CLASS X (2020-21)
MATHEMATICS STANDARD (041)
SAMPLE PAPER-01

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.   If $x = 0.\bar{7}$, then find $2x$.

OR

1.   The L.C.M. of x and 18 is 36.
2.   The H.C.F. of x and 18 is 2.
What is the number x?

Q2.   Find the value of k for which the system of linear equations $x + 2y = 3$, $5x + ky + 7 = 0$ is inconsistent.

Q3.   If the sum and product of the zeroes of a quadratic polynomial are 3 and -10 respectively, find the quadratic polynomial.

OR

If the sum of the zeroes of the quadratic polynomial $kx^2 + 2x + 3k$ is equal to their product, then what is the value of k?
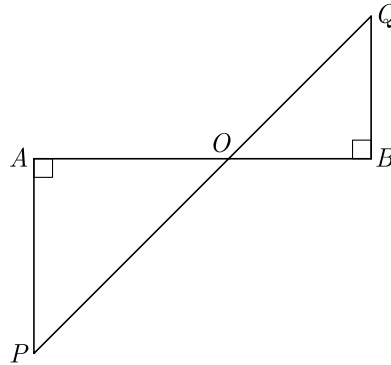
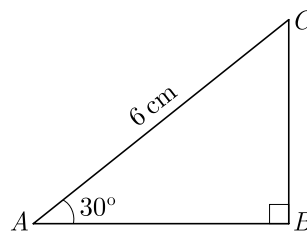Q4.   What is the nth term of the AP $a, 3a, 5a, ...$?

OR

What is the common difference of the AP $\frac{1}{p}, \frac{1-p}{p}, \frac{1-2p}{p}, ...$?

Q5. $\triangle ABC$ is an equilateral triangle of side $2a$, then length of one of its altitude is ....

Q6.   In the given figure, if $\angle A = 90^o, \angle B = 90^o$, $OB = 4.5$cm $OA = 6$ cm and $AP = 4$ cm then find QB.
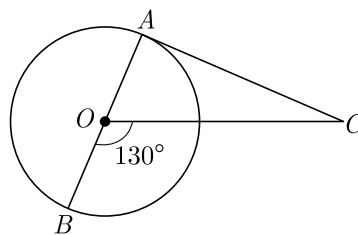

Q7.   In the adjoining figure, what is the length of BC?

Q8.   Prove that
        $$(1 + \tan A - \sec A) \times (1 + \tan A + \sec A) = 2\tan A$$

Q9.   A pole casts a shadow of length $2\sqrt{3}$ m on the ground, when the Sun's elevation is 60º. Find the height of the pole.

Q10.   In the given figure, AOB is a diameter of the circle with centre O and AC is a tangent to the circle at A. If $\angle BOC = 130°$, the find $\angle ACO$.

Q11.   If PQ and PR are two tangents to a circle with centre O. If $\angle QPR = 46^o$ then find $\angle QOR$.
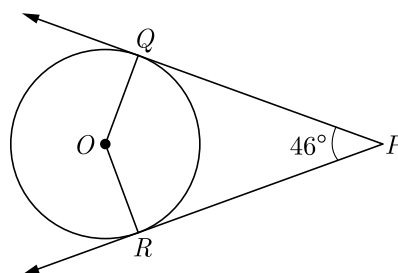
Q12.   If the perimeter and the area of the circle are numerically equal, then find the radius of the circle.

OR

In given fig., O is the centre of a circle. If the area of the sector $OAPB$ is $\frac{5}{36}$ times the area of the circle, then find the value of x.
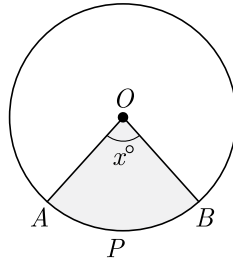

Q13. The total surface area of the given solid figure is ....
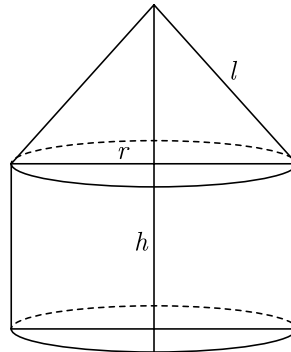
Q14. A cylinder, a cone and a hemisphere have same base and same height. Find the ratio of their volumes.

