Time : 1 Hr. Max. Marks : 60

CLASS24

PAPER CODE	-
FORM NUMBER	

IMO (STAGE-2) MOCK TEST

(ACADEMIC SESSION 2023-2024)

Pre Foundation Division

CLASS X

MOCK TEST # 01

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. Answers are to be given on a separate OMR sheet.
2. This test contains Mathematical Reasoning (45 Questions) and Achievers Section (5 Questions). Total questions are **50**. Duration of test is **1 Hr**.
3. Each question in **Achievers Section carries 3** marks whereas all other questions carry 1 mark. There is no negative marking for wrong answers. Total marks are **60**.
4. Mark your answers for questions 1–50 on the OMR sheet by darkening the circles.
5. If you do not know the answer to any question, do not waste time on it and pass on to the next one. Time permitting, you can come back to the questions, which you have left in the first instance and attempt them.
6. Since the time allotted for this question paper is very limited you should make the best use of it by not spending too much time on any one question.
7. Rough work can be done anywhere in the booklet but not on the OMR sheet/loose paper.

MATHEMATICS

1. Given that H.C.F. (306, 954, 1314) = 18, find L.C.M. (306, 954, 1314).

(1) 1183534 (2) 1123238

(3) 1183914 (4) 1123328

2. The 100^{th} root of $10^{\left(10^{10}\right)}$ is _____ .

(1) $10^{8^{10}}$ (2) 10^{10^8}

(3) $\left(\sqrt{10}\right)^{\left(\sqrt{10}\right)^{10}}$ (4) $10^{\left(\sqrt{(10)}\right)^{\sqrt{10}}}$

3. If 7, 2, 9 and 5 occur with frequencies 2, 3, 6 and 4 respectively, then the arithmetic mean is ____.

(1) 6.25 (2) 6.75 (3) 6.27 (4) 6.42

4. Find the value of p, if the mean of the following data is 20.

x_i	15	17	19	20 + p	23
f_i	2	3	4	5p	6

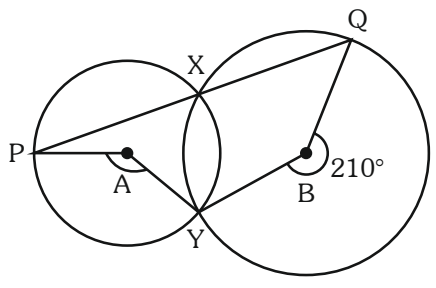
(1) 2 (2) 1 (3) 4 (4) 10

5. The king, queen and jack of clubs are removed from a deck of 52 playing cards and then well-shuffled. One card is selected from the remaining cards. The probability of getting a club is ____.

(1) $\frac{13}{49}$ (2) $\frac{10}{49}$

(3) $\frac{3}{49}$ (4) $\frac{1}{49}$

6. In the given figure, A and B are the centres of two circles that intersect at X and Y. PXQ is a straight line. If reflex angle QBY = 210°, find obtuse angle PAY.



(1) 210° (2) 150° (3) 160° (4) 120°

7. A vertical tower stands on a horizontal land and is surmounted by a vertical flag staff of height 12 metres. At a point on the plane, the angle of elevation of the bottom and the top of the flag staff are respectively 45° and 60°. Find the height of tower.

(1) $6\left(\sqrt{3}+4\right)$m

(2) $6\left(\sqrt{3}+1\right)$m

(3) $7\left(\sqrt{3}+1\right)$m

(4) None of these

8. If the angle of elevation of a cloud from a point h metres above a lake is x and the angle of depression of its reflection in the lake is y, then the distance of the cloud from the point of observation is

