CLASS X (2020-21)
MATHEMATICS STANDARD (041)
SAMPLE PAPER-02

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. What is the HCF of smallest primer number and the smallest composite number?

OR

Write one rational and one irrational number lying between 0.25 and 0.32.

Q2. Find the value of k for which the system of equations $x+y-4=0$ and $2x+ky=3$, has no solution.

Q3. If α and β are the zeroes of the polynomial x^2+2x+1, then what is the value of $\frac{1}{\alpha}+\frac{1}{\beta}$?

OR

If α and β are the zeroes of the polynomial $2x^2-13x+6$, then what is the value of $\alpha+\beta$?

Q4. What is the value of x for which $2x,(x+10)$ and $(3x+2)$ are the three consecutive terms of an AP ?

OR

If the first term of AP is p and the common difference is q, then what is its 10th term?

Q5. ΔABC and ΔBDE are two equilateral triangle such that D is the mid-point of BC. Ratio of the areas of triangles ABC and BDE is ..... .

Q6. In ΔABC, if X and Y are points on AB and AC respectively such that $\frac{AX}{XB}=\frac{3}{4}$, $AY=5$ and $YC=9$, then state whether XY and BC parallel or not.

Q7. If $\sec 5A = \text{cosec}(A + 30^\circ)$, where $5A$ is an acute angle, then what is the value of A?

Q8. If $\tan A = \cot B$, then find the value of $(A + B)$.

Q9. If the length of the ladder placed against a wall is twice the distance between the foot of the ladder and the wall. Find the angle made by the ladder with the horizontal.

Q10. If a line intersects a circle in two distinct points, what is it called ?

Q11. What is the length of the tangent drawn from a point 8 cm away from the centre of a circle of radius 6 cm ?

Q12. If circumference of a circle is 44 cm, then what will be the area of the circle?

OR

A steel wire when bent in the form of a square encloses an area or 121 cm^2. If the same wire is bent in the form of a circle, then find the circumference of the circle.

Q13. A solid metallic cuboid 24 cm $\times$ 11 cm $\times$ 7 cm is melted and recast and recast into solid cones of base radius 3.5 cm and height 6 cm. Find the number of cones so formed.

Q14. What is the ratio of the total surface area of the solid hemisphere to the square of its radius.

Q15. From the following frequency distribution, find the median class :

Cost of living index	1400-1500	1550-1700	1700-1850	1850-2000
Number of weeks	8	15	21	8

OR

In the following frequency distribution, find the median class.

Height (in cm)	104-145	145-150	150-155	155-160	160-165	165-170
Frequency	5	15	25	30	15	10

Q16. In a frequency distribution, the mid value of a class is 10 and the width of the class is 6. What is the lower limit of the class?

SECTION II

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

Q17. The Prime Minister's Citizen Assistance and Relief in Emergency Situations Fund was created on 28 March 2020, following the COVID-19 pandemic in India. The fund will be used for combating, and containment and relief efforts against the coronavirus outbreak and similar pandemic like situations in the future.

The allotment officer is trying to come up with a method to calculate fair division of funds across various affected families so that the fund amount and amount received per family can be easily adjusted based on daily revised numbers. The total fund allotted for a village is $x^3+6x^2+20x+9$. The officer has divided the fund equally among families of the village and each family receives an amount of x^2+2x+2. After distribution, some amount is left.

(i) How many families are there in the village?

(a) $x+4$ (b) $x-3$

(c) $x-4$ (d) $x+3$

(ii) If an amount of ₹1911 is left after distribution, what is value of x?

(a) 190 (b) 290

(c) 191 (d) 291

(iii) How much amount does each family receive?

(a) 24490 (b) 34860

(c) 22540 (d) 36865

(iv) What is the amount of fund allocated?