Q15. Find the class marks of the classes 20-50 and 35-60.

OR

If the median of a series exceeds the mean by 3, find by what number the mode exceeds its mean?

Q16. 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.

SECTION II

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

Q17. RK Fabricators has got a order for making a frame for machine of their client. For which, they are using a AutoCAD software to create a constructible model that includes the relevant information such as dimensions of the frame and materials needed.

The frame will have a solid base and will be cut out of a piece of steel. The final area of the frame should be 54 sq m. The digram of frame is shown below.

In order to input the right values in the AutoCAD software, the engineer needs to calculate some basic values.

(i) What are the dimensions of the outer frame ?
    (a) $(10 + x)$ and $(5 + x)$ (b) $(10 - x)$ and $(5 - x)$
    (c) $(10 + 2x)$ and $(5 + 2x)$ (d) $(10 - 2x)$ and $(5 - 2x)$

(ii) A metal sheet of minimum area is used to make the frame. What should be the minimum area of metal sheet before cutting ?
    (a) $4x^2 + 30x + 50$ (b) $x^2 + 27x + 55$
    (c) $5x^2 + 30$ (d) $4x^2 + 50$

(iii) What is the area of required final metal frame ?
    (a) $4x^2 + 30x + 50$ m²   (b) $x^2 + 27x + 55$ m²
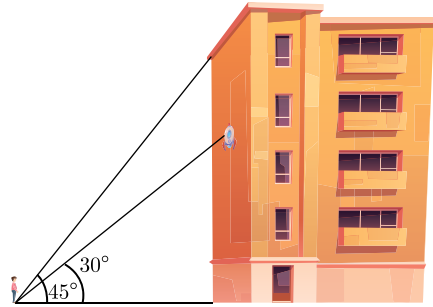   (c) $4x^2 + 50x$ m²   (d) $4x^2 + 30x$ m²

(iv) If the area of the frame is 54 sq m, what is the value of x ?
    (a) 0.75 m   (b) 3.0 m
    (c) 1.5 m   (d) 1.8 m

(v) What is the perimeter of the frame?
    (a) 36 m   (b) 42 m
    (c) 45 m   (d) 39 m

Q18. Resident Welfare Association (RWA) of a Gulmohar Society in Delhi have installed three electric poles A, B and C in a society's common park. Despite these three poles, some parts of the park are still in dark.
So, RWA decides to have one more electric pole D in the park.

The park can be modelled as a coordinate systems given below.

On the basis of the above information, answer any four of the following questions:

(i) What is the position of the pole C?

(a) (4, 5) (b) (5, 4)

(c) (6, 5) (d) (5, 6)

(ii) What is the distance of the pole B from the corner O of the park ?

(a) $6\sqrt{2}$ units (b) $3\sqrt{2}$ units

(c) $6\sqrt{3}$ units (d) $3\sqrt{3}$ units

(iii) Find the position of the fourth pole D so that four points A, B C and D form a parallelogram
.

(a) (5, 2) (b) (1, 5)

(c) (1, 4) (d) (2, 5)

(iv) What is the distance between poles A and C ?

(a) $6\sqrt{2}$ units (b) $3\sqrt{2}$ units

(c) $6\sqrt{3}$ units (d) $3\sqrt{3}$ units

(v) What is the distance between poles B and D?

(a) $2\sqrt{3}$ units (b) $\sqrt{28}$ units

(c) $6\sqrt{3}$ units (d) $\sqrt{26}$ units

Q19. A clinometer is a tool that is used to measure the angle of elevation, or angle from the ground, in a right - angled triangle. We can use a clinometer to measure the height of tall things that you can't possibly reach to the top of, flag poles, buildings, trees.

