CLASS X (2020-21)

MATHEMATICS BASIC(241)

SAMPLE PAPER-7

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.   The decimal expansion of the rational number $\frac{14587}{1250}$ will terminate after how many places of decimal?

OR

If two positive integers a and b are written as $a = x^3 y^2$ and $b = xy^3$, where x, y are prime numbers, then Find HCF (a, b).

Q2.   What is the lowest value of $x^2 + 4x + 2$?

Q3.   Two lines are given to be parallel. The equation of one of the lines is $4x + 3y = 14$, then find the equation of the second line.

Q4.   Find the nature of roots of the quadratic equation $x^2 - 4x + 3\sqrt{2} = 0$.

OR

Find the nature of roots of the quadratic equation $x^2 + 4x - 3\sqrt{2} = 0$.

Q5.   Find the ratio in which x-axis divides the line segment joining $A(2, -3)$ and $B(5, 6)$.

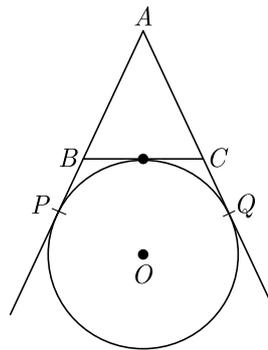Q6.   If $\cos(\alpha + \beta) = 0$, then find $\sin(\alpha - \beta)$ in terms of β.

Q7.   If the height and length of the shadow of a man are equal, then find the angle of elevation of the sun.

Q8.   In figure, O is the centre of circle. PQ is a chord and PT is tangent at P which makes an angle of $50°$ with PQ. Find the angle $\angle POQ$.
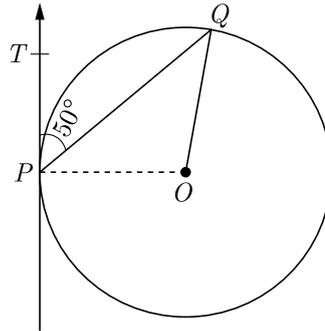
OR

In figure, AP, AQ and BC are tangents of the circle with centre O. If $AB = 5\,\text{cm}$, $AC = 6$ cm and $BC = 4$ cm, then what is the length of AP?

Q9.   To divide a line segment AB in the ratio 2 : 5, first a ray AX is drawn, so that $\angle BAX$ is an acute angle and then at equal distance points are marked on the ray AX such that the minimum number of these point is_____

Q10.   What is the perimeter of the sector with radius 10.5 cm and sector angle 60º.

OR

If the circumferences of two concentric circles forming a ring are 88 cm and 66 cm respectively. Find the width of the ring.

Q11.   The base radii of a cone and a cylinder are equal. If their curved surface areas are also equal, then what is the ratio of the slant height of the cone to the height of the cylinder?

Q12.   A solid piece of iron in the form of a cuboid of dimensions $49\,\text{cm} \times 33\,\text{cm} \times 24\,\text{cm}$, is moulded to form a solid sphere. What is the radius of the sphere ?

Q13.   Find the mode of the following grouped frequency distribution.

Class	Frequency
3-6	2
6-9	5
9-12	10
12-15	23

Class	Frequency
15-18	21
18-21	12
21-24	03

Q14.   Consider the data:

Class	65-85	85-105	105-125	125-145	145-165	165-185	185-205
Frequency	4	5	13	20	14	7	4

What is the difference of the upper limit of the median class and the lower limit of the modal class?

Q15.   Find the class marks of the classes 15-35 and 45-60.

Q16.   If $P(E) = 0.20$, then what is the probability of 'not E'?

OR

If the probability of winning a game is $\frac{5}{11}$, find the probability of losing the game.

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

Q17.   An barrels manufacturer can produce up to 300 barrels per day. The profit made from the sale of these barrels can be modelled by the function $P(x) = -10x^2 + 3500x - 66000$ where $P(x)$ is the profit in rupees and x is the number of barrels made and sold.