(a) Rs 72 72 759 (b) Rs 75 72 681

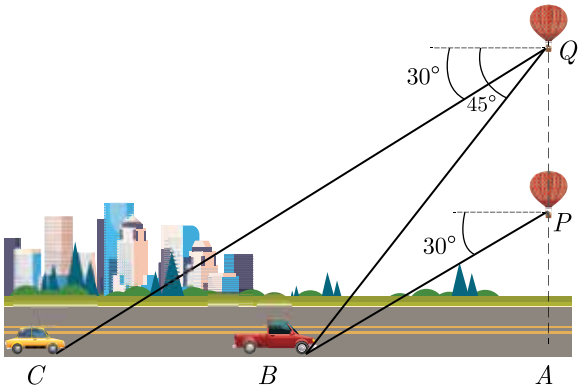
(c) Rs 69 72 846 (d) Rs 82 74 888

(v) How many families are there in the village?

(a) 191 (b) 98

(c) 187 (d) 195

Q18. A hot air balloon is a type of aircraft. It is lifted by heating the air inside the balloon, usually with fire. Hot air weighs less than the same volume of cold air (it is less dense), which means that hot air will rise up or float when there is cold air around it, just like a bubble of air in a pot of water. The greater the difference between the hot and the cold, the greater the difference in density, and the stronger the balloon will pull up.



Lakshman is riding on a hot air balloon. After reaching at height x at point P, he spots a lorry parked at B on the ground at an angle of depression of $30°$. The balloon rises further by 50 metres at point Q and now he spots the same lorry at an angle of depression of $45°$ and a car parked at C at an angle of depression of $30°$.

(i) What is the relation between the height x of the balloon at point P and distance d between point A and B?

(a) $x = 3d$ (b) $d = 3x$

(c) $d^2 = 3x^2$ (d) $3d^2 = x^2$

(ii) When balloon rises further 50 metres, then what is the relation between new height y and d ?

(a) $y = d + 50$ (b) $d = y$

(c) $y = \sqrt{3}\, d$ (d) $\sqrt{3}\, y = d$

(iii) What is the new height of the balloon at point Q?

(a) $50(\sqrt{3}+3)$ m (b) $25(\sqrt{3}+1)$ m

(c) $50(\sqrt{3}+1)$ m (d) $25(\sqrt{3}+3)$ m

(iv) What is the distance AB on the ground ?

(a) $50(\sqrt{3}+3)$ m (b) $25(3+3\sqrt{3})$ m

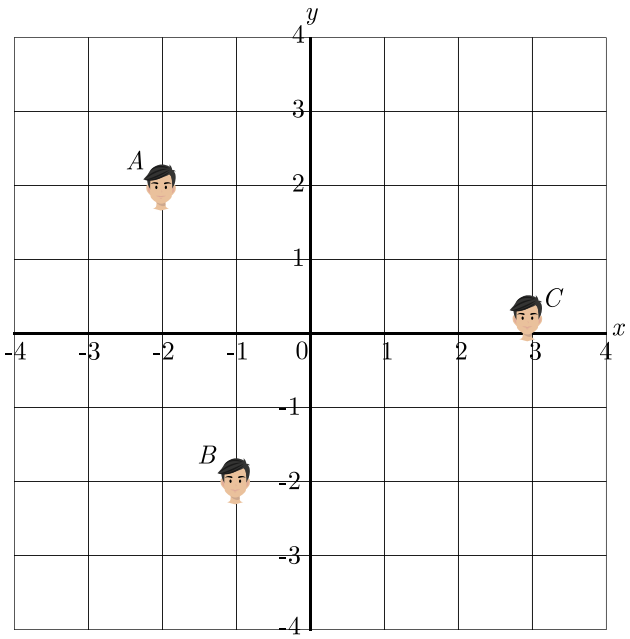
(c) $50(\sqrt{3}+1)$ m (d) $25(\sqrt{3}+3)$ m

(v) What is the distance AC on the ground ?

(a) $75(1+\sqrt{3})$ m (b) $25(1+\sqrt{3})$ m

(c) $50(1+\sqrt{3})$ m (d) $25(\sqrt{3}+3)$ m

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. In two dice game, the player take turns to roll both dice, they can roll as many times as they want in one turn. A player scores the sum of the two dice thrown and gradually reaches a higher score as they continue to roll. If a single number 1 is thrown on either die, the score for that whole turn is lost. Two dice are thrown simultaneously.

(i) What is the probability of getting the sum as an even number ?

(a) $\frac{3}{4}$ (b) $\frac{1}{2}$

(c) $\frac{1}{4}$ (d) $\frac{5}{8}$

(ii) What is the probability of getting the sum as a prime number ?

