equilateral
- Q8.** The sum of all the exterior angles of a triangle is: [1]
- (a) 180°
 - (b) 360°
 - (c) 540°
 - (d) 720°
- Q9.** A quadrilateral has all sides equal and diagonals perpendicular to each other. It is a: [1]
- (a) Rectangle
 - (b) Square
 - (c) Rhombus
 - (d) Parallelogram
- Q10.** The perpendicular from the centre of a circle to a chord: [1]
- (a) Bisects the chord
 - (b) Trisects the chord
 - (c) Does not bisect the chord
 - (d) None of these
- Q11.** The area of a triangle with base 10 cm and height 8 cm is: [1]
- (a) 80 cm^2
 - (b) 40 cm^2
 - (c) 18 cm^2
 - (d) 20 cm^2
- Q12.** The total surface area of a cube with edge 5 cm is: [1]
- (a) 25 cm^2
 - (b) 125 cm^2
 - (c) 150 cm^2
 - (d) 100 cm^2

- Q13.** If the radius of a sphere is doubled, its volume becomes: [1]
- (a) 2 times
 - (b) 4 times
 - (c) 8 times
 - (d) 16 times
- Q14.** The mode of the data: 5, 3, 7, 5, 9, 5, 11 is: [1]
- (a) 3
 - (b) 5
 - (c) 7
 - (d) 9
- Q15.** The class mark of the class 90-110 is: [1]
- (a) 90
 - (b) 100
 - (c) 110
 - (d) 200
- Q16.** The median of first 7 odd natural numbers is: [1]
- (a) 5
 - (b) 7
 - (c) 9
 - (d) 11
- Q17.** The distance of point (4, 0) from the origin is: [1]
- (a) 0
 - (b) 4
 - (c) -4
 - (d) 8
- Q18.** A line parallel to y-axis has equation: [1]
- (a) $y = k$
 - (b) $x = k$
 - (c) $x + y = k$
 - (d) $x - y = k$

- Q19.** If $x^3 + y^3 = 0$, then: [1]
- (a) $x = y$
(b) $x = -y$
(c) $x = 0$
(d) $y = 0$

- Q20.** The value of $(a + b)^3 - (a - b)^3$ is: [1]
- (a) $2a^3 + 6ab^2$
(b) $2b^3 + 6a^2b$
(c) $a^3 + b^3$
(d) $8ab$

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

- Q21.** Find three rational numbers between 3 and 4. [2]
- Q22.** If $x - 2$ is a factor of $x^3 - 3x^2 + ax + 6$, find the value of a . [2]
- Q23.** Write the coordinates of a point which lies on x-axis at a distance of 5 units from the origin in the negative direction. [2]
- Q24.** In $\triangle ABC$, $\angle A = 70^\circ$ and $\angle B = 60^\circ$. Which side of the triangle is the longest? [2]
- Q25.** The diameter of the base of a cylinder is 14 cm and its height is 10 cm. Find its curved surface area. [2]

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

- Q26.** Simplify: $(\sqrt{3} + \sqrt{7})(\sqrt{3} - \sqrt{7})$ [3]
- Q27.** Factorise: $x^3 - 2x^2 - 5x + 6$ [3]
- Q28.** ABCD is a rhombus. Prove that $\triangle ABC \cong \triangle CDA$. [3]

OR

In $\triangle ABC$, $\angle B = 90^\circ$ and $BD \perp AC$. Prove that $AB^2 = AD \times AC$.

Q29. The sides of a triangle are 35 cm, 54 cm and 61 cm. Find its area using Heron's formula. [3]

Q30. How many litres of milk can a hemispherical bowl of radius 10.5 cm hold? (Take $\pi = 22/7$) [3]

Q31. Find the median of the following data: 41, 43, 46, 50, 53, 61, 70, 79, 84, 88. [3]

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

Q32. Prove that $\sqrt{3}$ is an irrational number. [5]

OR

If $x = 5 + 2\sqrt{6}$, find the value of $x + 1/x$ and $x^2 + 1/x^2$.

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

Q34. In $\triangle ABC$, D is the mid-point of BC. Prove that $AB + AC > 2AD$. [5]

OR

Prove that if in a triangle, the square of one side is equal to the sum of squares on the other two sides, then the angle opposite to the first side is a right angle. (Converse of Pythagoras Theorem)

Q35. Draw the graph of the equation $y = 2x - 1$. From the graph, find: [5]

(i) The value of y when $x = 3$

(ii) The value of x when $y = 5$

(iii) The point where the line crosses the x-axis

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

Q36.