(1) $\frac{2h\sec x}{\tan y+\tan x}$

(2) $\frac{2h\cos x}{\tan x+\tan y}$

(3) $\frac{2h\cot x}{\tan y+\tan x}$

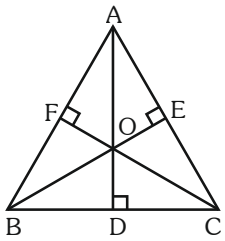
(4) $\frac{2h\sec x}{\tan y-\tan x}$

9. If $\frac{x}{a}\cos\theta+\frac{y}{b}\sin\theta=1$, $\frac{x}{a}\sin\theta-\frac{y}{b}\cos\theta=1$, then _____ .

(1) $x^2+y^2=a^2+b^2$ (2) $\frac{x^2}{a^2}+\frac{y^2}{b^2}=2$

(3) $a^2x^2+b^2y^2=1$ (4) $x^2-y^2=a^2-b^2$

10. In the given figure, AD ⊥ BC, BE ⊥ AC, CF ⊥ AB, then $AF^2 + BD^2 + CE^2$ =



(1) $OA^2 + OB^2 + OC^2$

(2) $OD^2 + OE^2 + OF^2$

(3) $AB^2 + BC^2 + AC^2$

(4) $AE^2 + BF^2 + CD^2$

11. If cosec θ – sin θ = ℓ and sec θ – cos θ = m, then $\ell^2 m^2(\ell^2 + m^2 + 3)$ = _____ .

(1) 1 (2) 2

(3) 2 sin θ (4) sin θ cos θ

12. If the centroid of the triangle formed by the points (a, b), (b, c) and (c, a) is at the origin, then $a^3 + b^3 + c^3$ =

(1) abc (2) 0

(3) a + b + c (4) 3abc

13. The coordinates of the third vertex of an equilateral triangle whose two vertices are at(3, 4), (–2, 3) are _____ .

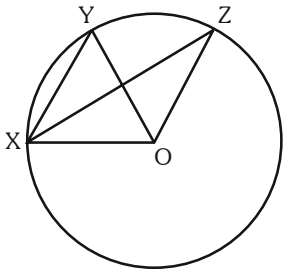
(1) (1, 7)

(2) (5, 1)

(3) $\left(\frac{1+\sqrt{3}}{2}, \frac{7-5\sqrt{3}}{2}\right)$ or $\left(\frac{1-\sqrt{3}}{2}, \frac{7+5\sqrt{3}}{2}\right)$

(4) (–5, 5)

14. In the given figure, O is the centre of the circle, then ∠XOZ is _____ .



(1) 2∠XZY (2) 2∠Y

(3) 2∠Z (4) 2(∠XZY + ∠YXZ)

15. How many values of c, for which the system of equations 6x + 3y = c – 3, 12x + cy = c has infinitely many solutions ?

(1) 1 (2) 2

(3) 3 (4) Infinite

16. Arun and Prabhat have some books with them. Once Prabhat said to Arun that, if Arun gives 3 books to Prabhat then Arun will have only $\frac{1}{2}$ of the books that Prabhat will have with him. Then Arun asked frankly that if Prabhat gives him only two books (to Arun), then Prabhat will have as many books as Arun will have. The total number of books that Arun and Prabhat have with them is _____ .

(1) 25

(2) 56

(3) 30

(4) Can't be dtermined

17. The roots of the equation $3\sqrt{x} + 5(x)^{-\frac{1}{2}} = \sqrt{2}$ can be found by solving _____ .

(1) $9x^2 + 28x + 25 = 0$

(2) $9x^2 + 30x + 25 = 0$

(3) $9x^2 + 28x - 25 = 0$

(4) $16x^2 + 22x - 30 = 0$

18. Solve for x and y in the following question.

$$\frac{2}{x+2y} + \frac{1}{2x-y} + \frac{5}{9} = 0 \quad ,$$

$$\frac{9}{x+2y} + \frac{6}{2x-y} + 4 = 0$$

(1) x = 1, y = 2 (2) x = 2, y = 1

(3) x = 2, $y = \frac{1}{2}$ (4) $x = \frac{1}{2}$, y = 2

19. Four numbers are inserted between the numbers 4 and 39 such that an A.P. results. Find the biggest of these four numbers.

(1) 33 (2) 31

(3) 32 (4) 30

20. If the m^{th} term of an A.P. is $\frac{1}{n}$ and n^{th} term is $\frac{1}{m}$, then the sum of first mn terms is _____.

