CLASS X (2020-21)
MATHEMATICS STANDARD (041)
SAMPLE PAPER-07

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 condition for the decimal expansion of a rational number to terminate? Explain with the help of an example.

Q2.   Find a quadratic polynomial, whose zeroes are -3 and 4 ?

Q3.   In given figure, the graph of a polynomial $p(x)$ is shown. Calculate the number of zeroes of $p(x)$.
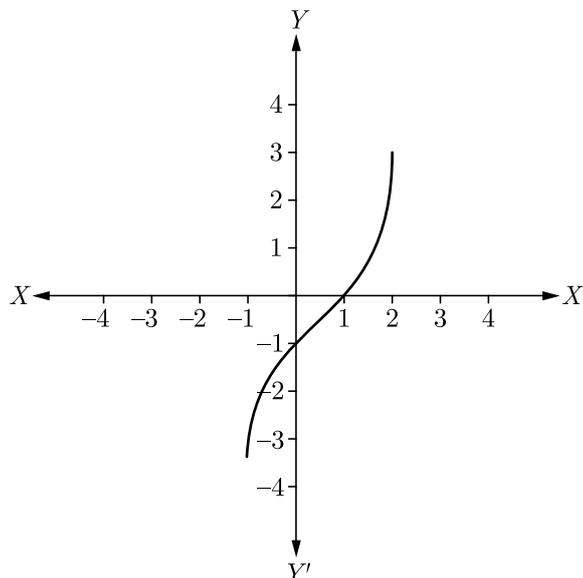
Q4.   Find the roots of the quadratic equation $\sqrt{3}\,x^2 - 2x - \sqrt{3} = 0$
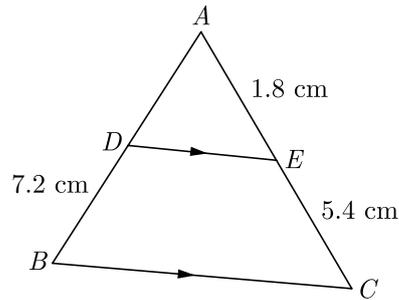
OR

Find the value of k, for which one root of the quadratic equation $kx^2 - 14x + 8 = 0$ is six times the other.

Q5.   Is series $\sqrt{3}, \sqrt{6}, \sqrt{9}, \sqrt{12}, ...$ an AP? Give reason.

OR

What is the next term of an AP $\sqrt{7}, \sqrt{28}, \sqrt{63}, ...$?

Q6.   In Figure, $DE \,||\, BC$. Find the length of side AD, given that $AE = 1.8\,\text{cm}$, $BD = 7.2\,\text{cm}$ and $CE = 5.4\,\text{cm}$.

Q7.   If the mid-point of the line segment joining the points $A(3, 4)$ and $B(k, 6)$ is $P(x, y)$ and $x + y - 10 = 0$, find the value of k.

Q8.   The ordinate of a point A on y-axis is 5 and B has co-ordinates $(-3, 1)$. Find the length of AB.

Q9.   If $\sec\theta \cdot \sin\theta = 0$, then find the value of θ.
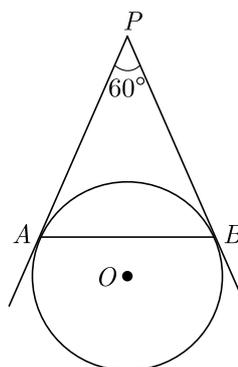
Q10.   If A and B are acute angles and $\sin A = \cos B$, then find the value of $A + B$.

Q11.   If $\tan(A + B) = \sqrt{3}$ and $\tan(A - B) = \dfrac{1}{\sqrt{3}}$, $A > B$, then the value of A is ....

Q12.   Two tangents making an angle of $60°$ between them are drawn to a circle of radius $\sqrt{3}$ cm, then find the length of each tangent.

OR

In figure, AP and BP are tangents to a circle with centre O, such that $AP = 5$ cm and $\angle APB = 60°$. Find the length of chord AB.

Q13. Two coins of diameter 2 cm and 4 cm respectively are kept one over the other as shown in the figure, find the area of the shaded ring shaped region in square cm.
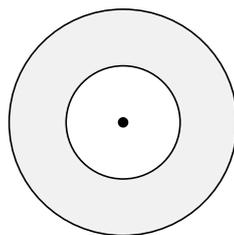
OR

The diameter of two circle with centre A and B are 16 cm and 30 cm respectively. If area of another circle with centre C is equal to the sum of areas of these two circles, then find the circumference of the circle with centre C.