[4]

CASE STUDY 1: Garden Layout

A landscaper wants to design a triangular garden with sides measuring 13 m, 14 m and 15 m. The garden will be covered with grass and surrounded by a decorative fence.

Based on the above information, answer the following questions:

- (i) Find the semi-perimeter of the garden. [1 mark]
- (ii) Calculate the area of the garden using Heron's formula. [2 marks]
- (iii) If grass costs ₹40 per m^2 , find the total cost of grass. [1 mark]

Q37.

[4]

CASE STUDY 2: Water Tank Problem

A hemispherical tank of radius 1.4 m is filled with water. The water is to be transferred into cylindrical bottles of radius 7 cm and height 10 cm.

Based on the above information, answer the following questions:

- (i) Find the volume of the hemispherical tank in cm^3 . [1 mark]
- (ii) Find the volume of one cylindrical bottle. [1 mark]
- (iii) How many bottles can be filled from the tank? [2 marks]

CASE STUDY 3: Sports Day Results

In a school sports day, the time taken (in seconds) by 50 students to complete a 100m race is given below:

Time (seconds)	12-14	14-16	16-18	18-20	20-22
Number of Students	8	12	15	10	5

Based on the above information, answer the following questions:

- (i) Find the modal class. [1 mark]
- (ii) Calculate the mean time. [2 marks]
- (iii) How many students took less than 18 seconds? [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

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

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

Q1. Answer: (c) A real number

Explanation: Every rational number is a real number. The set of real numbers includes both rational and irrational numbers.

Q2. Answer: (a) $\sqrt{9} + \sqrt{8}$

Solution: $1/(\sqrt{9} - \sqrt{8}) = (\sqrt{9} + \sqrt{8})/[(\sqrt{9} - \sqrt{8})(\sqrt{9} + \sqrt{8})] = (\sqrt{9} + \sqrt{8})/(9 - 8) = \sqrt{9} + \sqrt{8}$

Q3. Answer: (a) 0

Solution: $p(3) = (3)^2 - 5(3) + 6 = 9 - 15 + 6 = 0$

Q4. Answer: (a) $x = 2, y = 3$

Solution: $3(2) + 2y = 12 \rightarrow 6 + 2y = 12 \rightarrow y = 3$

Q5. Answer: (d) IV

Explanation: Point (2, -3) has positive x and negative y, so it lies in Quadrant IV.

Q6. Answer: (c) Right angled

Explanation: If $A = B + C$, then $A + B + C = 180^\circ$ gives $2A = 180^\circ$, so $A = 90^\circ$.

Q7. Answer: (b) Right angled

Solution: $5^2 + 12^2 = 25 + 144 = 169 = 13^2$. By Pythagoras converse, it's right-angled at B.

Q8. Answer: (b) 360°

Explanation: The sum of exterior angles of any polygon is always 360° .

Q9. Answer: (c) Rhombus

Explanation: A quadrilateral with all sides equal and perpendicular diagonals is a rhombus.

Q10. Answer: (a) Bisects the chord

Explanation: Circle theorem: The perpendicular from centre to chord bisects the chord.

Q11. Answer: (b) 40 cm^2

Solution: Area = $(1/2) \times 10 \times 8 = 40 \text{ cm}^2$

Q12. Answer: (c) 150 cm^2

Solution: TSA of cube = $6a^2 = 6 \times 25 = 150 \text{ cm}^2$

Q13. Answer: (c) 8 times

Solution: New volume = $(4/3)\pi(2r)^3 = 8 \times (4/3)\pi r^3$

Q14. Answer: (b) 5

Solution: 5 appears 3 times (highest frequency). Mode = 5

Q15. Answer: (b) 100

Solution: Class mark = $(110 + 90)/2 = 100$

Q16. Answer: (b) 7

Solution: First 7 odd numbers: 1, 3, 5, 7, 9, 11, 13. Median = 4th term = 7

Q17. Answer: (b) 4

Solution: Distance = $\sqrt{[(4-0)^2 + (0-0)^2]} = 4$ units

Q18. Answer: (b) $x = k$

Explanation: Line parallel to y-axis has constant x-coordinate: $x = k$

Q19. Answer: (b) $x = -y$

Solution: $x^3 + y^3 = 0 \rightarrow x^3 = -y^3 \rightarrow x = -y$

Q20. Answer: (b) $2b^3 + 6a^2b$

Solution: $(a+b)^3 - (a-b)^3 = [a^3+3a^2b+3ab^2+b^3] - [a^3-3a^2b+3ab^2-b^3] = 6a^2b + 2b^3$