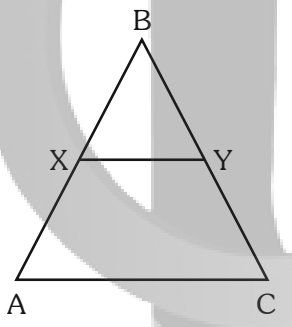
(1) mn + 1 (2) $\frac{mn+1}{2}$

(3) $\frac{mn-1}{2}$ (4) $\frac{mn-1}{3}$

21. Value of the expression : $\frac{1}{\sqrt{11-2\sqrt{30}}}-\frac{3}{\sqrt{7-2\sqrt{10}}}-\frac{4}{\sqrt{8+4\sqrt{3}}}$

(1) $\sqrt{30}$ (2) $2\sqrt{10}$ (3) 1 (4) 0

22. In ΔABC, $\overline{XY}$ is paralled to $\overline{AC}$ and divides the triangle into the two parts of equal area. Then the $\frac{AX}{AB}$ equals



(1) $\frac{\sqrt{2}+1}{2}$ (2) $\frac{2-\sqrt{2}}{2}$

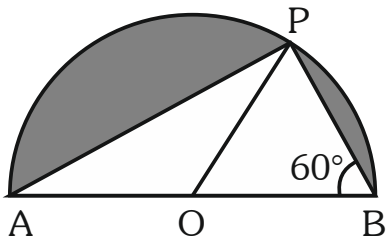
(3) $\frac{2+\sqrt{2}}{2}$ (4) $\frac{\sqrt{2}-1}{2}$

23. The minumum value of the polynomial $p(x) = 3x^2 - 5x + 2$ is

(1) $-\frac{1}{6}$ (2) $\frac{1}{6}$

(3) $\frac{1}{12}$ (4) $-\frac{1}{12}$

24. In the figure, a semicircle with centre O is drawn on AB. The ratio of the larger shaded area to the smaller shaded are is.



(1) $\frac{4\pi-2\sqrt{3}}{2\pi-2\sqrt{3}}$

(2) $\frac{4\pi-3\sqrt{3}}{3\pi-3\sqrt{3}}$

(3) $\frac{4\pi-3\sqrt{3}}{2\pi-3\sqrt{3}}$

(4) $\frac{3\pi-2\sqrt{3}}{2\pi-2\sqrt{3}}$

25. If a, b, c be the 4^{th}, 7^{th} and 10^{th} term of an AP respectively then the sum of the roots of the equation $ax^2 - 2bx + c = 0$

(1) $-\frac{b}{a}$

(2) $-\frac{2b}{a}$

(3) $\frac{c+a}{a}$

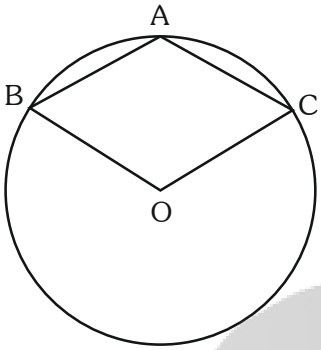
(4) Can not be determined unless some more information is given about the AP

26. The number of integral solution of the equation

$$7\left(y+\frac{1}{y}\right)-2\left(y^2+\frac{1}{y^2}\right)=9$$

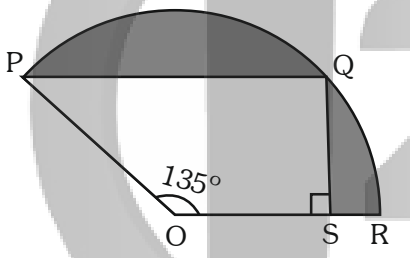
(1) 0 (2) 1 (3) 2 (4) 3

27. In the figure, BC is a chord of the circle with centre O and A is a point on the minor arc BC. Then, $\angle BAC - \angle OBC$ is equal to



(1) 30° (2) 60° (3) 80° (4) 90°

28. In the figure PQSO, is a trapezium in which PQ || OS, $\angle POS = 135°$ and $\angle OSQ = 90°$ points P, Q and R lie on a circle with centre O and radius 12 cm. The area of the shaded part, in cm^2, is



(1) $61\frac{2}{7}$ (2) $61\frac{5}{7}$ (3) $73\frac{5}{7}$ (4) $73\frac{2}{7}$

29. When a natural number x is divided by 5, the remainder is 2 When a natural number y is divided by 5, the remainder is 4, The remainder is z when x + y is divided by 5. The value of

