Pre Board Examination 2023-24
Std. 10 **Max. Marks : 80**
18-01-2024 **Time : 3 hrs.**

MATHEMATICS

General Instructions:

i) This Question Paper has 5 Sections A, B, C, D and E.
ii) Section A has 20 MCQs carrying 1 mark each.
iii) Section B has 5 questions carrying 02 marks each.
iv) Section C has 6 questions carrying 03 marks each.
v) Section D has 4 questions carrying 05 marks each.
vi) Section E has 3 case-based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
vii) All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks, and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E.
viii) Draw neat figures wherever required. Take π=22/7 wherever required if not stated.

SECTION – A

1. The LCM of the smallest 2-digit composite number and smallest composite number is
   a) 12 b) 4 c) 20 d) 44

2. If α, β are the zeroes of the polynomial $p(x) = x^2 + x + 1$ then $\frac{1}{\alpha} + \frac{1}{\beta} =$
   a) 0 b) 1 c) -1 d) 2

3. If 2 and $\frac{1}{2}$ are the zeroes of $px^2 + 5x + r = 0$ then:
   a) p = r = 2 b) p = r = -2
   c) p = 2, r = -2 d) p = -2, r = 2

4. If 217x + 131y = 913, 131x + 217y = 827, then x + y:
   a) 5 b) 6 c) 7 d) 8

5. Which of the following is true?
   a) 3 Mode = 2 Median – Mean b) 3 Median = 2 Mean + Mode
   c) Mode = 3 Median + 2 Mean d) None of these

6. If a point A (3, y) is midpoint of PQ where P is (6,5) and Q is (0,3) then the value of y is
   a) 0 b) -4 c) 4 d) 3

7. The ratio in which P(4, m) divides the line segment joining the points A(2,3), B(6, -3) is
   a) 1:2 b) 2:1 c) 1:3 d) 1:1

8. In right triangle ABC right angled at B if $\tan A = \frac{1}{\sqrt{3}}$ then cos A cos C – sin A sin C =
   a) -1 b) 0 c) 1 d) $\frac{\sqrt{3}}{2}$

9. If $2\sin^2\beta - \cos^2\beta = 2$ then, β =
   a) 0^0 b) 90^0 c) 45^0 d) 30^0

10. (sec A + tan A) (1 – sin A) equals to
    a) Sec A b) Sin A c) Cosec A d) Cos A

11. The perimeter and area of a circle are numerically equal then the radius of the circle is
    a) 2 units b) π units c) 4 units d) 7 units

12. From a point P, tangents PA and PB drawn to a circle with centre O and radius 8cm. If OP is equal to 10 cm then the length of PA is:
    a) 6 b) 8 c) 9 d) 10

13. The probability of getting a doublet in a throw of a pair of dice is
    a) $\frac{1}{3}$ b) $\frac{1}{4}$ c) $\frac{1}{2}$ d) $\frac{1}{6}$

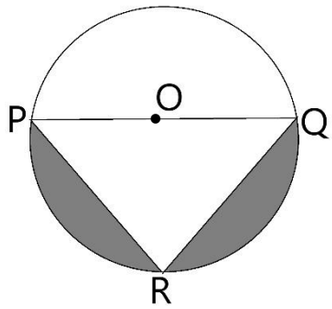
14. In the following frequency distribution:

CLASS INTERVAL	FREQUENCY
0 – 5	10
5 – 10	15
10 – 15	12
15 – 20	20
20 – 25	9

The class mark of modal class is:

a) 17.5 b) 7.5 c) 22.5 d) 12.5

15. In the figure given, O is the centre of the circle PR and RQ are chords of the circle. The radius of the circle is 5 cm, PR= 8 cm, QR= 6 cm, ∠PRQ= 90°. What is the area of the shaded region?