(a) $\frac{5}{12}$ (b) $\frac{1}{6}$

(c) $\frac{7}{12}$ (d) $\frac{11}{12}$

(iii) What is the probability of getting the sum of atleast 10?

(a) $\frac{5}{12}$ (b) $\frac{5}{6}$

(c) $\frac{1}{6}$ (d) $\frac{7}{12}$

(iv) What is the probability of getting a doublet of even number ?

(a) $\frac{1}{12}$ (b) $\frac{5}{12}$

(c) $\frac{11}{12}$ (d) $\frac{7}{12}$

(v) What is the probability of getting a product of numbers greater than 16?

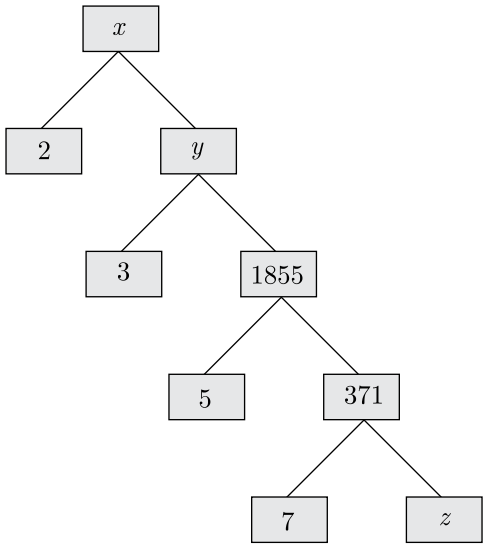
(a) $\frac{7}{36}$ (b) $\frac{2}{9}$

(c) $\frac{5}{18}$ (d) $\frac{11}{36}$

PART - B

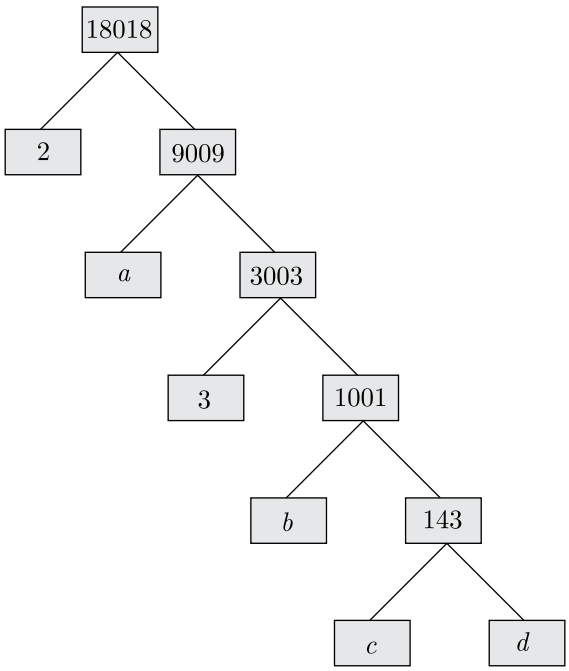
All questions are compulsory. In case of internal choices, attempt any one.

Q21. Complete the following factor tree and find the composite number x



OR

Find the missing numbers a, b, c and d in the given factor tree:



Q22. In $\Delta ABC, AD \perp BC$, such that $AD^2 = BD \times CD$. Prove that ΔABC is right angled at A.

OR

In an equilateral triangle, prove that three times the square of one side is equal to four times the square of one of its altitudes.

OR

Find the altitude of an equilateral triangle when each of its side is a cm.

Q23. Find the ratio in which the point $P(\frac{3}{4}, \frac{5}{12})$ divides the line segment joining the point A $(\frac{1}{2}, \frac{3}{2})$ and $(2, -5)$.

Q24. If $\sin\phi = \frac{1}{2}$, show that $3\cos\phi - 4\cos^3\phi = 0$.

Q25. 12 solid spheres of the same size are made by melting a solid metallic cone of base radius 1 cm and height of 48 cm. Find the radius of each sphere.

Q26. Find the mean of the following data :

Class	0- 20	20-40	40-60	60-80	80-100	100- 120
Frequency	20	35	52	44	38	31

Q27. Three bells toll at intervals of 9, 12, 15 minutes respectively. If they start tolling together, after what time will they next toll together?

