CLASS X (2020-21)
MATHEMATICS STANDARD (041)
SAMPLE PAPER-10

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 :

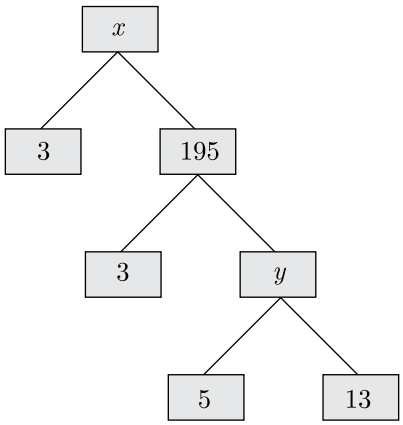
1. Question no. 21 to 26 are very short answer type questions of 2 mark each.
2. Question no. 27 to 33 are short answer type questions of 3 marks each.
3. Question no. 34 to 36 are long answer type questions of 5 marks each.
4. Internal choice is provided in 2 questions of 2 marks, 2 questions of 3 marks 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. Complete the following factor tree and find the composite number x.



OR

Write the rational number $\frac{7}{75}$ will have a terminating decimal expansion. or a non-terminating repeating decimal.

Q2. x and y are 2 different digits. If the sum of the two digit numbers formed by using both the digits is a perfect square, then what is the value of $x+y$?

Q3. Two triangles are similar if their corresponding sides are ..... .

Q4. What is the distance of the point $(-12,\ 5)$ from the origin ?

OR

What is the distance of point $P(3, 4)$ from x-axis?

Q5. If $\cos A = \frac{4}{5}$, then find the value of $\tan A$.

Q6. If $\sin\theta - \cos\theta = 0$, then find the value of $(\sin^4\theta + \cos^4\theta)$

Q7. The ..... of an object viewed, is the angle formed by the line of sight with the horizontal when it is above the horizontal level, i.e., the case when we raise our head to look at the object.

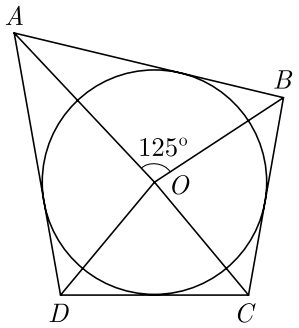
OR

The ..... of an object viewed, is the angle formed by the line of sight with the horizontal when it is below the horizontal level, i.e., the case when we lower our head to look at the object.

Q8. Two concentric circles are of radii 10 cm and 8 cm, then find the length of the chord of the larger circle which touches the smaller circle.

OR

In given figure, if $\angle AOB = 125°$, then find the angle $\angle COD$?



Q9. To find a point P on the line segment $AB = 6$ cm, such that $\frac{AP}{AB} = \frac{2}{5}$, in which ratio the line segment AB is divided.

OR

A line Segment AB is divided at point P such that $\frac{PB}{AB} = \frac{3}{7}$, then find the ratio $AP : PB$.

Q10. Find the area of circle that can be inscribed in a square of side 10 cm.

Q11. If the radius of a circle is doubled, what about its area?

Q12. For finding the popular size of readymade garments, which central tendency is used?

Q13. For the following distribution find the sum of lower limits of the median class and modal class.

Class	0-5	5-10	10-15	15-20	20-25
Frequency	10	15	12	20	9

Q14. A bag contains 3 red and 2 blue marbles. If a marble is drawn at random, then find the probability of drawing a blue marble.

Q15. A card is drawn at random from a well-shuffled pack of 52 cards. Find the probability of getting a red king.

Q16. A box contains 90 discs, numbered from 1 to 90. If one disc is drawn at random from box, find the probability that it bears a prime number less than 23.

SECTION II

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

Q17. Pyramid, in architecture, a monumental structure constructed of or faced with stone or brick and having a rectangular base and four sloping triangular sides meeting at an apex. Pyramids have been built at various times in Egypt, Sudan, Ethiopia, western Asia, Greece, Cyprus, Italy, India, Thailand, Mexico, South America, and on some islands of the Pacific Ocean. Those of Egypt and of Central and South America are the best known.

