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Your JEE Guide

MP Board Class X · Mathematics (Standard)

Sample Question Paper 7 · Session 2026-27

Time allowed: 3 hours **Maximum marks: 75**

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This is an original practice paper written to the MPBSE 2027 sample question paper pattern; it is not issued by MPBSE.

General instructions:

1. All questions are compulsory.
2. Sub-questions of question numbers 1 to 5 carry 1 mark each.
3. Question numbers 6 to 17 carry 2 marks each.
4. Question numbers 18 to 20 carry 3 marks each.
5. Question numbers 21 to 23 carry 4 marks each.
6. Internal choices are provided for question numbers 18 to 23.
7. Draw neat and clean labelled diagrams wherever required.

1.	**(i)** *Choose and write the correct option:* The number $2^3 \times 3^2 \times 5$ equals: (a) 360 (b) 240 (c) 180 (d) 120	1
	(ii) If –1 is a zero of $x^2 + 6x + k$, then k is: (a) 7 (b) 5 (c) –7 (d) –5	1
	(iii) The solution of x – 2y = 0 and 3x + 4y = 20 is: (a) x = 2, y = 4 (b) x = 8, y = 4 (c) x = 4, y = 2 (d) x = 2, y = 1	1
	(iv) The equation $x^2 + 4x + k = 0$ has real roots when: (a) k = 5 (b) k > 4 (c) k ≥ 4 (d) k ≤ 4	1
	(v) The 11th term of the AP –3, –1/2, 2, … is: (a) 22 (b) 20 (c) 28 (d) 25	1
	(vi) The value of $9\sec^2 A - 9\tan^2 A$ is: (a) 1 (b) 8 (c) 9 (d) 0	1
2.	**(i)** *Fill in the blanks:* The HCF of $2^3 \times 3$ and $2^2 \times 3^2$ is _____.	1

	(ii) The zeroes of $x^2 - 2x$ are 0 and _____.	1
	(iii) The equations 3x + 2y = 5 and 6x + 4y = 10 represent _____ lines.	1
	(iv) The roots of $x^2 - 1 = 0$ are _____.	1
	(v) The sum of the first n even natural numbers is _____.	1
	(vi) The x-coordinate of a point is its distance from the _____-axis.	1
3.	**(i)** *Write True or False:* $3 + 2\sqrt{5}$ is an irrational number.	1
	(ii) The degree of the zero polynomial is 0.	1
	(iii) A pair of linear equations representing coincident lines is consistent.	1
	(iv) $4x^2 + 4x + 1 = 0$ has two distinct real roots.	1
	(v) In △ABC right-angled at B, sin A = BC/AC.	1
	(vi) The probability of an event always lies between 0 and 1, both included.	1
4.	Match column A with column B:	6

Column A	Column B
(i) Probability of a sure event	(a) 0
(ii) Probability of an impossible event	(b) 1
(iii) P(not E)	(c) 3 median – 2 mean
(iv) Class mark of a class	(d) (upper limit + lower limit) ÷ 2
(v) Empirical relation for mode	(e) 3
(vi) Mean of 1, 2, 3, 4, 5	(f) 1 – P(E)

5.	**(i)** *Write the answer in one word or one sentence:* Write the power of 2 in the prime factorisation of 144.	1
	(ii) Write the value of $p(x) = x^3 + 1$ at x = –1.	1
	(iii) Write the first term of the AP whose nth term is 2n + 1.	1
	(iv) Write the value of 2 sin 30° cos 30°.	1
	(v) Write the volume of a hemisphere of radius 3 cm in terms of π.	1
	(vi) Write the number of possible outcomes when two coins are tossed together.	1
6.	Find the HCF and LCM of 210 and 55.	2
7.	If α and β are the zeroes of $x^2 - 5x + 6$, find $\alpha^2 + \beta^2$.	2

