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Your JEE Guide

MP Board Class X · Mathematics (Standard)

Sample Question Paper 3 · 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 product of the HCF and LCM of 8 and 14 is: (a) 22 (b) 56 (c) 6 (d) 112	1
	(ii) If α and β are the zeroes of $x^2 - 4x + 3$, then α + β is: (a) –3 (b) 4 (c) 3 (d) –4	1
	(iii) The value of k for which x + 2y = 3 and 3x + ky = 9 have infinitely many solutions is: (a) 6 (b) 2 (c) 3 (d) 9	1
	(iv) The roots of $x^2 = 16$ are: (a) 8 and –8 (b) 16 (c) 4 and –4 (d) 4 only	1
	(v) The 5th term of the AP 10, 7, 4, … is: (a) –5 (b) –2 (c) 1 (d) –1	1
	(vi) If cos A = ½ and A is acute, then A is: (a) 45° (b) 90° (c) 60° (d) 30°	1

2.	**(i)** *Fill in the blanks:* The HCF of two co-prime numbers is _____.	1
	(ii) The degree of a cubic polynomial is _____.	1
	(iii) The lines of a consistent pair of linear equations either intersect or are _____.	1
	(iv) If the discriminant of a quadratic equation is negative, it has _____ real roots.	1
	(v) The sum of the first n natural numbers is _____.	1
	(vi) The mid-point of a line segment divides it in the ratio _____.	1
3.	**(i)** *Write True or False:* Every natural number is a whole number.	1
	(ii) The zero of the polynomial 2x + 5 is –5/2.	1
	(iii) The common difference of an AP can be negative.	1
	(iv) A tangent to a circle passes through its centre.	1
	(v) sec 0° = 1.	1
	(vi) A sector of a circle is the region between an arc and its chord.	1
4.	Match column A with column B:	6

Column A	Column B
(i) Discriminant of $ax^2 + bx + c = 0$	(a) $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
(ii) Sum of its roots	(b) $\frac{\theta}{360^\circ} \times \pi r^2$
(iii) Product of its roots	(c) $b^2 - 4ac$
(iv) Sum of n terms of an AP	(d) $\frac{c}{a}$
(v) Distance between two points	(e) $-\frac{b}{a}$
(vi) Area of a sector of angle θ	(f) $\frac{n}{2}[2a + (n-1)d]$

5.	**(i)** *Write the answer in one word or one sentence:* Express 140 as a product of its prime factors.	1
	(ii) Write the zero of p(x) = 3x – 6.	1
	(iii) Write the common difference of the AP –5, –1, 3, …	1
	(iv) Write the value of cosec 30°.	1
	(v) Write the probability of a sure event.	1
	(vi) Write the formula for the curved surface area of a cone.	1

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6.	Given that $\sqrt{5}$ is irrational, prove that $3\sqrt{5}$ is irrational.	2
7.	If 2 is a zero of $2x^2 - 5x + k$, find k and the other zero.	2
8.	Solve: 2x + y = 7 and 4x – 3y = –1.	2
9.	Solve $2x^2 + x - 6 = 0$ by factorisation.	2
10.	Find the 8th term from the end of the AP 3, 10, 17, …, 157.	2
11.	D and E are points on AB and AC of △ABC with AD = 3 cm, AB = 9 cm, AE = 4 cm and AC = 12 cm. Is DE ∥ BC? Give a reason.	2
12.	Find the mid-point of the segment joining (–3, 5) and (7, –1).	2
13.	If $\tan A = \frac{1}{\sqrt{3}}$ and A is acute, find sin A + cos A.	2
14.	The shadow of a pole is $\sqrt{3}$ times its height. Find the angle of elevation of the Sun.	2
15.	A circle touches all four sides of a quadrilateral ABCD. If AB = 6 cm, BC = 7 cm and CD = 4 cm, find AD.	2
16.	Find the area of the ring between two concentric circles of radii 14 cm and 7 cm. (Use π = 22/7.)	2
17.	One card is drawn from a well-shuffled pack of 52 cards. Find the probability that it is a red king.	2
18.	Find two numbers whose sum is 20 and whose product is 96. **OR** A fraction becomes 4/5 if 1 is added to both its numerator and denominator, and becomes 1/2 if 5 is subtracted from both. Find the fraction.	3
19.	Prove that $\frac{\sin\theta+\cos\theta}{\sin\theta-\cos\theta} + \frac{\sin\theta-\cos\theta}{\sin\theta+\cos\theta} = \frac{2}{\sin^2\theta-\cos^2\theta}$. **OR** Find the value of sin 60° cos 30° + sin 30° cos 60°. Which single trigonometric ratio has this value?	3
20.	A horse is tied with a 7 m rope at one corner of a rectangular field 20 m long and 15 m wide. Find the area it can graze and the area it cannot. (Use π = 22/7.) **OR** A box has discs numbered 1 to 50. One disc is drawn at random. Find the probability that its number is (a) a prime; (b) a multiple of 7; (c) a perfect square.	3

