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Your JEE Guide

CBSE Class X · Mathematics Standard (041)

Sample Question Paper 7 · Session 2026-27

Time allowed: 3 hours **Maximum marks: 80**

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General instructions:

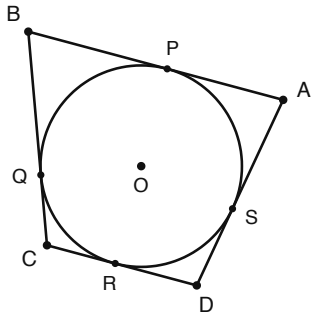
1. This question paper contains 38 questions. All questions are compulsory.
2. This question paper is divided into five Sections: A, B, C, D and E.
3. In Section A, Questions 1 to 18 are multiple choice questions (MCQs) and Questions 19 and 20 are Assertion–Reason based questions of 1 mark each.
4. In Section B, Questions 21 to 25 are very short answer (VSA) type questions carrying 2 marks each.
5. In Section C, Questions 26 to 31 are short answer (SA) type questions carrying 3 marks each.
6. In Section D, Questions 32 to 35 are long answer (LA) type questions carrying 5 marks each.
7. In Section E, Questions 36 to 38 are case study based questions carrying 4 marks each.
8. There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 2 questions in Section C, 2 questions in Section D, and in the 2-mark sub-parts of Section E.
9. Draw neat figures wherever required. Take π = 22/7 wherever required, if not stated.
10. Use of calculators is not allowed.

Section A

1.	If $2^a \times 3^b = 72$, then a + b is: (A) 7 (B) 5 (C) 6 (D) 4	1
2.	Which of the following is a rational number? (A) $\sqrt{5}$ (B) π (C) $\sqrt{\frac{9}{4}}$ (D) $2\sqrt{3}$	1
3.	A quadratic polynomial whose zeroes are 5 and –5 is: (A) $x^2 - 25$ (B) $x^2 + 10x - 25$ (C) $x^2 + 25$ (D) $x^2 - 10x + 25$	1
4.	If one zero of $x^2 - 6x + k$ is twice the other, then k is: (A) 4 (B) 6 (C) 9 (D) 8	1

5.	The pair $2x + 3y = 5$ and $4x + 6y = c$ has no solution when: (A) $c \neq 10$ (B) c = 10 (C) c = 5 (D) for every value of c	1
6.	The sum of the roots of $3x^2 - 5x + 2 = 0$ is: (A) $-\frac{2}{3}$ (B) $-\frac{5}{3}$ (C) $\frac{2}{3}$ (D) $\frac{5}{3}$	1
7.	The first four terms of the AP with first term –2 and common difference –2 are: (A) –2, 0, 2, 4 (B) –2, –4, –8, –16 (C) –2, –4, –6, –8 (D) 2, 4, 6, 8	1
8.	The number of multiples of 4 between 10 and 250 is: (A) 61 (B) 60 (C) 59 (D) 62	1
9.	The distance of the point (3, –4) from the x-axis is: (A) 4 units (B) 3 units (C) 5 units (D) 7 units	1
10.	If (1, 2a + 1) is the midpoint of the segment joining (2a, 4) and (–2, 3b), then: (A) a = 1, b = 1 (B) a = 2, b = 2 (C) a = 2, b = 1 (D) a = 1, b = 2	1
11.	$\sin 30^\circ + \cos 60^\circ$ is equal to: (A) $\sqrt{3}$ (B) $\frac{1}{2}$ (C) 1 (D) 0	1
12.	If $4\tan\theta = 3$, then $\dfrac{4\sin\theta - \cos\theta}{4\sin\theta + \cos\theta}$ is: (A) $\frac{3}{4}$ (B) $\frac{2}{3}$ (C) $\frac{1}{3}$ (D) $\frac{1}{2}$	1
13.	The shadow of a tower is $\sqrt{3}$ times its height. The angle of elevation of the Sun is: (A) 45° (B) 90° (C) 60° (D) 30°	1
14.	In $\triangle ABC$, $\angle B = 90^\circ$ and BD $\perp$ AC. If AD = 4 cm and CD = 9 cm, then BD is: (A) 6 cm (B) 5 cm (C) 13 cm (D) 36 cm	1