Based on this model answer the following questions:

(i)   When no barrels are produce what is a profit loss?
(a) Rs 22000   (b) Rs 66000
(c) Rs 11000   (d) Rs 33000

(ii)   What is the break even point ? (Zero profit point is called break even)
(a) 10 barrels   (b) 30 barrels
(c) 20 barrels   (d) 100 barrels

(iii)   What is the profit/loss if 175 barrels are produced
(a) Profit 266200   (b) Loss 266200
(c) Profit 240250   (d) Loss 240250

(iv) What is the profit/loss if 400 barrels are produced
    (a) Profit Rs 466200   (b) Loss Rs 266000
    (c) Profit Rs 342000   (d) Loss Rs 342000

(v) What is the maximum profit which can manufacturer earn?
    (a) Rs 240250   (b) Rs 480500
    (c) Rs 680250   (d) Rs 240250

Q18. To conduct sports day activities, in a rectangular shaped school ground $ABCD$, lines have been drawn with chalk powder at a distance of 1 m each. 100 flower pots have been placed at a distance of 1 m from each other along AB, as shown in figure. Nishtha runs $\frac{1}{4}$ th the distance AB on the 2nd line and posts a green flag. Suman runs $\frac{1}{5}$ th the distance AB on the 8th line and posts a red flag.
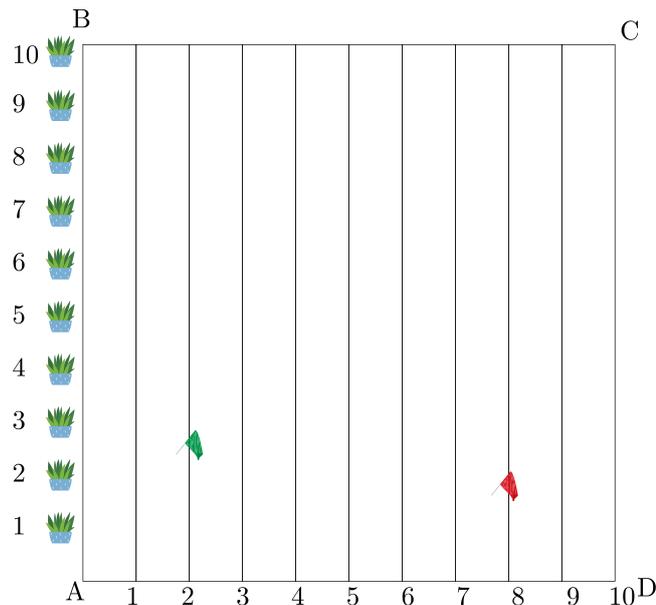
(i) What is the position of green flag ?
    (a) (2, 25)   (b) (25, 4)
    (c) (25,2)   (d) (4, 25)

(ii) What is the position of red flag ?
    (a) (20, 4)   (b) (8, 20)
    (c) (20, 8)   (d) (4, 20)

(iii) What is the distance between both the flags?
    (a) $\sqrt{51}$ (b) $3\sqrt{3}$
    (c) $\sqrt{61}$ (d) $2\sqrt{3}$

(iv) What is the distance of red flag from point A ?
    (a) $4\sqrt{29}$ (b) $2\sqrt{29}$
    (c) $8\sqrt{15}$ (d) $16\sqrt{3}$

(v) If Rakhi has to post a blue flag exactly halfway between the line segment joining the two flags, where should she post her flag?
    (a) (20, 4)
   (b) (22.5, 5)
    (c) (4, 20)
    (d) (5, 22.5)

Q19. 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.
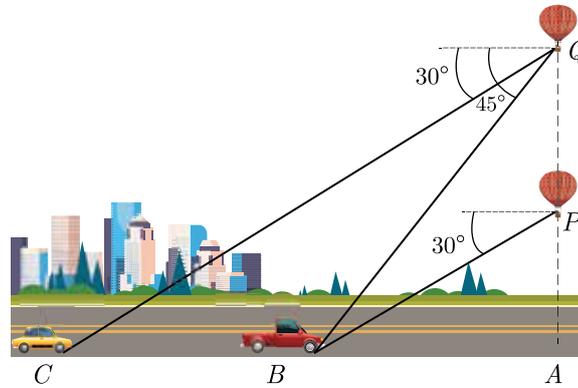

Lakshman is riding on a hot air balloon. After reaching at height x at point P, he spots a lorry parked at B on the ground at an angle of depression of $30°$. The balloon rises further by 50 metres at point Q and now he spots the same lorry at an angle of depression of $45°$ and a car parked at C at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