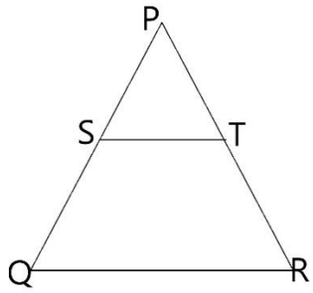
a) $\frac{25}{4}\pi - 24$ b) $\frac{25}{2}\pi - 24$

c) $\frac{25}{4}\pi$ d) $\frac{25\pi}{2}$

16. If ΔPQR ~ ΔABC; PQ= 6 cm, AB = 8cm, and the perimeter of ΔABC is 36 cm, then the perimeter of ΔPQR is

a) 20.25cm b) 27cm c) 48cm d) 64cm

17. In the following figure ST is parallel to QR and point S divides PQ in the ratio 4:5. If ST=1.6, what is the length of QR?



a) 0.17cm
b) 2cm
c) 3.6cm
d) None of these

18. Triangle ABC is similar to triangle QPR. If AC = 6 cm, BC = 5 cm, QR = 3 cm, PR = x; then the value of x is

a) 3.6 cm b) 2.5 cm c) 10 cm d) 3.2 cm

19. Assertion (A): The volume of a right circular cylinder of base radius 7cm and height 10cm is 1540cm^3.
Reason (R): Curved surface area of the above cylinder is 440cm^2.

a) Both (A) and (R) are true and (R) is the correct explanation of (A).
b) Both (A) and (R) are true and (R)is not the correct explanation of (A).
c) (A) is true but (R) is false.
d) (A) is false but (R) is true.

20. Assertion (A): $\sqrt{3} + \sqrt{5}$ is an irrational number.
Reason (R): Sum of a rational number and an irrational number is an irrational number.

a) Both (A) and (R) are true and (R) is the correct explanation of (A).
b) Both (A) and (R) are true and (R)is not the correct explanation of (A).
c) (A) is true but (R) is false.
d) (A) is false but (R) is true.

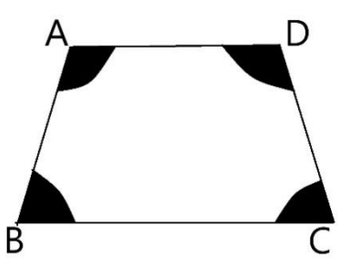
SECTION – B

21. Solve the pair of linear equations using elimination method.
x + y = 3, 2x + 5y = 12

22. The length of the minute hand of a clock is 5cm. Find the area swept by it when it moves from 8:05 pm to 8:40 pm.

(OR)

In the given figure arcs have been drawn of radius 7cm each with vertices A, B, C and D of quadrilateral ABCD. Find the area of the shaded region.



23. A vertical stick of length 18m casts a shadow 12m long on the ground. A tower casts a shadow 48m long at the same time. Find the height of the tower.

24. Prove that : $\sin\theta\cos\theta(\tan\theta + \cot\theta) = 1$.

(OR)

$\frac{cosA}{1+sinA} + \frac{1+sinA}{cosA}$ = 2sec A, where A is an acute angle.

25. Prove that tangents drawn at the end of a diameter of a circle are parallel.

SECTION – C

26. Prove that $\sqrt{5}$ is an irrational number.

27. Prove that the length of tangents drawn from an external point to the circle are equal.

28. If $\alpha \; and \; \beta$ are the zeroes of a quadratic polynomial $P(x)= x^2 - 5x + 4$, then find
a) $\alpha^2 + \beta^2$ b) $\frac{1}{\alpha} + \frac{1}{\beta}$.

29. (cosec A – sin A) (sec A- cos A) = $\frac{1}{tan\,A+cotA}$.

(OR)

Find the value of $\sin^2 45^o \tan 60^o \sec^2 45^o + \frac{cot^2 30° cos^2 60°}{cosec^2 90°}$.

30. When two dice are thrown simultaneously, find the probability of the getting:
a) The number on each dice is odd.
b) The sum of numbers appearing on two dice is 7.

31. One side of a rectangle exceeds its other side by 2cm. If its area is $195cm^2$, determine the sides of the rectangle.

(OR)

A father's age is equal to the square of his son's age. An year ago, his age was 8 times that of his son. Find their present age.

SECTION – D

32. State and prove Basic Proportionality Theorem.

(OR)

Sides AB and AC and median AD of a triangle ABC are respectively proportional to the sides PQ and PR and median PM of another triangle PQR. Show that ΔABC ~ΔPQR.

