CLASS X (2020-21)
MATHEMATICS BASIC(241)
SAMPLE PAPER-2

Time : 3 Hours   **Maximum Marks : 80**

General Instructions :

1.   This question paper contains two parts A and B.
2.   Both Part A and Part B have internal choices.

Part–A :
1.   It consists of two sections- I and II.
2.   Section I has 16 questions. Internal choice is provided in 5 questions.
3.   Section II has four case study-based questions. Each case study has 5 case-based sub-parts. An examinee is to attempt any 4 out of 5 sub-parts.

Part–B :
1.   Question no. 21 to 26 are very short answer type questions of 2 mark each.
2.   Question no. 27 to 33 are short answer type questions of 3 marks each.
3.   Question no. 34 to 36 are long answer type questions of 5 marks each.
4.   Internal choice is provided in 2 questions of 2 marks, 2 questions of 3 marks and 1 question of 5 marks.

PART - A

SECTION - I

Section I has 16 questions of 1 mark each. Internal choice is provided in 5 questions.

Q1.   Find the HCF and the LCM of 12, 21, 15.

Q2.   The graph of a polynomial is shown in Figure. What is the number of its zeroes?
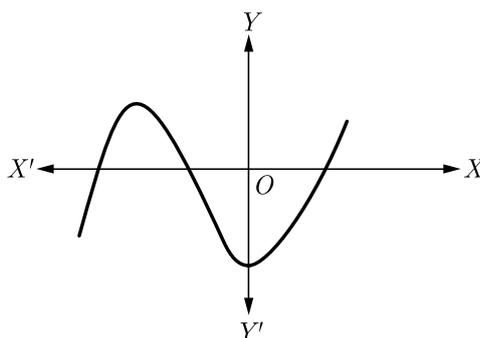
Q3.   The pair of equations $y = 0$ and $y = -7$ has no solution. Justify.

Q4.   What are the real roots of the equation $x^{2/3} + x^{1/3} - 2 = 0$?

Q5.   The nth term of an AP is $(7 - 4n)$, then what is its common difference?

OR

In an AP, if the common difference $d = -4$, and the seventh term a_7 is 4, then find the first term.

Q6. $\triangle ABC$ is isosceles with $AC = BC$. If $AB^2 = 2AC^2$, then find the measure of $\angle C$.

Q7.   Find the point on the x-axis which is equidistant from the points $A(-2, 3)$ and $B(5, 4)$?

OR

If three points $(0, 0)$, $(3, \sqrt{3})$ and $(3, \lambda)$ form an equilateral triangle, then what is the value of λ?

Q8.   If $\tan(A + B) = \sqrt{3}$ and $\tan(A - B) = \dfrac{1}{\sqrt{3}}$, $A > B$, then the value of A is ....

Q9.   The .... is the line drawn from the eye of an observer to the point in the object viewed by the observer.

Q10.   In figure, $\triangle ABC$ is circumscribing a circle, the length of BC is .... cm.
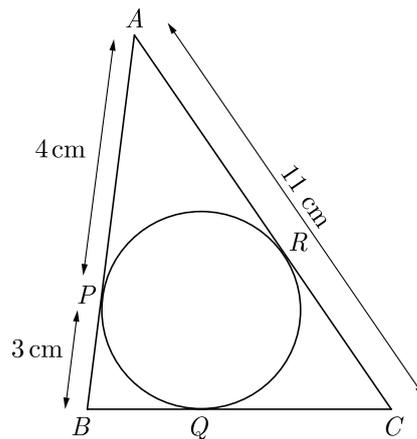
OR

If the angle between two radii of a circle is $130°$, then what is the angle between the tangents at the end points of radii at their point of intersection ?

Q11.   In drawing a triangle, if $AB = 3$ cm, $BC = 2$ cm and $AC = 6$ cm. What is the possibility that a triangle cannot be drawn.

Q12.   Find the ratio of volumes of two cones with same radii.

Q13.   The median of a set of 9 distinct observations is 20.5. If each of the largest 4 observation of the set is increased by 2, then what is the median of the new set?

OR

If the coordinates of the point of intersection of less than ogive and more than ogive is (13.5, 20), then find the value of median.