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SECTION B - SOLUTIONS ($2 \times 5 = 10$ Marks)

Q21. Solution:

Marking Scheme: 1 mark method + 1 mark answer

Three rational numbers between 3 and 4:

$$3 = 30/10 \text{ and } 4 = 40/10$$

Answer: 3.1, 3.2, 3.3 (or 31/10, 32/10, 33/10)

Q22. Solution:

Marking Scheme: 1 mark Factor Theorem + 1 mark value

$$p(x) = x^3 - 3x^2 + ax + 6$$

$$p(2) = 8 - 12 + 2a + 6 = 0$$

$$2 + 2a = 0$$

$$\mathbf{a = -1}$$

Q23. Solution:

Marking Scheme: 1 mark understanding + 1 mark coordinates

Point on x-axis has $y = 0$

5 units in negative direction: $x = -5$

Coordinates: (-5, 0)

Q24. Solution:

Marking Scheme: 1 mark finding $\angle C$ + 1 mark side

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

$$70^\circ + 60^\circ + \angle C = 180^\circ$$

$$\angle C = 50^\circ$$

Largest angle $\angle A = 70^\circ$

BC is the longest side (opposite to $\angle A$)

Q25. Solution:

Marking Scheme: 1 mark radius + 1 mark CSA

Diameter = 14 cm, so $r = 7$ cm, $h = 10$ cm

$$\text{CSA} = 2\pi rh = 2 \times (22/7) \times 7 \times 10 = 440 \text{ cm}^2$$

$$\text{CSA} = \mathbf{440 \text{ cm}^2}$$

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SECTION C - SOLUTIONS (3 × 6 = 18 Marks)**Q26. Solution:**

Marking Scheme: 1 mark identity + 1 mark substitution + 1 mark answer

$$(\sqrt{3} + \sqrt{7})(\sqrt{3} - \sqrt{7})$$

$$\text{Using } (a+b)(a-b) = a^2 - b^2$$

$$= (\sqrt{3})^2 - (\sqrt{7})^2 = 3 - 7$$

$$= \mathbf{-4}$$

Q27. Solution:

Marking Scheme: 1 mark factor + 1 mark division + 1 mark complete factorization

$$p(x) = x^3 - 2x^2 - 5x + 6$$

$$p(1) = 1 - 2 - 5 + 6 = 0, \text{ so } (x-1) \text{ is a factor}$$

$$x^3 - 2x^2 - 5x + 6 = (x-1)(x^2 - x - 6) = (x-1)(x+2)(x-3)$$

Answer: $(x-1)(x+2)(x-3)$

Q28. Solution:

Marking Scheme: 1 mark sides + 1 mark diagonal + 1 mark proof

In $\triangle ABC$ and $\triangle CDA$:

$$AB = CD \text{ (opposite sides of rhombus)}$$

$$BC = DA \text{ (opposite sides of rhombus)}$$

$$AC = AC \text{ (common)}$$

$\therefore \triangle ABC \cong \triangle CDA$ (SSS) **Hence Proved**

OR

In $\triangle ADB$ and $\triangle ABC$:

$$\angle ADB = \angle ABC = 90^\circ, \angle A = \angle A$$

$$\triangle ADB \sim \triangle ABC \text{ (AA similarity)}$$

$$AD/AB = AB/AC \rightarrow AB^2 = AD \times AC \text{ Hence Proved}$$

Q29. Solution:

Marking Scheme: 1 mark s + 1 mark formula + 1 mark calculation

$$a = 35, b = 54, c = 61$$

$$s = (35+54+61)/2 = 75 \text{ cm}$$

$$\text{Area} = \sqrt{[75(75-35)(75-54)(75-61)]}$$

$$= \sqrt{[75 \times 40 \times 21 \times 14]} = \sqrt{882000} = 939 \text{ cm}^2$$

Area $\approx 939 \text{ cm}^2$

Q30. Solution:

Marking Scheme: 1 mark formula + 1 mark calculation + 1 mark litres

$$r = 10.5 \text{ cm}$$

$$\text{Volume} = \left(\frac{2}{3}\right)\pi r^3 = \left(\frac{2}{3}\right) \times \left(\frac{22}{7}\right) \times (10.5)^3 = 2425.5 \text{ cm}^3$$

$$= 2425.5/1000 \text{ litres}$$

$$\approx \mathbf{2.43 \text{ litres}}$$

Q31. Solution:

Marking Scheme: 1 mark arranging + 1 mark position + 1 mark median

Data: 41, 43, 46, 50, 53, 61, 70, 79, 84, 88

$$n = 10 \text{ (even)}$$

$$\text{Median} = (\text{5th} + \text{6th term})/2 = (53 + 61)/2 = 57$$

$$\mathbf{\text{Median} = 57}$$

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

Q32. Solution:

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

To Prove: $\sqrt{3}$ is irrational

Assume $\sqrt{3} = p/q$ (p, q co-prime)

$$3 = p^2/q^2 \rightarrow p^2 = 3q^2$$

3 divides $p^2 \rightarrow$ 3 divides p

$$\text{Let } p = 3m \rightarrow 9m^2 = 3q^2 \rightarrow 3m^2 = q^2$$

3 divides q

Contradiction! $\therefore \sqrt{3}$ is irrational

OR

$$x = 5 + 2\sqrt{6}$$

$$1/x = (5-2\sqrt{6})/[(5+2\sqrt{6})(5-2\sqrt{6})] = (5-2\sqrt{6})/(25-24) = 5-2\sqrt{6}$$

$$x + 1/x = (5+2\sqrt{6}) + (5-2\sqrt{6}) = 10$$

$$(x+1/x)^2 = x^2 + 2 + 1/x^2$$

$$100 = x^2 + 2 + 1/x^2$$

$$\mathbf{x^2 + 1/x^2 = 98}$$

Q33. Solution:

Marking Scheme: 2 marks identity + 2 marks substitution + 1 mark calculation

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

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

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

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

$$\mathbf{ab + bc + ca = 71}$$

Q34. Solution:

Marking Scheme: 2 marks construction + 2 marks proof + 1 mark conclusion

Given: D is mid-point of BC

Construction: Produce AD to E such that AD = DE. Join EC.

In $\triangle ADB$ and $\triangle EDC$: AD=DE, BD=DC, $\angle ADB = \angle EDC$

$\triangle ADB \cong \triangle EDC$ (SAS) $\rightarrow AB = EC$

In $\triangle AEC$: AC + CE > AE

AC + AB > 2AD **Hence Proved**

OR Converse of Pythagoras:

Given $AC^2 = AB^2 + BC^2$

Construct $\triangle PQR$: PQ=AB, QR=BC, $\angle Q=90^\circ$

$PR^2 = PQ^2 + QR^2 = AB^2 + BC^2 = AC^2$

PR = AC

$$\triangle ABC \cong \triangle PQR \text{ (SSS)}$$

$$\angle B = \angle Q = 90^\circ \text{ Hence Proved}$$

Q35. Solution:

Marking Scheme: 2 marks graph + 1 mark each part

$$y = 2x - 1$$

Points: (0,-1), (1,1), (2,3), (3,5)

[Draw graph]

(i) When $x=3$: $y = 2(3)-1 = 5$

(ii) When $y=5$: $5 = 2x-1 \rightarrow x = 3$

(iii) x-axis crossing: $y=0 \rightarrow 0=2x-1 \rightarrow x=0.5$, Point: (0.5, 0)

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

Q36. Solution: CASE STUDY 1

Marking Scheme: 1 + 2 + 1 = 4 marks

(i) $s = (13+14+15)/2 = 21 \text{ m}$

(ii) Area = $\sqrt{[21 \times 8 \times 7 \times 6]} = \sqrt{7056} = 84 \text{ m}^2$

(iii) Cost = $84 \times 40 = ₹3360$

Q37. Solution: CASE STUDY 2

Marking Scheme: 1 + 1 + 2 = 4 marks

(i) $r=1.4\text{m}=140\text{cm}$, $V=(2/3)\pi(140)^3 = 5,749,333 \text{ cm}^3$

(ii) $v = \pi(7)^2(10) = 1540 \text{ cm}^3$

(iii) $n = 5749333/1540 = 3734 \text{ bottles}$

Q38. Solution: CASE STUDY 3

Marking Scheme: 1 + 2 + 1 = 4 marks

(i) Modal class = 16-18 (highest frequency = 15)

(ii) Mean = $\frac{\sum f_i x_i}{\sum f_i} = \frac{(8 \times 13 + 12 \times 15 + 15 \times 17 + 10 \times 19 + 5 \times 21)}{50} = \frac{834}{50} = 16.68$
seconds

(iii) Students < 18 seconds = 8 + 12 + 15 = 35 students

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✓ **END OF SOLUTIONS** ✓

All solutions based on CBSE Class 9 Syllabus 2025-26

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