33. If the median of the frequency distribution given below is 28.5. Find the value of x and y.

CLASS INTERVAL	FREQUENCY
0-10	5
10-20	x
20-30	20
30-40	15
40-50	y
50-60	5
TOTAL	60

(OR)

Daily wages of 110 workers obtained in a survey is given below. Find the mean daily wages and modal daily wages of these workers.

NUMBER OF WORKERS	DAILY WAGES
100-120	10
120-140	15
140-160	20
160-180	22
180-200	18
200-220	12
220-240	13

34. An iron pillar is in the form of a right circular cylinder surmounted by a right circular cone. The radius of the base of the cone and cylinder is 8 cm. The cylindrical part is 240 cm high and the conical part is 36cm high. Find the weight of the pillar if one cubic centimetre of iron weighs 7.8 g.

35. Solve graphically the pair of linear equations:

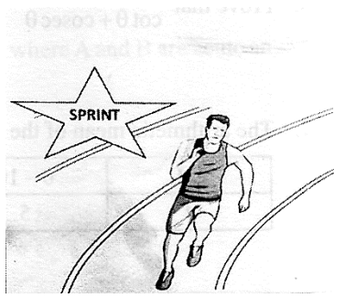
$3x - 4y + 3 = 0$

$3x + 4y - 21 = 0$

Find the co-ordinates of the vertices of the triangular region formed by these lines and x axis. Also calculate the area of the triangle.

SECTION – E

36. Sprint events in track and field usually consists of the 100m, 200m and 400m race though 60m dashes are also held on occasions. These races are largely based upon the athlete's stability to accelerate to one's maximum speed in the quickest time possible. Girish wants to participate in the 200m sprint. He can currently run the distance in 45 seconds. But he wants to do that within 30 seconds, with each day of practice it takes him 2 seconds less. Considering the above situation, answer the following question:



a) Write an AP for the above situation. 1

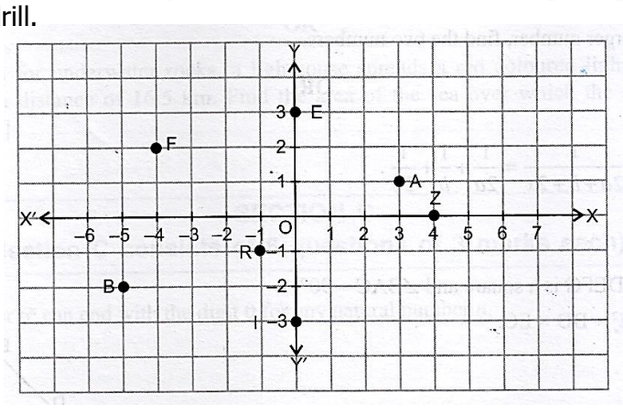
b) How many days does he need to practice to accomplish this goal? 1

c) Write the expression for the nth term of the AP formed above.

(OR)

Write the expression for the sum of first n terms of the AP formed above. 2

37. For a sports event, certain points were marked on a rectangular ground denoting positions of different drill.



a) Find the distance between the points A and E. 1

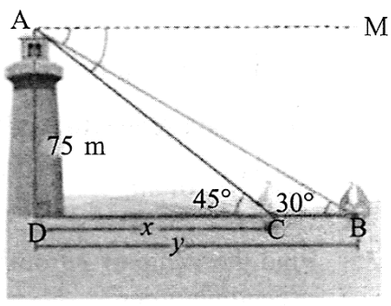
b) What type of triangle is formed by joining the points A, Z and R? 1

c) Find the ratio in which the x-axis divides the join of A and R.

(OR)

Find the distance of the point B from F. 2

38. A lighthouse is a tower with a bright light at the top and serves as a navigational aid that warns ships of dangerous areas. In the given figure, a man on top of a 75m high lighthouse is observing two ships approaching towards its base. Observe the figure carefully and answer the following questions:



a) $\angle MAB = \angle DBA$ because they are alternate angles. Is it true? 1

b) Find the distance of ship B from the foot of the lighthouse. 1

c) Find the distance between the two ships.

(OR)

What would have been the distance between the two ships if the ships were on either side of the lighthouse? 2