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<table>
<tr><td>21.</td><td>A man saves ₹500 in the first month, and each month he saves ₹100 more than in the previous month. How much does he save in 2 years?
OR
A car travels 300 km at a uniform speed. If its speed were 10 km/h more, it would take 1 hour less. Find its speed.</td><td>4</td></tr>
<tr><td>22.</td><td>From the deck of a ship 10 m above the water, the angle of elevation of the top of a cliff is 60° and the angle of depression of its base is 30°. Find the distance of the ship from the cliff and the height of the cliff.
OR
In △ABC, DE // BC with D on AB and E on AC. If AD = x + 1, DB = 3x − 1, AE = x + 3 and EC = 3x + 4 (in cm), find x and the lengths AD and AE.</td><td>4</td></tr>
<tr><td>23.</td><td>A solid metal cone of radius 6 cm and height 24 cm is melted and recast into small spheres of radius 2 cm. How many spheres are made?
OR
Find the median and the mode of the following data:
<table>
<tr><td>Class</td><td>0–20</td><td>20–40</td><td>40–60</td><td>60–80</td><td>80–100</td></tr>
<tr><td>Frequency</td><td>6</td><td>14</td><td>20</td><td>7</td><td>3</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) **(d)** 112. *Working:* HCF × LCM = product of the numbers = 8 × 14.

(ii) **(b)** 4. *Working:* −b/a = 4.

(iii) **(a)** 6. *Working:* 1/3 = 2/k = 3/9.

(iv) **(c)** 4 and −4. *Working:* x = ±4.

(v) **(b)** −2. *Working:* 10 + 4(−3).

(vi) **(c)** 60°. *Working:* cos 60° = ½.

Question 2

(i) 1.

(ii) 3.

(iii) coincident.

(iv) no.

(v) n(n + 1)/2.

(vi) 1 : 1.

Question 3

(i) True.

(ii) True.

(iii) True: e.g. 10, 7, 4, …

(iv) False: it touches the circle at one point only.

(v) True.

(vi) False: that is a segment; a sector lies between an arc and two radii.

4. (i) – (c) $b^2 - 4ac$; (ii) – (e) $-\frac{b}{a}$; (iii) – (d) $\frac{c}{a}$; (iv) – (f) $\frac{n}{2}[2a + (n-1)d]$; (v) – (a) $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$; (vi) – (b) $\frac{\theta}{360^\circ} \times \pi r^2$

Question 5

(i) $2^2 \times 5 \times 7$.

(ii) 2.

(iii) 4.

(iv) 2.

(v) 1.

(vi) πrl, where l is the slant height.

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6. Suppose $3\sqrt{5} = r$, a rational number; then $\sqrt{5} = \frac{r}{3}$ (1). r/3 is rational, a contradiction, so $3\sqrt{5}$ is irrational (1).

7. 8 – 10 + k = 0, so k = 2 (1). Product of zeroes = k/2 = 1, so the other zero is ½ (1).

8. y = 7 – 2x, so 4x – 21 + 6x = –1 (1), giving x = 2 and y = 3 (1).

9. (2x – 3)(x + 2) = 0 (1), so x = 3/2 or x = –2 (1).

10. From the end the AP is 157, 150, … with d = –7 (1). 8th term = 157 + 7(–7) = 108 (1).

11. AD/DB = 3/6 = ½ and AE/EC = 4/8 = ½ (1). The sides are divided in the same ratio, so DE ∥ BC by the converse of the basic proportionality theorem (1).