Q14.   If a card is selected from a deck of 52 cards, then find the probability of its being a red face card?

OR

A card is drawn from a deck of 52 cards. The event E is that card is not an ace of hearts. Find the number of outcomes favourable to E.

Q15.   If the angles of elevation of the top of a tower from two points distant a and $b(a > b)$ from its foot and in the same straight line from it are respectively $30°$ and $60°$, then find the height of the tower.

Q16.   The circumference of the edge of a hemisphere bowl is 132 cm. When π is taken as $\frac{22}{7}$, find the capacity of the bowl in cm³.

SECTION II

Case study-based questions are compulsory. Attempt any 4 sub parts from each question. Each question carries 1 mark.

Q17. John and Priya went for a small picnic. After having their lunch Priya insisted to travel in a motor boat. The speed of the motor boat was 20 km/hr. Priya being a Mathematics student wanted to know the speed of the current. So she noted the time for upstream and downstream.


She found that for covering the distance of 15 km the boat took 1 hour more for upstream than downstream.

(i) Let speed of the current be x km/hr. then speed of the motorboat in upstream will be
(a) 20 km/hr
(b) $(20 + x)$ km/hr
(c) $(20 - x)$ km/hr
(d) 2 km/hr

(ii) What is the relation between speed distance and time?
(a) speed = (distance)/time
(b) distance = (speed)/time
(c) time = speed × distance
(d) none of these

(iii) Which is the correct quadratic equation for the speed of the current ?
(a) $x^2 + 30x - 200 = 0$
(b) $x^2 + 20x - 400 = 0$
(c) $x^2 + 30x - 400 = 0$
(d) $x^2 - 20x - 400 = 0$

(iv) What is the speed of current ?
(a) 20 km/hour
(b) 10 km/hour
(c) 15 km/hour
(d) 25 km/hour

(v) How much time boat took in downstream ?
(a) 90 minute
(b) 15 minute
(c) 30 minute
(d) 45 minute

Q18. The law of reflection states that when a ray of light reflects off a surface, the angle of incidence is equal to the angle of reflection.
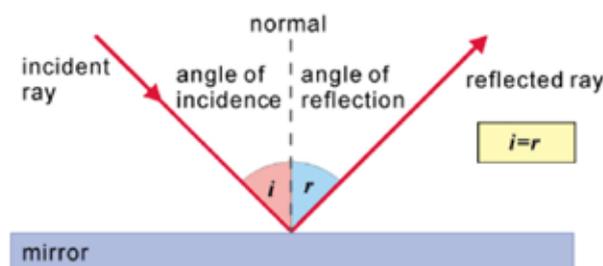
Ramesh places a mirror on level ground to determine the height of a pole (with traffic light fired on it). He stands at a certain distance so that he can see the top of the pole reflected from the mirror. Ramesh's eye level is 1.5 m above the ground. The distance of Ramesh and the pole from the mirror are 1.8 m and 6 m respectively.
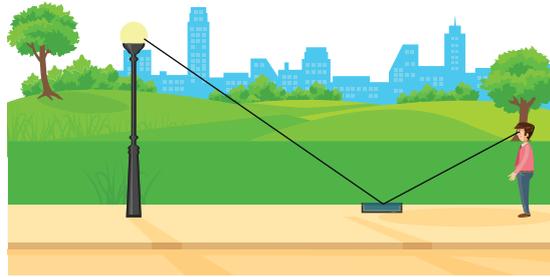
(i) Which criterion of similarity is applicable to similar triangles?
(a) SSA   (b) ASA
(c) SSS   (d) AA

(ii) What is the height of the pole?
(a) 6 metres   (b) 8 metres
(c) 5 metres   (d) 4 metres

(iii) If angle of incidence is i, which of the following is correct relation?
(a) $\tan i = \frac{5}{6}$ (b) $\tan i = \frac{6}{5}$
(c) $\tan i = \frac{3}{5}$ (d) $\tan i = \frac{5}{3}$

(iv) Now Ramesh move behind such that distance between pole and Ramesh is 13 meters. He place mirror between him and pole to see the reflection of light in right position. What is the distance between mirror and Ramesh ?
(a) 7 metres   (b) 3 metres
(c) 5 metres   (d) 4 metres