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8.	For what values of k does the pair 2x + ky = 3, 4x + 6y = 5 have a unique solution?	2
9.	Solve $3x^2 - 5x + 2 = 0$ using the quadratic formula.	2
10.	Is 184 a term of the AP 3, 7, 11, …? Give a reason.	2
11.	In △ABC, DE ∥ BC with D on AB and E on AC. If AD = 4 cm, AB = 10 cm and BC = 15 cm, find DE.	2
12.	Find the point on the x-axis that is equidistant from (3, 4) and (7, 2).	2
13.	Prove that $(1 - \sin^2 A)\sec^2 A = 1$.	2
14.	From the top of a 75 m tower, the angle of depression of a car is 30°. How far is the car from the foot of the tower?	2
15.	PQ is a tangent at P to a circle with centre O and radius 9 cm. If OQ = 15 cm, find PQ.	2
16.	Find the area of a circle whose circumference is 88 cm. (Use π = 22/7.)	2
17.	A number is chosen at random from 1 to 20. Find the probability that it is a prime.	2
18.	Three years ago, Ritu was four times as old as her son. Five years from now, she will be twice as old as her son. Find their present ages. **OR** Find the HCF and LCM of 12, 15 and 21. Is HCF × LCM equal to the product of the three numbers?	3
19.	PA and PB are tangents from an external point P to a circle with centre O. Prove that OP is the perpendicular bisector of the chord AB. **OR** Find the mean of the following data: Class: 0–6 | 6–12 | 12–18 | 18–24 | 24–30 Frequency: 4 | 7 | 10 | 6 | 3	3
20.	Find the area of the segment of a circle of radius 21 cm cut off by a chord that subtends 120° at the centre. (Use π = 22/7 and √3 = 1.73.) **OR** Cards numbered 1 to 40 are put in a box and one is drawn at random. Find the probability that its number is (a) a multiple of 5; (b) greater than 30; (c) a perfect square.	3

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<table>
<tr><td>21.</td><td>A two-digit number is four times the sum of its digits and twice the product of its digits. Find the number.
OR
An auditorium has 20 seats in the first row, 24 in the second, 28 in the third, and so on, for 30 rows. How many seats are there in all?</td><td>4</td></tr>
<tr><td>22.</td><td>From a point 30 m from the foot of a tower, the angle of elevation of its top is 30°. How much higher must the tower be raised so that the angle of elevation becomes 60°?
OR
Prove that $\frac{1+\cos A}{\sin A} + \frac{\sin A}{1+\cos A} = 2\csc A$.</td><td>4</td></tr>
<tr><td>23.</td><td>A container is a cylinder of radius 7 cm and height 10 cm with a hemispherical bottom of the same radius. Find its capacity. (Use π = 22/7.)
OR
Find the median and mode of the following data:
<table>
<tr><td>Class</td><td>0–10</td><td>10–20</td><td>20–30</td><td>30–40</td><td>40–50</td><td>50–60</td></tr>
<tr><td>Frequency</td><td>2</td><td>5</td><td>9</td><td>12</td><td>8</td><td>4</td></tr>
</table></td><td>4</td></tr>
</table>

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Answers and Marking Scheme

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

Question 1

(i) **(a)** 360. *Working:* 8 × 9 × 5.

(ii) **(b)** 5. *Working:* 1 − 6 + k = 0.

(iii) **(c)** x = 4, y = 2. *Working:* x = 2y gives 10y = 20.

(iv) **(d)** k ≤ 4. *Working:* D = 16 − 4k ≥ 0.

(v) **(a)** 22. *Working:* d = 5/2: −3 + 10 × 5/2.

(vi) **(c)** 9. *Working:* $9(\sec^2 A - \tan^2 A) = 9$.

Question 2

(i) 12.

(ii) 2.

(iii) coincident.

(iv) 1 and −1.

(v) n(n + 1).

(vi) y.

Question 3

(i) True.

(ii) False: its degree is not defined.

(iii) True: it has infinitely many solutions.

(iv) False: D = 0, so the roots are equal.

(v) True: opposite side over hypotenuse.

(vi) True.

4. (i) – (b) 1; (ii) – (a) 0; (iii) – (f) 1 − P(E); (iv) – (d) (upper limit + lower limit) ÷ 2; (v) – (c) 3 median − 2 mean; (vi) – (e) 3

Question 5

(i) 4 ($144 = 2^4 \times 3^2$).

(ii) 0.

(iii) 3.

(iv) $\frac{\sqrt{3}}{2}$.

(v) 18π cm³.

(vi) 4.

6. 210 = 2 × 3 × 5 × 7, 55 = 5 × 11 (1). HCF = 5, LCM = 2 × 3 × 5 × 7 × 11 = 2310 (1).

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7. α + β = 5, αβ = 6 (1). $\alpha^2 + \beta^2 = 25 - 12 = 13$ (1).

8. Unique solution when $\frac{2}{4} \neq \frac{k}{6}$ (1), i.e. k ≠ 3 (1).

9. D = 25 – 24 = 1 (1). $x = \frac{5 \pm 1}{6}$, so x = 1 or 2/3 (1).

10. 3 + (n – 1)4 = 184 gives n – 1 = 181/4 (1), which is not a whole number, so 184 is not a term (1).