12. ((–3 + 7)/2, (5 – 1)/2) (1) = (2, 2) (1).

13. A = 30° (1). $\sin A + \cos A = \frac{1}{2} + \frac{\sqrt{3}}{2} = \frac{1+\sqrt{3}}{2}$ (1).

14. tan θ = h/($\sqrt{3}$h) = 1/$\sqrt{3}$ (1), so θ = 30° (1).

15. Tangents from a point are equal, so AB + CD = BC + AD (1). 6 + 4 = 7 + AD, so AD = 3 cm (1).

16. Area $= \pi\left(14^2 - 7^2\right) = \frac{22}{7} \times 147$ (1) = 462 cm² (1).

17. There are 2 red kings (1). P = 2/52 = 1/26 (1).

18. Let the numbers be x and 20 – x: x(20 – x) = 96 (1). $x^2 - 20x + 96 = 0$, i.e. (x – 8)(x – 12) = 0 (1). The numbers are 8 and 12 (1).

OR Let it be x/y: 5(x + 1) = 4(y + 1), i.e. 5x – 4y = –1; 2(x – 5) = y – 5, i.e. y = 2x – 5 (1). Substituting: 5x – 8x + 20 = –1, so x = 7 (1). y = 9; the fraction is 7/9 (1).

19. LHS $= \frac{(\sin\theta+\cos\theta)^2+(\sin\theta-\cos\theta)^2}{\sin^2\theta-\cos^2\theta}$ (1). The numerator is $2\left(\sin^2\theta + \cos^2\theta\right)$ (1) = 2, which gives the RHS (1).

OR $\frac{\sqrt{3}}{2}\cdot\frac{\sqrt{3}}{2} + \frac{1}{2}\cdot\frac{1}{2}$ (1) $= \frac{3}{4} + \frac{1}{4} = 1$ (1). It equals sin 90° (1).

20. It can graze a quadrant of radius 7 m: ¼ × 22/7 × 49 = 38.5 m² (1½). Field area = 300 m², so the area not grazed = 261.5 m² (1½).

OR (a) There are 15 primes up to 50: 15/50 = 3/10 (1). (b) 7, 14, …, 49: 7/50 (1). (c) 1, 4, 9, …, 49: 7/50 (1).

21. The savings form an AP with a = 500, d = 100, n = 24 (1). $S_{24} = \frac{24}{2}[1000 + 23 \times 100]$ (1½) = 12 × 3300 = ₹39,600 (1½).

OR $\frac{300}{v} - \frac{300}{v+10} = 1$ (1). This gives v(v + 10) = 3000, i.e. $v^2 + 10v - 3000 = 0$ (1). (v + 60)(v – 50) = 0 (1). Speed cannot be negative, so v = 50 km/h (1).

22. Angle of depression 30°: tan 30° = 10/d, so $d = 10\sqrt{3}$ m ≈ 17.32 m (1½). The top of the cliff is h above the deck: $h = d\tan 60^\circ = 10\sqrt{3} \times \sqrt{3} = 30$ m (1½). Height of the cliff = 30 + 10 = 40 m (1).

OR By the basic proportionality theorem, $\frac{x+1}{3x-1} = \frac{x+3}{3x+4}$ (1). Cross-multiplying: $3x^2 + 7x + 4 = 3x^2 + 8x - 3$ (1), so x = 7 (1). AD = 8 cm and AE = 10 cm (1).

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23. Volume of the cone $= \frac{1}{3}\pi \times 36 \times 24 = 288\pi$ cm³ (1½). Volume of one sphere $= \frac{4}{3}\pi \times 8 = \frac{32\pi}{3}$ cm³ (1). Number of spheres $= 288\pi \div \frac{32\pi}{3} = 27$ (1½).

OR Cumulative frequencies 6, 20, 40, 47, 50; N/2 = 25, median class 40–60 (1). Median $= 40 + \frac{25-20}{20} \times 20 = 45$ (1). Modal class 40–60 (1). Mode $= 40 + \frac{20-14}{40-14-7} \times 20 \approx 46.32$ (1).

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