$\frac{2z-5}{3}$ is

(1) –1 (2) 1 (3) –2 (4) 2

30. If α and β are the roots of the quadratic equation $x^2 - 6x - 2 = 0$ and if $a_n = \alpha^n - \beta^n$, then the value of $\frac{a_{10} - 2a_8}{2a_9}$

(1) 6.0 (2) 5.2 (3) 5.0 (4) 3.0

31. The graphs of the equations $x - y = 2$ and $kx + y = 3$, where k is a constant, intersect at the point (x, y) in the first quadrant, if and only if k is

(1) equal to –1

(2) greater than –1

(3) less than $\frac{3}{2}$

(4) lying between –1 and $\frac{3}{2}$

32. If cosec x – sin x = a and sec x – cos x = b, then

(1) $\left(a^2b\right)^{\frac{3}{2}} + \left(ab^2\right)^{\frac{2}{3}} = 1$

(2) $\left(ab^2\right)^{\frac{2}{3}} + \left(a^2b^2\right)^{\frac{2}{3}} = 1$

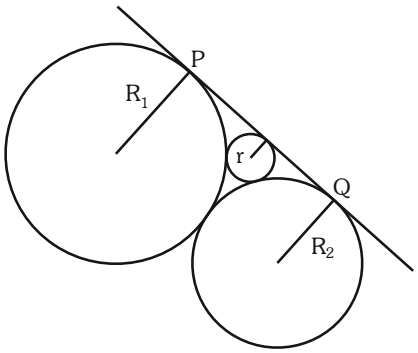
(3) $a^2 + b^2 = 1$

(4) $b^2 - a^2 = 1$

33. If the line segment joining (2, 3) and (–1, 2) is divided internally in the ratio 3 : 4 by the graph of the equation x + 2y = k, then value of k is

(1) $\frac{5}{7}$ (2) $\frac{31}{7}$ (3) $\frac{36}{7}$ (4) $\frac{41}{7}$

34. Three circles with radii R_1, R_2 and r touch each other externally as shown in the adjoining figure. If PQ is their common tangent and $R_1 > R_2$, then which of the following relations is correct ?



(1) $R_1 - R_2 = r$ (2) $R_1 + R_2 = 2r$

(3) $\frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{r}$ (4) $\frac{1}{\sqrt{R_1}} + \frac{1}{\sqrt{R_2}} = \frac{1}{\sqrt{r}}$

35. A circular metallic sheet is divided into two parts in such a way that each part can be folded into a cone. If the ratio of their curved surface areas is 1 : 2, then the ratio of their volumes is

(1) 1 : 8 (2) $1:\sqrt{6}$

(3) $1:\sqrt{10}$ (4) 2 : 3

36. The mean of three positive numbers is 10 more than the smallest of the numbers and 15 less than the largest of three. If the median of the three numbers is 5, then the mean of squares of the numbers is

(1) $108\frac{2}{3}$ (2) $116\frac{2}{3}$

(3) $208\frac{2}{3}$ (4) $216\frac{2}{3}$

37. Three dice are thrown simultaneously. The probability of getting a total of at least 5 of the numbers appearing on their tops is

(1) $\frac{5}{54}$ (2) $\frac{7}{54}$ (3) $\frac{49}{54}$ (4) $\frac{53}{54}$

38. For what value of p, the following pair of linear equations in two variables will have infinitely many solutions ?

$px + 3y - (p - 3) = 0$

$12x + py - p = 0$

(1) 6 (2) –6 (3) 0 (4) 2

39. Two quadratic equations $x^2 - bx + 6 = 0$ and $x^2 - 6x + c = 0$ have a common root. If the remaining roots of the first and second equations are positive integers and are in the ratio 3 : 4 respectively, then the common root is

(1) 1 (2) 2 (3) 3 (4) 4

40. Let ABC be an equilateral triangle. If the co-ordinates of A are (1, 2) and co-ordinates of B are (2, –1) then

(1) C cannot lie in the first quadrant

(2) C cannot lie in the second quadrant

(3) C is the origin

(4) C cannot lie in the third quadrant

41. Shyam wants to make a solid brick shape structure from 400 wooden cubes of unit volume each. If the sides of the solid brick have the ratio 1 : 2 : 3, then the maximum number of cubes, which can be used, will be

(1) 400 (2) 288 (3) 300 (4) 384

42. Given below are the steps of construction of two tangents to the circle (without using the centre of the circle) of ratius 4 cm from point P. Which of the following steps is INCORRECT ?