(v) What is the distance between mirror and pole?
(a) 9 metres   (b) 8 metres
(c) 12 metres   (d) 10 metres

Q19.   A barn is an agricultural building usually on farms and used for various purposes. A barn refers to structures that house livestock, including cattle and horses, as well as equipment and fodder, and often grain.
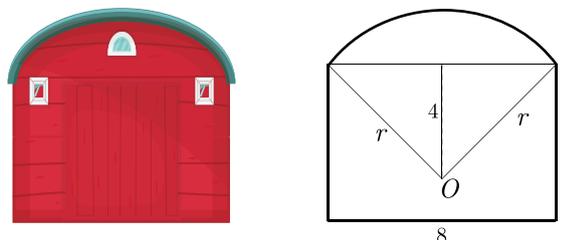
Ramkaran want to build a barn at his farm. He has made a design for it which is shown above. Here roof is arc of a circle of radius r at centre O.

(i) What is the value of radius of arc ?
(a) $4\sqrt{3}$ m   (b) $4\sqrt{2}$ m
(c) $4\sqrt{3}$ m   (d) $2\sqrt{2}$ m

(ii) What is the curved width of roof ?
    (a) $2\pi\sqrt{3}$ m   (b) $4\pi\sqrt{2}$ m
    (c) $2\pi\sqrt{2}$ m   (d) $4\pi\sqrt{3}$ m

(iii) What is area of cross section of barn ?
    (a) $8(6+\pi)\,\text{m}^2$ (b) $4(6+\pi)\,\text{m}^2$
    (c) $8(3+\pi)\,\text{m}^2$ (d) $4(3+\pi)\,\text{m}^2$

(iv) If the length of the barn is 12 meters, what is the curved surface area of roof?
    (a) $32\sqrt{2}\,\pi\,\text{m}^2$ (b) $16\sqrt{2}\,\pi\,\text{m}^2$
    (c) $48\sqrt{2}\,\pi\,\text{m}^2$ (d) $24\sqrt{2}\,\pi\,\text{m}^2$

(v) What is the storage capacity of barn ?
    (a) $48(6+\pi)\,\text{m}^3$ (b) $48(6+\pi)\,\text{m}^3$
    (c) $96(6+\pi)\,\text{m}^3$ (d) $96(3+\pi)\,\text{m}^3$

Q20. Student-teacher ratio expresses the relationship between the number of students enrolled in a school and the number teachers employed by the school. Student-teacher ratio is important for a number of reasons. It can be used as a tool to measure teacher workload as well as the allocation of resources. A low student-teacher ratio indicates the burden on a single teacher of teaching multiple students as well as the lack of time that each student gets.

A survey was conducted in the 100 secondary school of Rajasthan and following frequency distribution table was prepared

Students per teacher	Number of School
20-25	5
25-30	15
30-35	25
35-40	30
40-45	15
45-50	10

(i) What is the upper limit of median class ?
    (a) 25   (b) 40
    (c) 35   (d) 35

(ii) What is the median value of students per teacher?
    (a) 25.67   (b) 37.67
    (c) 35.83   (d) 39.67

(iii) What is the lower limit of model class ?
    (a) 20   (b) 40
    (c) 35   (d) 45

(iv) What is the model value of students per teacher ?
    (a) 35.25   (b) 36.25
    (c) 37.25   (d) 39.25

(v) What is the mean value of students per teacher ?
    (a) 35.625   (b) 36.250
    (c) 38.500   (d) 39.275

PART - B

All questions are compulsory. In case of internal choices, attempt anyone.

Q21. Find HCF and LCM of 404 and 96 and verify that HCF $\times$ LCM = Product of the two given numbers.

Q22. Find whether the lines represented by $2x + y = 3$ and $4x + 2y = 6$ are parallel, coincident or intersecting.

Q23. Find a relation between x and y such that the point $P(x,y)$ is equidistant from the points $A(-5,3)$ and $B(7,2)$.

OR

Find the ratio in which y-axis divides the line segment joining the points $A(5,-6)$ and $B(-1,-4)$. Also find the co-ordinates of the point of division.