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15.	A quadrilateral ABCD is drawn to circumscribe a circle. If AB = 7 cm, BC = 8 cm and CD = 6 cm, then AD is:  (A) 9 cm (B) 5 cm (C) 7 cm (D) 21 cm	1
16.	The area of the largest circle that can be drawn inside a square of side 6 cm is: (A) 6π cm² (B) 18π cm² (C) 9π cm² (D) 36π cm²	1
17.	The volume of the largest right circular cone that can be cut out of a cube of edge 4.2 cm is: (use $\pi = \frac{22}{7}$) (A) 9.702 cm³ (B) 38.808 cm³ (C) 58.212 cm³ (D) 19.404 cm³	1
18.	A coin is tossed twice. The probability of getting at least one head is: (A) 1 (B) $\frac{1}{4}$ (C) $\frac{3}{4}$ (D) $\frac{1}{2}$	1
19.	**Assertion (A):** $\sec^2\theta - \tan^2\theta = 1$ for every acute angle θ. **Reason (R):** $1 + \tan^2\theta = \sec^2\theta$. (A) Both Assertion (A) and Reason (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.	1
20.	**Assertion (A):** The distance between (0, 0) and (3, 4) is 7 units. **Reason (R):** The distance of a point (x, y) from the origin is $\sqrt{x^2 + y^2}$. (A) Both Assertion (A) and Reason (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.	1

Section B

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21.	Express 5005 as a product of its prime factors. Hence find the HCF of 5005 and 1001.	2
22.	Find a quadratic polynomial whose zeroes are –2 and $\frac{1}{3}$. **OR** Without solving, determine whether the pair $3x + 2y = 5$ and $2x - 3y = 7$ is consistent.	2
23.	Find the ratio in which the x-axis divides the line segment joining A(1, –5) and B(–4, 5). Also find the point of division.	2
24.	Find the length of the arc of a circle of radius 14 cm whose central angle is 45°. (use $\pi = \frac{22}{7}$) **OR** A horse is tied to a peg at one corner of a square grass field of side 15 m with a 5 m rope. Find the area of the field the horse can graze. (use $\pi = 3.14$)	2
25.	Evaluate: $\dfrac{\sin 30^\circ + \tan 45^\circ - \operatorname{cosec} 60^\circ}{\sec 30^\circ + \cos 60^\circ + \cot 45^\circ}$.	2

Section C

26.	Given that $\sqrt{2}$ is irrational, prove that $\frac{1}{\sqrt{2}}$ is irrational.	3
27.	Find a quadratic polynomial whose zeroes are the reciprocals of the zeroes of $x^2 - 7x + 12$.	3
28.	Part of the monthly hostel charge is fixed and the rest depends on the number of days a student takes food in the mess. Student A takes food for 20 days and pays ₹1000; student B takes food for 26 days and pays ₹1180. Find the fixed charge and the cost of food per day. **OR** Places A and B are 100 km apart on a highway. One car starts from A and another from B at the same time. If they travel in the same direction, they meet in 5 hours; if they travel towards each other, they meet in 1 hour. Find their speeds.	3
29.	Prove that in two concentric circles, the chord of the larger circle that touches the smaller circle is bisected at the point of contact. **OR** XY and X′Y′ are two parallel tangents to a circle with centre O. Another tangent AB, touching the circle at C, meets XY at A and X′Y′ at B. Prove that $\angle AOB = 90^\circ$.	3
30.	Prove that $\dfrac{\sin A + \cos A}{\sin A - \cos A} + \dfrac{\sin A - \cos A}{\sin A + \cos A} = \dfrac{2}{2\sin^2 A - 1}$.	3

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31. Find the median of the following data: — 3

Class	0–10	10–20	20–30	30–40	40–50
Frequency	5	9	15	10	6

Section D

32. A shopkeeper buys some books for ₹80. Had he bought 4 more books for the same amount, each book would have cost ₹1 less. Find the number of books he bought. — 5

OR

A pole is to be put up on the boundary of a circular park of diameter 13 m so that the difference of its distances from two diametrically opposite gates A and B is 7 m. Is this possible? If so, how far from each gate should it be?