The volume and surface area of a pyramid with a square base of area a^2 and height h is given by $V = \frac{ha^2}{3}$ and $S = a^2 + 2a\sqrt{(\frac{a}{2})^2 + h^2}$

A pyramid has a square base and a volume of $3y^3 + 18y^2 + 27y$ cubic units.

(i) If its height is y, then what polynomial represents the length of a side of the square base ?

(a) $9(y+3)$ (b) $9(y+3)^2$

(c) $3(y+3)$ (d) $3(y+3)^2$

(ii) If area of base is 576 metre, what is the side of base?

(a) 24 metre (b) 16 metre

(c) 13 metre (d) 12 metre

(iii) What is the height of pyramid at above area of base ?

(a) 4 metre (b) 6 metre

(c) 5 metre (d) 12 metre

(iv) What is the ratio of length of side to the height ?

(a) $\frac{1}{5}$ (b) $\frac{2}{5}$

(c) $\frac{5}{24}$ (d) $\frac{24}{5}$

(v) What is surface area of pyramid ?

(a) 800 m^2 (b) 2400 m^2

(c) 1200 m^2 (d) 1600 m^2

Q18. Optimal pricing strategy : The director of the Blue Rose Theatre must decide what to charge for a ticket to the comedy drama. If the price is set too low, the theatre will lose money; and if the price is too high, people won't come. From past experience she estimates that the profit P from sales (in hundreds) can be approximated by $P(x) = -x^2 + 22x - 40$ where x is the cost of a ticket and $0 \le x \le 25$ hundred rupees.

(i) What is the lowest cost of a ticket that would allow the theatre to break even?
(a) Rs 3 hundred (b) Rs 4 hundred
(c) Rs 2 hundred (d) Rs 1 hundred

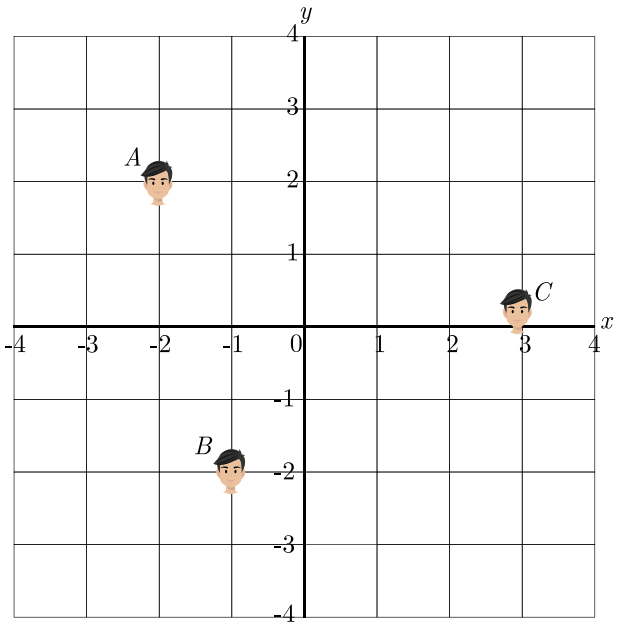
(ii) What is the highest cost that the theatre can charge to break even?
(a) Rs 16 hundred (b) Rs 14 hundred
(c) Rs 4 hundred (d) Rs 20 hundred

(iii) If theatre charge Rs 4 hundred for each ticket, what is the profit/loss ?
(a) Loss Rs 1600 (b) Profit Rs 1600
(c) Loss Rs 3200 (d) Profit Rs 3200

(iv) If theatre charge Rs 25 hundred for each ticket, what is the profit/loss ?
(a) Loss Rs 11500 (b) Profit Rs 8500
(c) Loss Rs 8500 (d) Profit Rs 11500

(v) What is the maximum profit which can be earned by theatre ?
(a) Rs 4000 (b) Rs 8100
(c) Rs 6100 (d) Rs 4200

Q19. Ajay, Bhigu and Colin are fast friend since childhood. They always want to sit in a row in the classroom . But teacher doesn't allow them and rotate the seats row-wise everyday. Bhigu is very good in maths and he does distance calculation everyday. He consider the centre of class as origin and marks their position on a paper in a co-ordinate system. One day Bhigu make the following diagram of their seating position.



(i) What are the coordinates of point A?