Q14. The radii of two cylinders are in the ratio $2 : 3$ and their heights are in the ratio $5 : 3$, find the ratio of their volumes.

Q15. Find the mean of the data using an empirical formula when it is given that mode is 50.5 and median in 45.5.

Q16. Cards marked with number 3, 4, 5, ..., 50 are placed in a box and mixed thoroughly. A card is drawn at random from the box. Find the probability that the selected card bears a perfect square number.

OR

20 tickets, on which numbers 1 to 20 are written, are mixed thoroughly and then a ticket is drawn at random out of them. Find the probability that the number on the drawn ticket is a multiple of 3 or 7.

SECTION II

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

Q17. The Republic Day parade, first held in 1950, has been a yearly ritual since. The parade marches from the Rashtrapati Bhawan along the Rajpath in New Delhi. Several regiments of the army, navy, and air force, along with their bands, march to India Gate. The parade is presided over by the President of India, who is the Commander-in-Chief of the Indian Armed Forces. As he unfurls the tricolour, the national anthem is played. The regiments of the Armed Forces then start their march past. Prestigious awards like Kirti Chakra, Ashok Chakra, Paramvir Chakra and Vir Chakra are given out by the President. Nine to twelve different regiments of the Indian Army, in addition to the Navy and Air Force march toward India Gate along with their bands. Contingents of paramilitary forces and other civil forces also participate in the parade.

On 71th republic day parade, captain RS Meel is planing for parade of following two group:

(a) First group of Army troops of 624 members behind an army band of 32 members.

(b) Second group of CRPF troops with 468 soldiers behind the 228 members of bikers.

These two groups are to march in the same number of columns. This sequence of soldiers is followed by different states Jhanki which are showing the culture of the respective states.

(i) What is the maximum number of columns in which the army troop can march?

    (a) 8   (b) 16

    (c) 4   (d) 32

(ii) What is the maximum number of columns in which the CRPF troop can march?

    (a) 4   (b) 8

    (c) 12   (d) 16

(iii) What is the maximum number of columns in which total army troop and CRPF troop together can march past?

    (a) 2   (b) 4

    (c) 6   (d) 8

(iv) What should be subtracted with the numbers of CRPF soldiers and the number of bikers so that their maximum number of column is equal to the maximum number of column of army troop?

    (a) 4 Soldiers and 4 Bikers   (b) 4 Soldiers and 2 Bikers

    (c) 2 Soldiers and 4 Bikers   (d) 2 Soldiers and 2 Bikers

(v) What should be added with the numbers of CRPF soldiers and the number of bikers so that their maximum number of column is equal to the maximum number of column of army troop?

    (a) 4 Soldiers and 4 Bikers   (b) 12 Soldiers and 12 Bikers

    (c) 6 Soldiers and 6 Bikers   (d) 12 Soldiers and 6 Bikers

Q18. Dipesh bought 3 notebooks and 2 pens for Rs. 80. His friend Ramesh said that price of each notebook could be Rs. 25. Then three notebooks would cost Rs.75, the two pens would cost Rs. 5 and each pen could be for Rs. 2.50. Another friend Amar felt that Rs. 2.50 for one pen was too little. It should be at least Rs. 16. Then the price of each notebook would also be Rs.16.
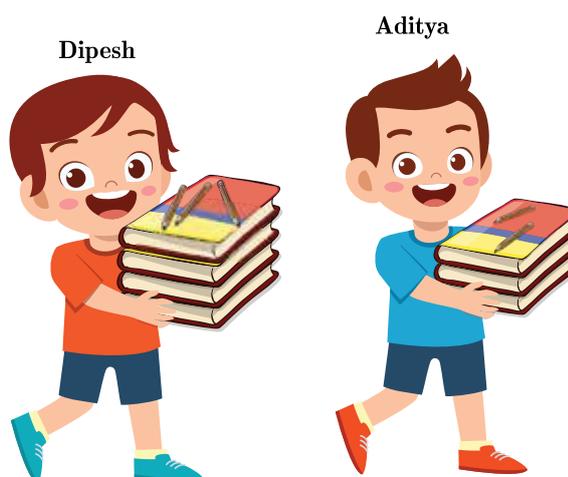

Aditya also bought the same types of notebooks and pens as Dipesh. He paid 110 for 4 notebooks and 3 pens.

(i) Whether the estimation of Ramesh and Amar is applicable for Aditya?

    (a) Ramesh's estimation is wrong but Amar's estimation is correct.

    (b) Ramesh's estimation is correct but Amar's estimation is wrong.