Q24. Find $\operatorname{cosec} 30°$ and $\cos 60°$ geometrically.

OR

If $4\cos\theta = 11\sin\theta$, find the value of $\frac{11\cos\theta - 7\sin\theta}{11\cos\theta + 7\sin\theta}$.

Q25. A kite is flying at a height of 90 m above the ground. The string attached to the kite is temporarily tied to a point on the ground. The inclination of the string with the ground is $60°$. Find the length of the string assuming that there is no slack in the string.

Q26. Median of a data is 52.5 and its mean is 54, use empirical relationship between three measure of central tendency to find its mode.

Q27. Prove that $\frac{2+\sqrt{3}}{5}$ is an irrational number, given that $\sqrt{3}$ is an irrational number.   [3]

Q28. Determine the values of m and n so that the following system of linear equation have infinite number of solutions :
$$(2m-1)x + 3y - 5 = 0$$
$$3x + (n-1)y - 2 = 0$$

Q29. Find the 20th term of an AP whose 3rd term is 7 and the seventh term exceeds three times the 3rd term by 2. Also find its nth term (a_n).

OR

If 7th term of an AP is $\frac{1}{9}$ and 9th term is $\frac{1}{7}$, find 63rd term.

Q30. Find the co-ordinate of a point P on the line segment joining $A(1,2)$ and $B(6,7)$ such that $AP = \frac{2}{5}AB$.

OR

The co-ordinates of the vertices of $\triangle ABC$ are $A(7,2)$, $B(9,10)$ and $C(1,4)$. If E and F are the mid-points of AB and AC respectively, prove that $EF = \frac{1}{2}BC$.

Q31.   Draw a line segment AB of length 7 cm. Taking A as centre, draw a circle of radius 3 cm and taking
       B as centre, draw another circle of radius 2 cm. Construct tangents to each circle from the centre
       of the other circle.

Q32.   A solid is in the shape of a cone mounted on a hemisphere of same base radius. If the curved
       surface areas of the hemispherical part and the conical part are equal, then find the ratio of the
       radius and the height of the conical part.

Q33.   One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting :
       (i) a red face card,
       (ii) a spade,
       (iii) either a king or a black cards.

Q34.   If α and β are the zeroes of polynomial $p(x) = 3x^2 + 2x + 1$, find the polynomial whose zeroes are
       $\frac{1-\alpha}{1+\alpha}$ and $\frac{1-\beta}{1+\beta}$.

Q35.   In the given figure, $DEFG$ is a square and $\angle BAC = 90°$. Show that $FG^2 = BG \times FC$.
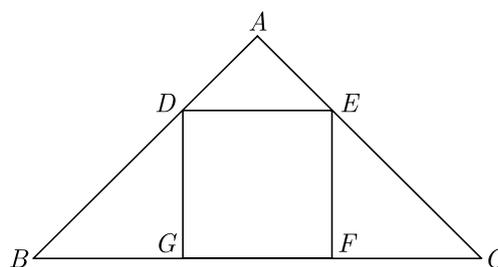
OR

       In Figure $DEFG$ is a square in a triangle ABC right angled at A. Prove that
       (i) $\Delta AGF \sim \Delta DBG$
       (ii) $\Delta AGF \sim \Delta EFC$
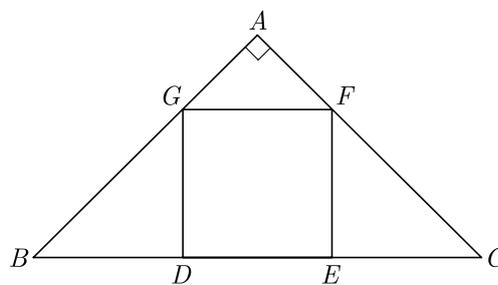
Q36.   If $\tan\theta = \dfrac{1}{\sqrt{5}}$,

       (1) Evaluate : $\dfrac{\text{cosec}^2\theta - \sec^2\theta}{\text{cosec}^2\theta + \sec^2\theta}$

       (2) Verify the identity : $\sin^2\theta + \cos^2\theta = 1$