(a) $(2, 2)$ (b) $(2, -2)$

(c) $(-2, 2)$ (d) $(-2, -2)$

(ii) What is the distance of point A from origin ?

(a) 8 (b) $2\sqrt{2}$

(c) 4 (d) $4\sqrt{2}$

(iii) What is the distance between A and B ?

(a) $3\sqrt{19}$ (b) $3\sqrt{5}$

(c) $\sqrt{17}$ (d) $2\sqrt{5}$

(iv) What is the distance between B and C ?

(a) $3\sqrt{19}$ (b) $3\sqrt{5}$

(c) $2\sqrt{17}$ (d) $2\sqrt{5}$

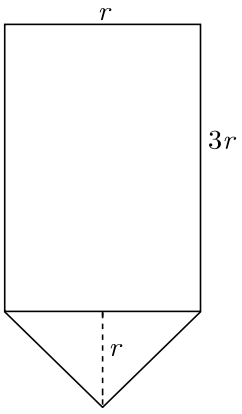
(v) A point D lies on the line segment between points A and B such that $AD : DB = 4 : 3$. What are the the coordinates of point D ?

(a) $\left(\frac{10}{7}, \frac{2}{7}\right)$ (b) $\left(\frac{2}{7}, \frac{7}{7}\right)$

(c) $\left(-\frac{10}{7}, -\frac{2}{7}\right)$ (d) $\left(-\frac{2}{7}, -\frac{7}{7}\right)$

Q20. The advantages of cone bottom tanks are found in nearly every industry, especially where getting every last drop from the tank is important. This type of tank has excellent geometry for draining, especially with high solids content slurries as these cone tanks provide a better full-drain solution. The conical tank eliminates many of the problems that flat base tanks have as the base of the tank is sloped towards the centre giving the greatest possible full-drain system in vertical tank design.

Rajesh has been given the task of designing a conical bottom tank for his client. Height of conical part is equal to its radius. Length of cylindrical part is the 3 times of its radius. Tank is closed from top. The cross section of conical tank is given below.



(i) If radius of cylindrical part is taken as 3 meter, what is the volume of above conical tank ?

(a) 120π m^3 (b) 90π m^3

(c) 60π m^3 (d) 30π m^3

(ii) What is the area of metal sheet used to make this conical tank ? Assume that tank is covered from top.

(a) $27(7+\sqrt{2})\pi$ m^2 (b) $9(7+\sqrt{2})\pi$ m^2

(c) $27(5+\sqrt{2})\pi$ m^2 (d) $9(5+\sqrt{2})\pi$ m^2

(iii) What is the ratio of volume of cylindrical part to the volume of conical part?

(a) 6 (b) 9

(c) $\frac{1}{6}$ (d) $\frac{1}{9}$

(iv) The cost of metal sheet is Rs 2000 per square meter and fabrication cost is 1000 per square meter. What is the total cost of tank ?

(a) Rs $27000(7+\sqrt{2})\pi$ (b) Rs $54000(7+\sqrt{2})\pi$

(c) Rs $27000(5+\sqrt{2})\pi$ (d) Rs $54000(5+\sqrt{2})\pi$

(v) A oil is to be filled in the tank. The density of oil is 1050 kg per cubic meter. What is the weight of oil filled in tank ?

(a) 195 Tonne (b) 200 Tonne

(c) 297 Tonne (d) 174 Tonne

PART - B

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

Q21. If two positive integers p and q are written as $p = a^2b^3$ and $q = a^3b$, where a and b are prime numbers than verify $\text{LCM}(p,q) \times \text{HCF}(q,q) = pq$

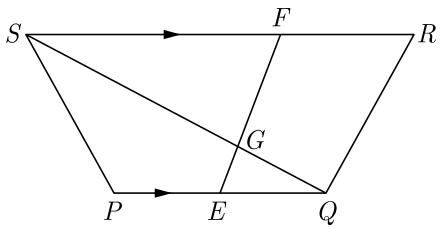
Q22. Sum of the ages of a father and the son is 40 years. If father's age is three times that of his son, then find their respective ages.

Q23. If $x = \frac{2}{3}$ and $x = -3$ are roots of the quadratic equation $ax^2 + 7x + b = 0$, find the values of a and b.