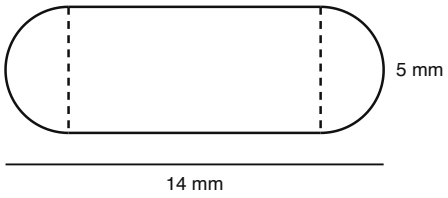
33. A construction contract sets a penalty for each day of delay: ₹200 for the first day, ₹250 for the second, ₹300 for the third, and so on, rising by ₹50 each day. Find the penalty for the 30th day of delay, and the total penalty if the work is 30 days late. — 5

34. A 1.2 m tall girl spots a balloon moving with the wind in a horizontal line 88.2 m above the ground. The angle of elevation of the balloon from her eyes is 60° at first, and some time later it is 30°. Find the distance travelled by the balloon in this time. (use $\sqrt{3} = 1.732$) — 5

OR

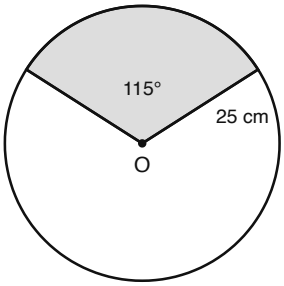
From the top of a 60 m high building, the angles of depression of the top and the bottom of a tower are 30° and 60°. Find the height of the tower.

35. A medicine capsule is a cylinder with a hemisphere at each end. Its total length is 14 mm and its diameter is 5 mm. Find its surface area and its volume. (use $\pi = \frac{22}{7}$) — 5



Section E

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36.	**Case study 1.** At a cinema, 3 adult tickets and 2 child tickets cost ₹1300, while 2 adult tickets and 3 child tickets cost ₹1200. (i) Taking the prices as ₹x (adult) and ₹y (child), write the pair of equations. *[1]* (ii) Find x + y. *[1]* (iii) Find the price of each ticket. *[2]* **OR** (iii) Find the cost of 4 adult and 5 child tickets. *[2]*	4
37.	**Case study 2.** A car has two wipers that do not overlap. Each blade is 25 cm long and sweeps through an angle of 115°. (use $\pi = \frac{22}{7}$)  (i) Find the area swept by one wiper. *[1]* (ii) Find the length of the arc traced by the tip of one blade. *[1]* (iii) Find the total area cleaned at each sweep of the blades. *[2]* **OR** (iii) If the blades were 21 cm long and swept through 120°, what area would one wiper clean? *[2]*	4
38.	**Case study 3.** A box contains 100 shirts: 88 are good, 8 have minor defects and 4 have major defects. Jimmy, a trader, accepts only good shirts. Sujatha, another trader, rejects only shirts with major defects. One shirt is drawn at random. (i) Find the probability that Jimmy accepts it. *[1]* (ii) Find the probability that Sujatha accepts it. *[1]* (iii) Find the probability that the shirt has a defect of either kind. *[2]* **OR** (iii) Find the probability that Sujatha rejects it. *[2]*	4

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Answers and Marking Scheme

Marks for each step are shown in brackets. Any correct alternative method gets full credit.

Section A

1. **(B)** 5. *Working:* $72 = 2^3 \times 3^2$, so a + b = 5.

2. **(C)** $\sqrt{\frac{9}{4}}$. *Working:* $\sqrt{\frac{9}{4}} = \frac{3}{2}$.

3. **(A)** $x^2 - 25$. *Working:* Sum 0, product –25.

4. **(D)** 8. *Working:* Zeroes a and 2a: 3a = 6, a = 2, so k = 2 × 4 = 8.

5. **(A)** $c \neq 10$. *Working:* $\frac{2}{4} = \frac{3}{6}$; no solution needs $\frac{5}{c} \neq \frac{1}{2}$, i.e. $c \neq 10$.

6. **(D)** $\frac{5}{3}$. *Working:* Sum $= -\frac{b}{a} = \frac{5}{3}$.

7. **(C)** –2, –4, –6, –8. *Working:* Subtract 2 each time.

8. **(B)** 60. *Working:* 12, 16, …, 248: $\frac{248-12}{4} + 1 = 60$.

9. **(A)** 4 units. *Working:* The distance from the x-axis is |y| = 4.

10. **(B)** a = 2, b = 2. *Working:* $\frac{2a-2}{2} = 1 \Rightarrow a = 2$; $\frac{4+3b}{2} = 5 \Rightarrow b = 2$.

11. **(C)** 1. *Working:* $\frac{1}{2} + \frac{1}{2} = 1$.

12. **(D)** $\frac{1}{2}$. *Working:* Divide by $\cos\theta$: $\frac{4\tan\theta - 1}{4\tan\theta + 1} = \frac{2}{4} = \frac{1}{2}$.

13. **(D)** 30°. *Working:* $\tan\theta = \frac{1}{\sqrt{3}}$.

14. **(A)** 6 cm. *Working:* $\triangle ADB \sim \triangle BDC$, so $BD^2 = AD \times CD = 36$.

15. **(B)** 5 cm. *Working:* AB + CD = AD + BC: 13 = AD + 8.