Ravish got a clinometer from school lab and started the measuring elevation angle in surrounding. He saw a building on which society logo is painted on wall of building.

From a point P on the ground level, the angle of elevation of the roof of the building is $45°$. The angle of elevation of the centre of logo is $30°$ from same point. The point P is at a distance of 24 m from the base of the building.

(i) What is the height of the building logo from ground ?
   (a) $8\sqrt{2}$ m   (b) $4\sqrt{3}$ m
   (c) $8\sqrt{3}$ m   (d) $4\sqrt{2}$ m

(ii) What is the height of the building from ground ?
   (a) $24(3-\sqrt{3})$ m   (b) $8(3-\sqrt{3})$ m
   (c) 24 m   (d) 32 m

(iii) What is the aerial distance of the point P from the top of the building ?
   (a) $24\sqrt{3}$ m   (b) $24\sqrt{2}$ m
   (c) $32\sqrt{3}$ m   (d) $32\sqrt{2}$ m

(iv) If the point of observation P is moved 9 m towards the base of the building, then the angle of elevation θ of the logo on building is given by
   (a) $\tan\theta = \sqrt{3}$ (b) $\tan\theta = \dfrac{2}{\sqrt{3}}$

   (c) $\tan\theta = \dfrac{1}{2}$ (d) $\tan\theta = \dfrac{8\sqrt{3}}{15}$

(v) In above case the angle of elevation ϕ of the top of building is given by
   (a) $\tan\phi = 1.6$ (b) $\tan\phi = 1.5$
   (c) $\tan\phi = 0.75$ (d) $\tan\phi = 0.8$

Q20. Cards on which numbers 1, 2, 3 .... 100 are written (one number on one card and no number is repeated), put in a bag and are mixed thoroughly. A card is drawn at random from the bag.


(i) What is the probability that card taken out has a odd number ?
   (a) 0.25   (b) 0.49
   (c) 0.50   (d) 0.51

(ii) What is the probability that card taken out has a two digit odd number ?
   (a) 0.23   (b) 0.45
   (c) 0.56   (d) 0.34

(iii) What is the probability that card taken out has a odd number which is multiple of 11?
    (a) 0.05   (b) 0.10
    (c) 0.12   (d) 0.06

(iv) What is the probability that card taken out has an odd number which is not less than 70 ?
    (a) 0.13   (b) 0.14
    (c) 0.12   (d) 0.15

(v) What is the probability that card taken out has an odd number which is not multiple of 11 ?
    (a) 0.25   (b) 0.50
    (c) 0.40   (d) 0.45

PART - B

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

Q21. Explain why $(7 \times 13 \times 11) + 11$ and $(7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1) + 3$ are composite numbers.

Q22. In an equilateral triangle of side 24 cm, find the length of the altitude.

Q23. If $A(5,2)$, $B(2,-2)$ and $C(-2,t)$ are the vertices of a right angled triangle with $\angle B = 90°$, then find the value of t.

Q24. If $\sqrt{3}\sin\theta - \cos\theta = 0$ and $0° < \theta < 90°$, find the value of θ.

Q25. A solid metallic object is shaped like a double cone as shown in figure. Radius of base of both cones is same but their heights are different. If this cone is immersed in water, find the quantity of water it will displace.
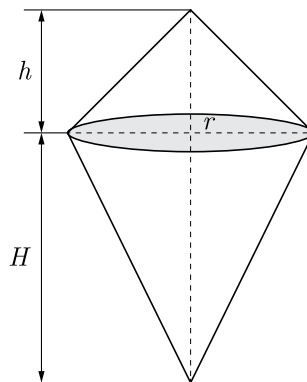
OR

Find the number of solid sphere of diameter 6 cm can be made by melting a solid metallic cylinder of height 45 cm and diameter 4 cm.