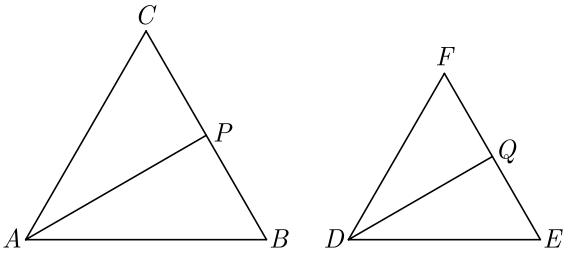
Q28. Solve for x and y :

$$\frac{x}{2} + \frac{2y}{3} = -1$$

$$x - \frac{y}{3} = 3$$

Q29. The sum of first n terms of three arithmetic progressions are S_1, S_2 and S_3 respectively. The first term of each AP is 1 and common differences are 1, 2 and 3 respectively. Prove that $S_1 + S_3 = 2S_2$.

Q30. In given figure $\Delta ABC \sim \Delta DEF$. AP bisects $\angle CAB$ and DQ bisects $\angle FDE$.



Prove that :

(1) $\frac{AP}{DQ} = \frac{AB}{DE}$

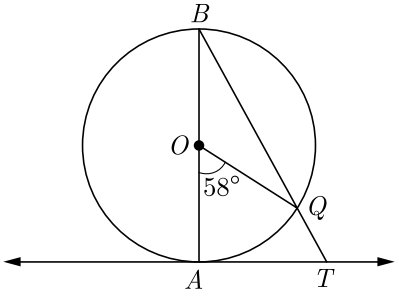
(2) $\Delta CAP \sim \Delta FDQ$.

Q31. In ΔABC, $\angle B = 90^\circ$, $BC = 5$ cm, $AC - AB = 1$, Evaluate : $\frac{1+\sin C}{1+\cos C}$.

OR

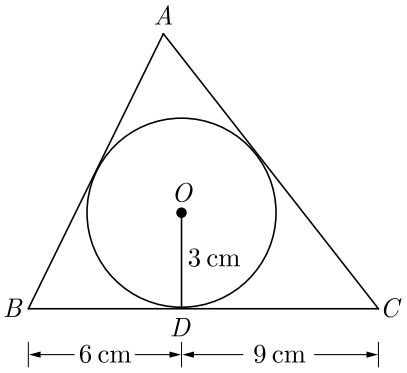
If $b\cos\theta = a$, then prove that $\operatorname{cosec}\theta + \cot\theta = \sqrt{\frac{b+a}{b-a}}$.

Q32. In given figure, AB is the diameter of a circle with centre O and AT is a tangent. If $\angle AOQ = 58^\circ$, find $\angle ATQ$.



OR

In figure, a triangle ABC is drawn to circumscribe a circle of radius 3 cm, such that the segments BD and DC are respectively of lengths 6 cm and 9 cm. If the area of ΔABC is 54 cm^2, then find the lengths of sides AB and AC.



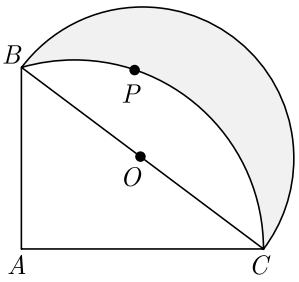
Q33. Construct a triangle whose perimeter is 13.5 cm and the ratio of the three sides is $2:3:4$.

Q34. Solve for x : $\frac{1}{x+1}+\frac{2}{x+2}=\frac{4}{x+4}$ $x \neq -1, -2, -4$

OR

Find the zeroes of the quadratic polynomial $7y^2-\frac{11}{3}y-\frac{2}{3}$ and verify the relationship between the zeroes and the coefficients.

Q35. In given figure $ABPC$ is a quadrant of a circle of radius 14 cm and a semicircle is drawn with BC as diameter. Find the are of the shaded region.



Q36. If the median of the following frequency distribution is 32.5. Find the values of f_1 and f_2.

Class	0- 10	10-20	20-30	30-40	40-50	50-60	60-70	Total
Frequency	f_1	5	9	12	f_2	3	2	40

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