16. **(C)** 9π cm². *Working:* Radius 3 cm.

17. **(D)** 19.404 cm³. *Working:* r = 2.1, h = 4.2: $\frac{1}{3} \times \frac{22}{7} \times 4.41 \times 4.2 = 19.404$ cm³.

18. **(C)** $\frac{3}{4}$. *Working:* HH, HT, TH out of 4 outcomes.

19. **(A)** Both Assertion (A) and Reason (R) are true and R is the correct explanation of A. *Working:* A follows directly from the identity in R.

20. **(D)** A is false but R is true. *Working:* A is false: the distance is $\sqrt{9+16} = 5$. R is true.

Section B

21. $5005 = 5 \times 7 \times 11 \times 13$ (1). $1001 = 7 \times 11 \times 13$, so HCF = 1001 (1).

22. Sum $= -\frac{5}{3}$, product $= -\frac{2}{3}$ (1). Polynomial: $3x^2 + 5x - 2$ (1).

OR $\frac{a_1}{a_2} = \frac{3}{2}$ and $\frac{b_1}{b_2} = -\frac{2}{3}$ (1). They are unequal, so there is a unique solution and the pair is consistent (1).

23. Let the ratio be k : 1. On the x-axis y = 0: $\frac{5k-5}{k+1} = 0$, so k = 1, ratio 1 : 1 (1). Point $\left(-\frac{3}{2}, 0\right)$ (1).

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24. $\frac{45}{360} \times 2 \times \frac{22}{7} \times 14$ (1) $= 11$ cm (1).

OR It grazes a quadrant of radius 5 m (1): $\frac{1}{4} \times 3.14 \times 25 = 19.625$ m² (1).

25. $= \frac{\frac{3}{2} - \frac{2}{\sqrt{3}}}{\frac{3}{2} + \frac{2}{\sqrt{3}}} = \frac{3\sqrt{3} - 4}{3\sqrt{3} + 4}$ (1). Rationalising: $\frac{(3\sqrt{3} - 4)^2}{27 - 16} = \frac{43 - 24\sqrt{3}}{11}$ (1).

Section C

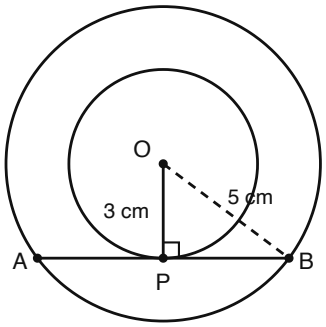
26. Suppose $\frac{1}{\sqrt{2}} = \frac{a}{b}$ with integers a, b ≠ 0 (1). Then $\sqrt{2} = \frac{b}{a}$, which is rational (1). This contradicts the irrationality of $\sqrt{2}$, so $\frac{1}{\sqrt{2}}$ is irrational (1).

27. $x^2 - 7x + 12 = (x - 3)(x - 4)$: zeroes 3 and 4 (1). New zeroes $\frac{1}{3}$, $\frac{1}{4}$: sum $\frac{7}{12}$, product $\frac{1}{12}$ (1). Polynomial: $12x^2 - 7x + 1$ (1).

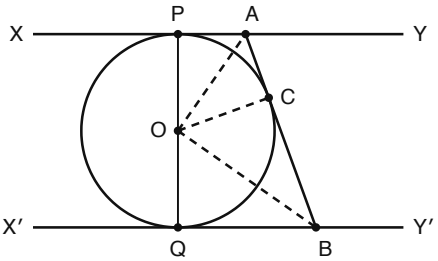
28. x + 20y = 1000 and x + 26y = 1180 (1). Subtracting: 6y = 180, y = 30 (1). Fixed charge ₹400, food ₹30 per day (1).

OR Let the speeds be x > y km/h: 5x − 5y = 100 and x + y = 100 (1). So x − y = 20 (1). The speeds are 60 km/h and 40 km/h (1).

29. Let chord AB of the larger circle touch the smaller circle at P (figure, ½). OP is a radius of the smaller circle, so OP ⊥ AB (1). In the larger circle, the perpendicular from the centre to a chord bisects it (1). So AP = PB (½).



OR Tangents from A are equal, so OA bisects $\angle PAB$; similarly OB bisects $\angle QBA$ (1). Since XY ∥ X′Y′, $\angle PAB + \angle QBA = 180^\circ$ (1). So $\angle OAB + \angle OBA = 90^\circ$, and in △AOB, $\angle AOB = 90^\circ$ (1).