OR

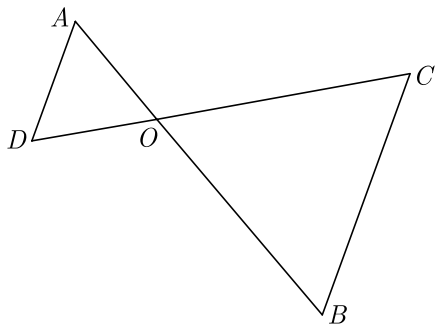
Find the roots of $x^2 - 4x - 8 = 0$ by the method of completing square.

Q24. In the figure, $PQRS$ is a trapezium in which $PQ \,||\, RS$. On PQ and RS, there are points E and F respectively such that EF intersects SQ at G. Prove that $EQ \times GS = GQ \times FS$.



OR

In the given figure, $OA \times OB = OC \times OD$, show that $\angle A = \angle C$ and $\angle B = \angle D$.



Q25. Prove that : $\frac{\sin\theta - 2\sin^3\theta}{2\cos^3 - \cos\theta} = \tan\theta$

Q26. The frequency distribution of agricultural holdings in a village below :

Area of land (in hectare)	1-3	3-5	5-7	7-9	9-11	11-13
Number of families	20	45	80	55	40	12

Find the modal agricultural holding of the village.

Q27. Prove that $\sqrt{5}$ is an irrational number.

Q28. A chemist has one solution which is 50 % acid and a second which is 25 % acid. How much of each should be mixed to make 10 litre of 40 % acid solution.

Q29. If in $\Delta ABC, AD$ is median and $AE \perp BC$, then prove that $AB^2 + AC^2 = 2AD^2 + \frac{1}{2}BC^2$.

Q30. Prove that $\frac{\tan^2 A}{\tan^2 A - 1} + \frac{\text{cosec}^2 A}{\sec^2 A - \text{cosec}^2 A} = \frac{1}{1 - 2\cos^2 A}$

OR

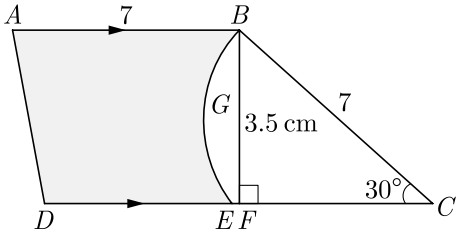
If in a triangle ABC right angled at B, $AB = 6$ units and $BC = 8$ units, then find the value of $\sin A \cos C + \cos A \sin C$.

Q31. Draw two concentric circle of radii 3 cm and 5 cm. Taking a point on the outer circle, construct the pair of tangents to the inner circle.

OR

Draw a line segment AB of length 8 cm. Taking A as centre, draw a circle of radius 4 cm, and taking B as centre draw another circle of radius 3 cm. Construct tangents to each circle of radius centre of the other circle.

Q32. Adjoining fig, $ABCD$ is a trapezium with $AB||DC$ and $\angle BCD = 30°$. Fig. $BGEC$ is a sector of a circle with centre C and $AB = BC = 7$ cm, $DE = 4$ cm and $BF = 3.5$ cm, then find the area of the shaded region. Use $\pi = \frac{22}{7}$.



Q33. The mode of a distribution is 55 and the modal class is 45-60 and the frequency preceding the modal class is 5 and the frequency after the modal class is 10. Find the frequency of the modal class.

Q34. Find the number of terms of the AP $-12, -9, -6, ..., 21$. If 1 is added to each term of this AP, then find the sum of all the terms of the AP thus obtained.

Q35. (i) Derive section formula.
(ii) In what ratio does $(-4, 6)$ divides the line segment joining the point $A(-6, 4)$ and $B(3, -8)$

OR

$(1, -1)$,$(0, 4)$ and $(-5, 3)$ are vertices of a triangle. Check whether it is a scalene triangle, isosceles triangle or an equilateral triangle. Also, find the length of its median joining the vertex $(1, -1)$ the mid-point of the opposite side.

Q36. The angle of elevation of the top B of a tower AB from a point X on the ground is $60°$. At point Y , 40 m vertically above X, the angle of elevation of the top is $45°$. Find the height of the tower AB and the distance XB.

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