11. △ADE ~ △ABC (AA), so DE/BC = AD/AB (1). DE = 15 × 4/10 = 6 cm (1).

12. For (x, 0): $(x-3)^2 + 16 = (x-7)^2 + 4$ (1). –6x + 25 = –14x + 53, so x = 3.5; the point is (3.5, 0) (1).

13. $1 - \sin^2 A = \cos^2 A$ (1). $\cos^2 A \times \frac{1}{\cos^2 A} = 1$ (1).

14. tan 30° = 75/d (1), so $d = 75\sqrt{3}$ m ≈ 129.9 m (1).

15. OP ⊥ PQ (1). $PQ = \sqrt{15^2 - 9^2} = 12$ cm (1).

16. 2πr = 88 gives r = 14 cm (1). Area = 22/7 × 196 = 616 cm² (1).

17. Primes: 2, 3, 5, 7, 11, 13, 17, 19, i.e. 8 numbers (1). P = 8/20 = 2/5 (1).

18. Ritu R, son S: R – 3 = 4(S – 3) and R + 5 = 2(S + 5) (1). So R = 4S – 9 and R = 2S + 5 (1). 2S = 14: son 7 years, Ritu 19 years (1).

OR 12 = 2² × 3, 15 = 3 × 5, 21 = 3 × 7: HCF = 3, LCM = 2² × 3 × 5 × 7 = 420 (2). HCF × LCM = 1260, but the product is 3780; the relation holds only for two numbers (1).

19. PA = PB, since tangents from an external point are equal (1). OA = OB, being radii (1). So both P and O are equidistant from A and B and lie on the perpendicular bisector of AB; hence OP is the perpendicular bisector of AB (1).

OR Class marks 3, 9, 15, 21, 27; fx = 12, 63, 150, 126, 81 (1). Σf = 30, Σfx = 432 (1). Mean = 432/30 = 14.4 (1).

20. Sector area = 120/360 × 22/7 × 441 = 462 cm² (1). The perpendicular from the centre to the chord makes 60° with each radius, so it is 21 cos 60° = 10.5 cm and the half-chord is $21\sin 60^\circ = \frac{21\sqrt{3}}{2}$ cm; triangle area $= 10.5 \times \frac{21\sqrt{3}}{2} = \frac{441\sqrt{3}}{4} \approx 190.73$ cm² (1). Segment ≈ 271.27 cm² (1).

OR (a) 5, 10, …, 40: 8/40 = 1/5 (1). (b) 31 to 40: 10/40 = 1/4 (1). (c) 1, 4, 9, 16, 25, 36: 6/40 = 3/20 (1).

21. Let the tens digit be x and the units digit y: 10x + y = 4(x + y), so y = 2x (1½). 10x + y = 2xy gives 12x = 4x², so x = 3 (1½). y = 6; the number is 36 (1).

OR An AP with a = 20, d = 4, n = 30 (1). $S_{30} = \frac{30}{2}[40 + 29 \times 4]$ (2) = 15 × 156 = 2340 seats (1).

22. Present height: tan 30° = h_1/30, so $h_1 = 10\sqrt{3}$ m (1½). Required height: tan 60° = h_2/30, so $h_2 = 30\sqrt{3}$ m (1½). Increase $= 20\sqrt{3}$ m ≈ 34.64 m (1).

OR LHS $= \frac{(1+\cos A)^2 + \sin^2 A}{\sin A(1+\cos A)}$ (1). Numerator $= 1 + 2\cos A + \cos^2 A + \sin^2 A = 2(1 + \cos A)$ (1½). LHS $= \frac{2(1+\cos A)}{\sin A(1+\cos A)} = \frac{2}{\sin A} = 2\csc A$ (1½).

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23. Cylinder: πr²h = 22/7 × 49 × 10 = 1540 cm³ (1½). Hemisphere: ⅔πr³ = ⅔ × 22/7 × 343 ≈ 718.67 cm³ (1½). Capacity ≈ 2258.67 cm³ (1).

OR Cumulative frequencies 2, 7, 16, 28, 36, 40; N/2 = 20, median class 30–40 (1). Median $= 30 + \frac{20-16}{12} \times 10 \approx 33.33$ (1). Modal class 30–40 (½). Mode $= 30 + \frac{12-9}{24-9-8} \times 10 \approx 34.29$ (1½).

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