30. LHS $= \frac{(\sin A + \cos A)^2 + (\sin A - \cos A)^2}{\sin^2 A - \cos^2 A}$ (1) $= \frac{2}{\sin^2 A - \cos^2 A}$ (1). Since $\cos^2 A = 1 - \sin^2 A$, the denominator is $2\sin^2 A - 1$ (1).

31. N = 45, N/2 = 22.5; cumulative frequencies 5, 14, 29, so the median class is 20–30 (1). l = 20, cf = 14, f = 15, h = 10 (1). Median $= 20 + \frac{22.5 - 14}{15} \times 10 \approx 25.67$ (1).

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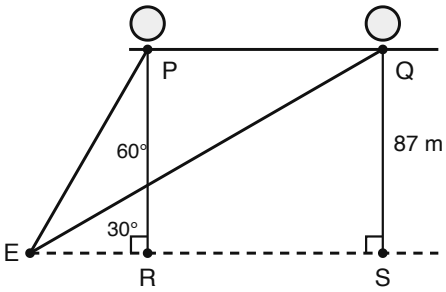
Section D

32. Let him buy x books (½). $\frac{80}{x} - \frac{80}{x+4} = 1$ (1). $x^2 + 4x - 320 = 0$ (1½). $(x + 20)(x - 16) = 0$ (1). He bought 16 books (1).

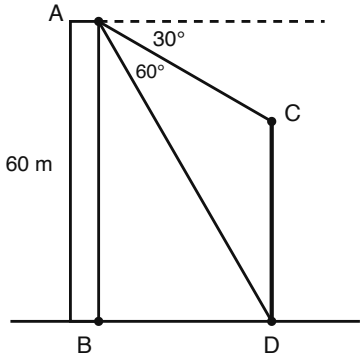
OR The angle at the pole in the semicircle is 90° (½). Let its distance from B be x and from A be x + 7: $x^2 + (x + 7)^2 = 169$ (1). $x^2 + 7x - 60 = 0$ (1½). $(x + 12)(x - 5) = 0$, x = 5 (1). Yes: 5 m from B and 12 m from A (1).

33. The daily penalties form an AP with a = 200, d = 50 (1). 30th day: $200 + 29 \times 50 = ₹1650$ (1). Total $S_{30} = 15(400 + 29 \times 50)$ (1½) $= 15 \times 1850 = ₹27\,750$ (1½).

34. Figure (1). Height of the balloon above her eyes = 88.2 − 1.2 = 87 m (½). $ER = 87 \cot 60^\circ = \frac{87}{\sqrt{3}}$ (1) and $ES = 87 \cot 30^\circ = 87\sqrt{3}$ (1). Distance $= 87\left(\sqrt{3} - \frac{1}{\sqrt{3}}\right) = 58\sqrt{3}$ (1) ≈ 100.46 m (½).



OR Figure (1). Let BD = x: $\tan 60^\circ = \frac{60}{x} \Rightarrow x = 20\sqrt{3}$ m (1½). $\tan 30^\circ = \frac{60 - h}{x} \Rightarrow 60 - h = 20$ (1½). The tower is 40 m high (1).



35. r = 2.5 mm; cylinder length = 14 − 5 = 9 mm (1). Surface area $= 2\pi r(9) + 4\pi r^2 = 45\pi + 25\pi = 70\pi = 220$ mm² (2). Volume $= \pi r^2(9) + \frac{4}{3}\pi r^3 \approx 176.79 + 65.48 = 242.26$ mm³ (2).

Section E

36. (i) 3x + 2y = 1300 and 2x + 3y = 1200.
(ii) Adding: 5(x + y) = 2500, so x + y = 500.
(iii) Subtracting: x − y = 100. So x = 300 and y = 200: ₹300 per adult and ₹200 per child. **OR** $4(300) + 5(200) = ₹2200$.

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37. (i) $\frac{115}{360} \times \frac{22}{7} \times 625 \approx 627.48$ cm².
(ii) $\frac{115}{360} \times 2 \times \frac{22}{7} \times 25 \approx 50.20$ cm.
(iii) $2 \times 627.48 \approx 1254.96$ cm². **OR** $\frac{1}{3} \times \frac{22}{7} \times 441 = 462$ cm².

38. (i) $\frac{88}{100} = \frac{22}{25}$.
(ii) $\frac{96}{100} = \frac{24}{25}$.
(iii) $\frac{12}{100} = \frac{3}{25}$. **OR** $\frac{4}{100} = \frac{1}{25}$.

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