Q26. Find the median for the given frequency distribution :

Class	40-45	45-50	50-55	55-60	60-65	65-70	70-75
Frequency	2	3	8	6	6	3	2

OR

Find the mean of the following distribution :

Class	10-25	25-40	40-55	55-70	70-85	85-100
Frequency	2	3	7	6	6	6

Q27. Given that $\sqrt{2}$ is irrational, prove that $(5 + 3\sqrt{2})$ is an irrational number.

Q28. A part of monthly hostel charge is fixed and the remaining depends on the number of days one has taken food in the mess. When Swati takes food for 20 days, she has to pay Rs. 3,000 as hostel charges whereas Mansi who takes food for 25 days Rs. 3,500 as hostel charges. Find the fixed charges and the cost of food per day.

Q29. Divide 56 in four parts in AP such that the ratio of the product of their extremes (1st and 4rd) to the product of means (2nd and 3rd) is $5{:}6$.

OR

The sum of n terms of an AP is $3n^2 + 5n$. Find the AP Hence find its 15th term.

Q30. If the diagonals of a quadrilateral divide each other proportionally, prove that it is a trapezium.

OR

In the given figure, P and Q are the points on the sides AB and AC respectively of $\triangle ABC$, such that $AP = 3.5$cm, $PB = 7$ cm, $AQ = 3$ cm and $QC = 6$ cm. If $PQ = 4.5$ cm, find BC.
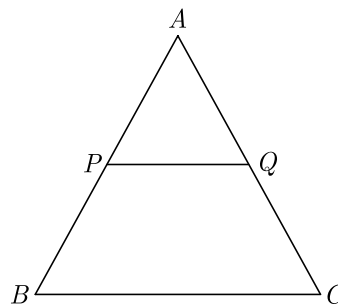
Q31. Prove that : $\dfrac{\cos A}{1 - \tan A} + \dfrac{\sin A}{1 - \cot A} = \sin A + \cos A$.

Q32. In the given figure PQ is chord of length 6 cm of the circle of radius 6 cm. TP and TQ are tangents to the circle at points P and Q respectively. Find $\angle PTQ$.
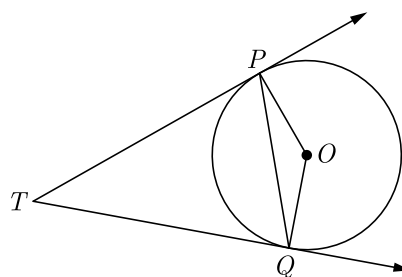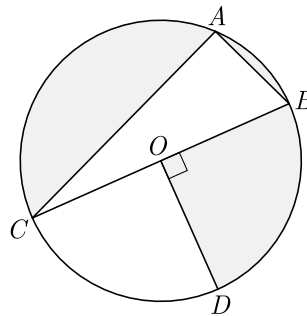

Q33. Draw a line segment AB of length 7 cm. Taking A as centre, draw a circle of radius 3 cm and taking B as center, draw another circle of radius 2 cm. Construct tangents to each circle from the centre of the other circle.

Q34. Solve for x : $\left(\dfrac{2x}{x-5}\right)^2 + \left(\dfrac{2x}{x-5}\right) - 24 = 0, x \neq 5$

Q35. In the given figure, O is the centre of the circle with $AC = 24$ cm, $AB = 7$ cm and $\angle BOD = 90°$. Find the area of the shaded region.

Q36. The median of the following data is 525. Find the values of x and y, if total frequency is 100 :

Class	Frequency
0-100	2
100-200	5
200-300	x
300-400	12
400-500	17
500-600	20
600-700	y
700-800	9
800-900	7
900-1000	4

OR

Daily wages of 110 workers, obtained in a survey, are tabulated below :

Daily Wages (in₹)	100-120	120-140	140-160	160-180	180-200	200-220	220-240
Number of Workers	10	15	20	22	18	12	13

Compute the mean daily wages an modal daily wages of these workers.