(c) Both estimation are correct.

(b) Ramesh's estimation is wrong but Amar's estimation is also wrong.

(ii) Let the cost of one notebook be x and that of pen be y. Which of the following set describe the given problem ?

    (a) $2x + 3y = 80$ and $3x + 4y = 110$ (b) $3x + 2y = 80$ and $4x + 3y = 110$

    (c) $2x + 3y = 80$ and $4x + 3y = 110$ (d) $3x + 2y = 80$ and $3x + 4y = 110$

(iii) What is the exact cost of the notebook?

    (a) Rs 10   (b) Rs 20

    (c) Rs 16   (d) Rs 24

(iv) What is the exact cost of the pen?

    (a) Rs 10   (b) Rs 20

    (c) Rs 16   (d) Rs 24

(v) What is the total cost if they purchase the same type of 15 notebooks and 12 pens.

    (a) Rs 410   (b) Rs 200

    (c) Rs 420   (d) Rs 240

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.
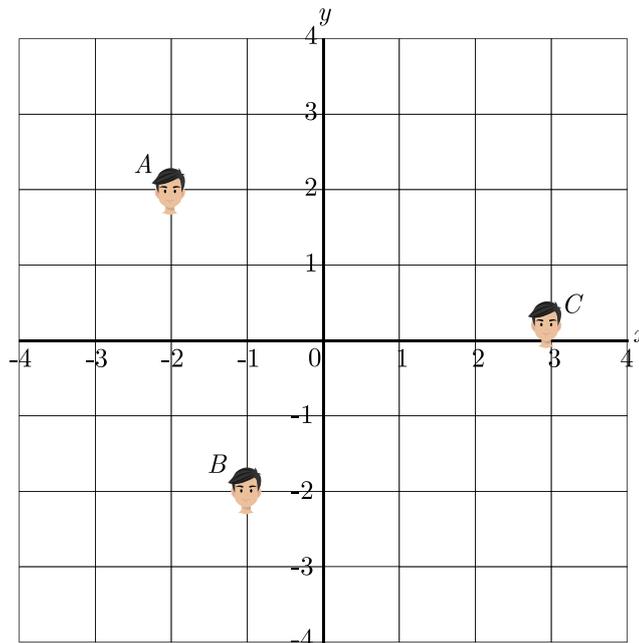

(i) What are the coordinates of point A?

    (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. Radio towers are used for transmitting a range of communication services including radio and television. The tower will either act as an antenna itself or support one or more antennas on its structure, including microwave dishes. They are among the tallest human-made structures. There are 2 main types: guyed and self-supporting structures.

On a similar concept, a radio station tower was built in two sections A and B. Tower is supported by wires from a point O. Distance between the base of the tower and point O is 36 m. From point O, the angle of elevation of the top of section B is $30°$ and the angle of elevation of the top of section A is $45°$.
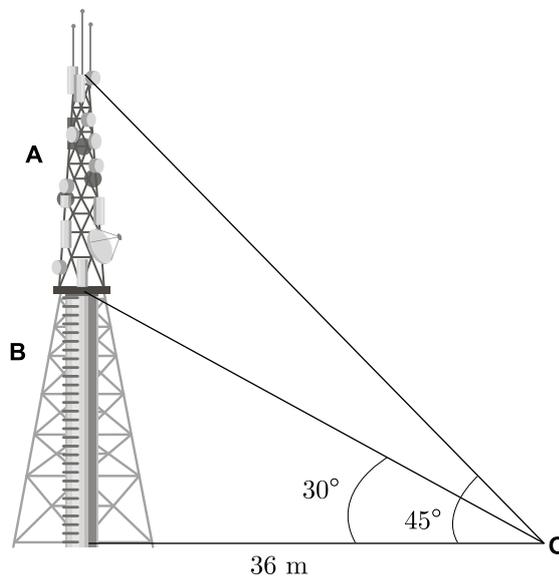
(i) What is the height of the section B ?
    (a) $12\sqrt{3}$ m   (b) $12\sqrt{2}$ m
    (c) $8\sqrt{3}$ m   (d) $4\sqrt{2}$ m

(ii) What is the height of the section A ?
    (a) $12(2-\sqrt{2})$ (b) $24(2-\sqrt{2})$
    (c) $12(3-\sqrt{3})$ (d) $24(3-\sqrt{3})$

(iii) What is the length of the wire structure from the point O to the top of section A ?
    (a) $32\sqrt{2}$ m   (b) $24\sqrt{3}$ m
    (c) $28\sqrt{3}$ m   (d) $36\sqrt{2}$ m

(iv) What is the length of the wire structure from the point O to the top of section B ?
    (a) $12\sqrt{3}$ m   (b) $24\sqrt{3}$ m
    (c) $28\sqrt{3}$ m   (d) $16\sqrt{3}$ m

(v) What is the angle of depression from top of tower to point O ?
    (a) $30°$ (b) $45°$
    (c) $15°$ (d) $75°$

PART - B

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

Q21.   If m and n are the zeroes of the polynomial $3x^2 + 11x - 4$, find the value of $\frac{m}{n} + \frac{n}{m}$.