Q20. Atal Tunnel (also known as Rohtang Tunnel) is a highway tunnel built under the Rohtang Pass in the eastern Pir Panjal range of the Himalayas on the Leh-Manali Highway in Himachal Pradesh. At a length of 9.02 km, it is the longest tunnel above 10,000 feet (3,048 m) in the world and is named after former Prime Minister of India, Atal Bihari Vajpayee. The tunnel reduces the travel time and overall distance between Manali and Keylong on the way to Leh. Moreover, the tunnel bypasses most of the sites that were prone to road blockades, avalanches, and traffic snarls.
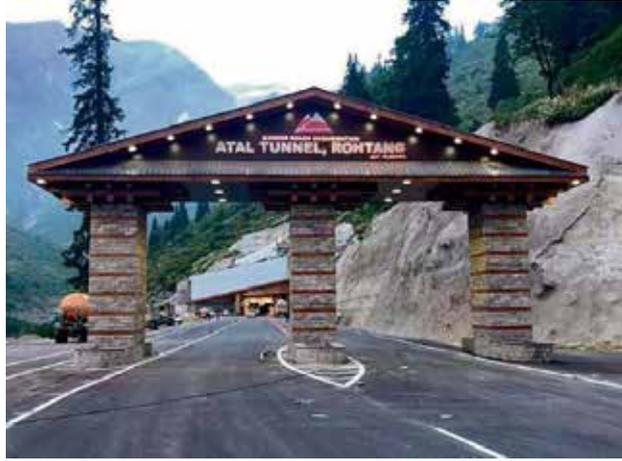
Earth is excavated to make a railway tunnel. The tunnel is a cylinder of radius 7 m and length 450 m. A level surface is laid inside the tunnel to carry the railway lines. Figure given below shows the circular cross - section of the tunnel. The level surface is represented by AB, the centre of the circle is O and $\angle AOB = 90°$. The space below AB is filled with rubble (debris from the demolition buildings).
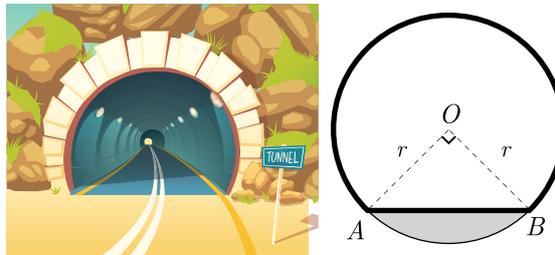
(i) How much volume of earth is removed to make the tunnel ?
    (a) 58700 m³   (b) 61400 m³
    (c) 62700 m³   (d) 69300 m³

(ii) If the cost of excavation of 1 cubic meter is Rs 250, what is the total cost of excavation?
    (a) Rs 17325000   (b) Rs 34650000
    (c) Rs 8662500   (d) Rs 12677500

(iii) A coating is to be done on the surface of inner curved part of tunnel. What is the area of tunnel to be being coated ?
    (a) 12300 m²   (b) 14850 m²
    (c) 15250 m²   (d) 21200 m²

(iv) Costing of coating is Rs 30 per m². What is the total cost of coating ?
    (a) Rs 5588000   (b) Rs 445500
    (c) Rs 339900   (d) Rs 228800

(v) How much volume of debris is required to fill the ground surface of tunnel ?
    (a) 3500 m³
    (b) 14000 m³
   (c) 7000 m³
    (d) 10500 m³

PART - B

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

Q21.   Find the value of k such that the polynomial $x^2 - (k+6)x + 2(2k+1)$ has sum of its zeros equal to half of their product.
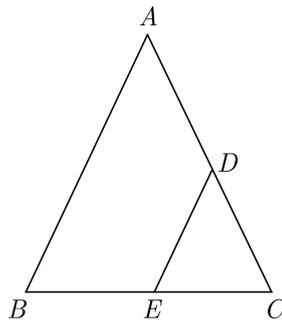
OR

Find the nature of roots of the quadratic equation $2x^2 - 4x + 3 = 0$.