Steps of Construction

Step I : Draw a circle of radius 4 cm and take a point P outside the circle and draw a secant PAB, intersecting the circle at A and B.

Step II : Produce AP to C such that AP = CP. Draw a semicircle with CB as diameter.

Step III : Draw PD $\perp$ CB, intersecting the semicircle at D. With P as centre and PC as radius draw arcs to intersect the given circle at T and T′.

Step IV : Join PT and PT′. Then, PT and PT′ are the required tangents.

(1) Only Step I

(2) Both Step I and Step II

(3) Only Step III

(4) Both Step II and Step IV

43. If the radii of the circular ends of bucket in the form of frustum are 28 cm and 7 cm and the height is 45cm. The capacity of the bucket is _____ .

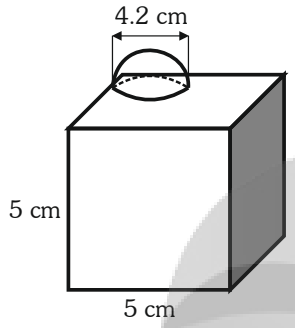
(1) 48150 cm^3 (2) 48510 cm^3

(3) 48105 cm^3 (4) 48205 cm^3

44. The height of a cone is 30 cm. A small cone is cut off at the top by a plane parallel to the base. If its volume be $\frac{1}{27}$ of the volume of the given cone, at what height above the base is the section made?

(1) 20 cm (2) 25 cm (3) 10 cm (4) 15 cm

45. The decorative block shown in the figure is made of two solids, a cube and a hemisphere. The base of the blcok is a cube with edge 5 cm, and the hemisphere fixed on the top has a diameter of 4.2 cm. The total surface area of the block is _____ .



(1) 150 cm^2 (2) 160.86 cm^2

(3) 162.86 cm^2 (4) 163.86 cm^2

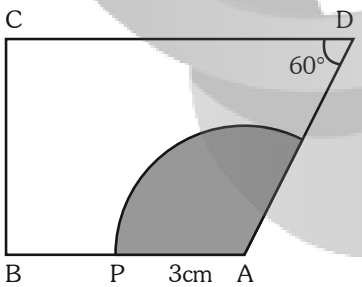
ACHIVERS SECTION

46. The ratio of the outer and inner perimeters of a circular path is 23 : 22. If the path is 5 metres wide, the diameter of the inner circle is

(1) 55 m (2) 110 m

(3) 220 m (4) 230 m

47. In the given figure, the area of the shaded region is _____ .



(1) 3π cm^2 (2) 6π cm^2

(3) 9π cm^2 (4) 7π cm^2

48. The value of $\frac{a+\sqrt{a^2-b^2}}{a-\sqrt{a^2-b^2}}+\frac{a-\sqrt{a^2-b^2}}{a+\sqrt{a^2-b^2}}$ is _____ .

(1) $\frac{a^2}{b^2}$ (2) $\frac{b^2}{a^2}$

(3) $\frac{a}{b}$ (4) $\frac{2\left(2a^2-b^2\right)}{b^2}$

49. The sum of all terms of the arithmetic progression having ten terms except for the first term, is 99, and except for the sixth term, is 89. Find the 8^{th} term of the progression if the sum of the first and the fifth term is equal to 10.

(1) 15 (2) 25 (3) 18 (4) 10

50. Which of the following is CORRECT statements ?

(i) $3(\sin\theta - \cos\theta)^4 + 6(\sin\theta + \cos\theta)^2 + 4(\sin^6\theta + \cos^6\theta)$ is independent of θ.

(ii) If $\text{cosec}\theta - \sin\theta = a^3$, $\sec\theta - \cos\theta = b^3$, then $a^2b^2(a^2 + b^2) = 2$

(1) Only (i) (2) Only (ii)

(3) Both (i) and (ii) (4) Neither (i) nor (ii)