Q22.   In the figure given below, $ABCD$ is a rectangle. Find the values of x and y.

Q23.   Find the roots of the following quadratic equation :
$(x+3)(x-1) = 3\left(x - \frac{1}{3}\right)$

Q24.   In a rectangle $ABCD$, E is a point on AB such that $AE = \frac{2}{3}AB$. If $AB = 6$ km and $AD = 3$ km, then find DE.

Q25.   Show that : $\dfrac{\cos^2(45^\circ + \theta) + \cos^2(45^\circ - \theta)}{\tan(60^\circ + \theta)\tan(30^\circ - \theta)} = 1$

OR

If $\cos(40^\circ + x) = \sin 30^\circ$, find the value of x.

Q26.   Find the unknown values in the following table :

Class Interval	Frequency	Cumulative Frequency
0-10	5	5
10-20	7	x_1
20-30	x_2	18
30-40	5	x_3
40-50	x_4	30

OR

Calculate the median from the following data :

Marks	0-10	10-20	20-30	30-40	40-50
Number of Students	5	15	30	8	2

Q27.   If α and β are the zeroes of the polynomial $f(x) = x^2 - 4x - 5$ then find the value of $\alpha^2 + \beta^2$

OR

Find the quadratic polynomial, the sum and product of whose zeroes are -3 and 2 respectively. Hence find the zeroes.

Q28.   Show that the sum of all terms of an AP whose first term is a, the second term is b and last term is c, is equal to $\dfrac{(a+c)(b+c-2a)}{2(b-a)}$

OR

If in an AP, the sum of first m terms is n and the sum of its first n terms is m, then prove that the sum of its first $(m+n)$ terms is $-(m+n)$.

Q29.   Two right triangles ABC and DBC are drawn on the same hypotenuse BC and on the same side of BC. If AC and BD intersect at P, prove that $AP \times PC = BP \times DP$.

Q30.   If $\sin\theta + \cos\theta = \sqrt{3}$, then prove that $\tan\theta + \cot\theta = 1$.

Q31.   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.   In fig. APB and AQP are semi-circle, and $AO = OB$. If the perimeter of the figure is 47 cm, find the area of the shaded region. Use $\pi = \frac{22}{7}$.
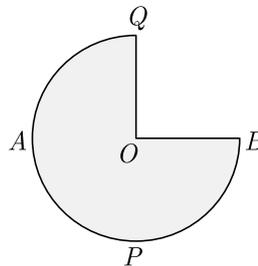
Q33.   Find the mean of the following distribution by step deviation method :

Class	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	5	13	20	15	7	5

Q34.   In figure O is the centre of a circle of radius 5 cm. T is a point such that $OT = 13$ cm and OT intersects circle at E. If AB is a tangent to the circle at E, find the length of AB, where TP and TQ are two tangents to the circle.
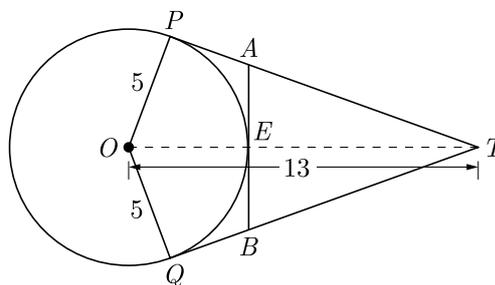
Q35.   A solid toy is in the form of a hemisphere surmounted by a right circular cone. The height of the cone is 2 cm and the diameter of the base is 4 cm. Determine the volume of the toy. If a right circular cylinder circumscribes the toy, find the difference of the volume of the cylinder and toy. (Use $\pi = 3.14$)

Q36.   A box contains 90 discs which are numbered 1 to 90. If one disc is drawn at random from the box, find the probability that it bears
(i) a two digit number,
(ii) number divisible by 5.

OR

Two different dice are thrown together. Find the probability that the numbers obtained have
(i) even sum, and
(ii) even product.