Q22.   In the figure of $\triangle ABC$, the points D and E are on the sides CA, CB respectively such that $DE \parallel AB$, $AD = 2x, DC = x + 3, BE = 2x - 1$ and $CE = x$. Then, find x.
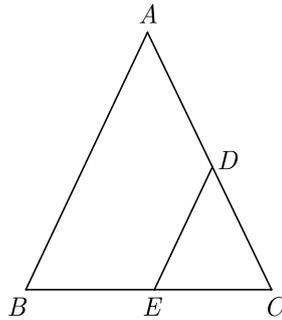
OR

In the figure of $\triangle ABC$, $DE \parallel AB$. If $AD = 2x$, $DC = x + 3$, $BE = 2x - 1$ and $CE = x$, then find the value of x.
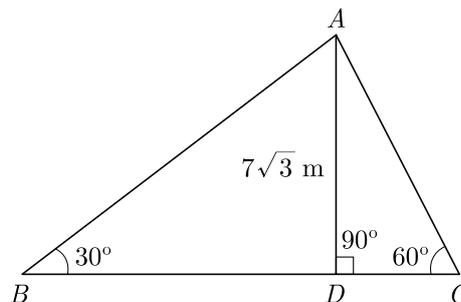

OR

In an equilateral triangle of side $3\sqrt{3}$ cm find the length of the altitude.

Q23.   Prove that : $\dfrac{1 - \tan^2\theta}{1 + \tan^2\theta} = \cos^2\theta - \sin^2\theta$

Q24.   In the given figure, if $AD = 7\sqrt{3}$ m, then find the value of BC.

Q25.   Two different dice are thrown together, find the probability that the sum of the numbers appeared is less than 5.

Q26.   If a number x is chosen at random from the numbers $-3, -2, -1. 0, 1, 2, 3$, then find the probability of $x^2 < 4$.

Q27.   If the sum and product of the zeroes of the polynomial $ax^2 - 5x + c$ are equal to 10 each, find the value of $'a'$ and $'c'$.

Q28.   Solve for x :
$$\frac{1}{(x-1)(x-2)} + \frac{1}{(x-2)(x-3)} = \frac{2}{3}; x \neq 1, 2, 3$$

Q29.   Find the point on y-axis which is equidistant from the points $(5, -2)$ and $(-3, 2)$.

Q30.   Construct a pair tangents PQ and PR to a circle of radius 4 cm from a point P outside the circle 8 cm away from the centre. Measure PQ and PR.

Q31.   A man standing on the deck of a ship, which is 10 m above water level, observes the angle of elevation of the top of a hill as 60º and the angle of depression of the base of hill as 30º. Find the distance of the hill from the ship and the height of the hill.

Q32.   In Figure, PQ and AB are two arcs of concentric circles of radii 7 cm and 3.5 cm respectively, with centre O. If $\angle POQ = 30°$, then find the area of shaded region.
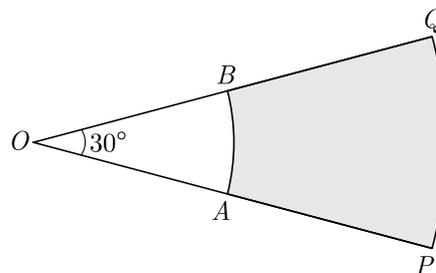
OR

A horse is tethered to one corner of a rectangular field of dimensions $70\,\text{m} \times 52\,\text{m}$, by a rope of length 21 m. How much area of the field can it graze?

Q33.   If the mean of the following data is 14.7, find the values of p and q.

Class	0-6	6- 12	12-18	18-24	24-30	30-36	36-42	Total
Frequency	10	p	4	7	q	4	1	40

OR

Find the mean and mode of the following frequency distribution :

Classes	0- 10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	3	8	10	15	7	4	3

Q34.   Prove that $n^2 - n$ is divisible by 2 for every positive integer n.

OR

Prove that $\sqrt{3}$ is an irrational number. Hence, show that $7 + 2\sqrt{3}$ is also an irrational number.

Q35. Solve $x + y = 5$ and $2x - 3y = 4$ by elimination method and the substitution method.

Q36. In the figure, the $\triangle ABC$ is drawn to circumscribe a circle of radius 4 cm, such that the segments BD and DC are of lengths 8 cm and 6 cm respectively. Find AB and AC.