KV No2 MIRC AHMEDNAGAR

CLASS X (2020-21)

MATHEMATICS BASIC(241)

SAMPLE PAPER-1

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

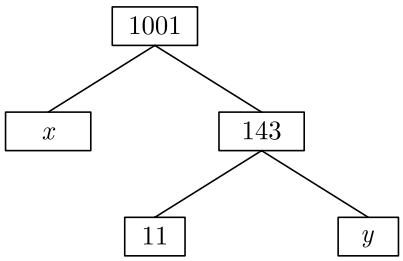
SECTION - I

Section I has 16 questions of 1 mark each. Internal choice is provided in 5 questions.

Q1. If two positive integers p and q can be expressed as $p = ab^2$ and $q = a^3b$; where a, b being prime numbers, then what is the LCM of (p, q) ?

OR

What are the values of x and y in the given figure ?



Q2. If the sum of the zeroes of the polynomial $f(x) = 2x^3 - 3kx^2 + 4x - 5$ is 6, then what is the value of k

Q3. Find whether the lines represented by $2x + y = 3$ and $4x + 2y = 6$ are parallel, coincident or intersecting.

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

OR

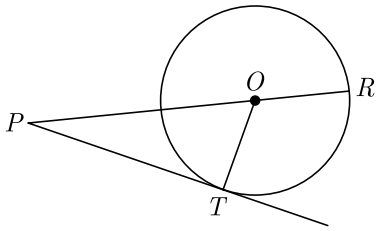
Find the nature of roots of the quadratic equation $3x^2 + 4\sqrt{3}\,x + 4$.

Q5. If the centre of a circle is (3, 5) and end points of a diameter are (4, 7) and (2, y), then what is the value of y ?

Q6. If $\cos 9\alpha = \sin \alpha$ and $9\alpha < 90^\circ$, then what is the value of $\tan 5\alpha$?

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, on a circle of radius 7 cm, tangent PT is drawn from a point P such that $PT = 24$ cm. If O is the centre of the circle, then what is the length of PR ?

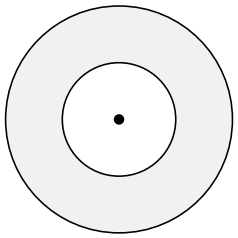


OR

Two chords AB and CD of a circle intersect at E such that $AE = 2.4\,\text{cm}$, $BE = 3.2\,\text{cm}$ and $CE = 1.6\,\text{cm}$. What is the length of DE?

Q9. To draw a pair of tangents to a circle which are inclined to each other at an angle of 55°, it is required to draw tangents at the end points of these two radii of the circle, what is the angle between two radii?

Q10. 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.

Q11. Find the ratio of lateral surface areas of two cylinders with equal height.

Q12. Twelve solid spheres of the same size are made by melting a solid metallic cylinder of base diameter 2 cm and height 16 cm. What is the diameter of each sphere?

Q13. If median is 137 and mean is 137.05, then what is the value of mode ?

Q14. The times, in seconds, taken by 150 athletes to run a 110 m hurdle race are tabulated below

Class	**Frequency**
13.8-14	2
14-14.2	4
14.2-14.4	5
14.4-14.6	71
14.6-14.8	48
14.8-15	20

What is the number of athletes who completed the race in less than 14.6 second?

Q15. If the mean of the first n natural number is 15, then find n.

Q16. If E be an event such that $P(E) = \frac{3}{7}$, what is $P(\text{not } E)$ equal to?

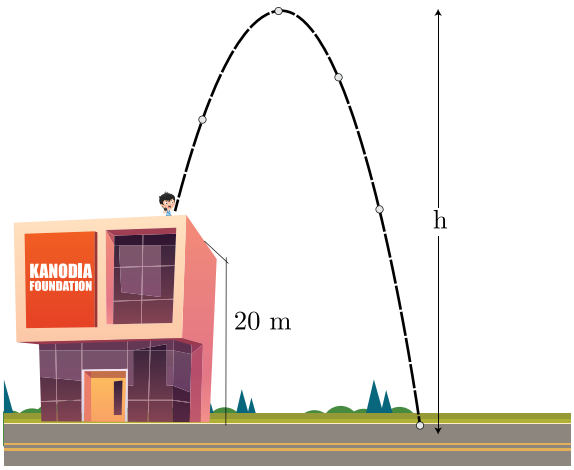
OR

A bag contains lemon flavoured candies only. Shalini takes out one candy without looking into the bag. What is the probability that she takes out an orange flavoured candy?

SECTION II

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

Q17. Lavanya throws a ball upwards, from a rooftop, which is 20 m above from ground. It will reach a maximum height and then fall back to the ground. The height of the ball from the ground at time t is h, which is given by $h = -4t^2 + 16t + 20$.



(i) What is the height reached by the ball after 1 second?

(a) 64 m (b) 128 m

(c) 32 m (d) 20 m

(ii) What is the maximum height reached by the ball?

(a) 54 m (b) 44 m

(c) 36 m (d) 18 m

(iii) How long will the ball take to hit the ground?

(a) 4 seconds (b) 3 seconds

(c) 5 seconds (d) 6 seconds

(iv) What are the two possible times to reach the ball at the same height of 32 m?

(a) 1 and 3 seconds (b) 1 and 4 seconds

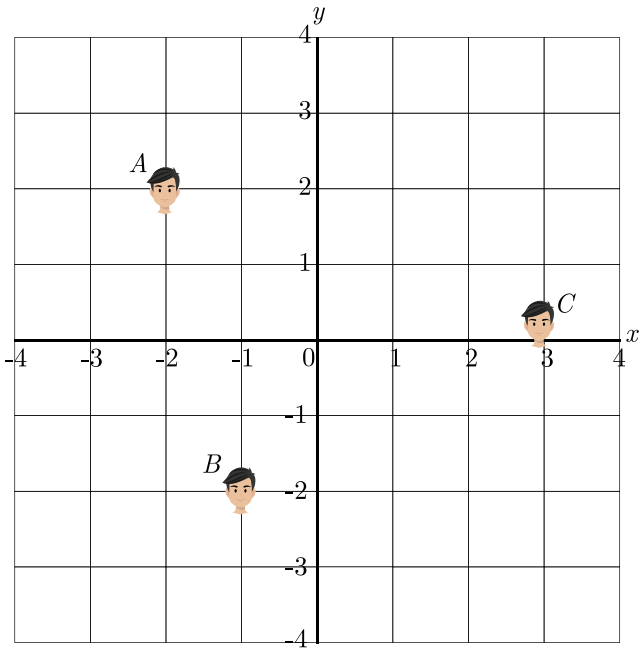
(c) 1 and 2 seconds (d) 1 and 5 seconds

(v) Where is the ball after 5 seconds ?

(a) at the ground (b) rebounds

(c) at highest point (d) fall back

Q18. 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) $3\sqrt{5}$

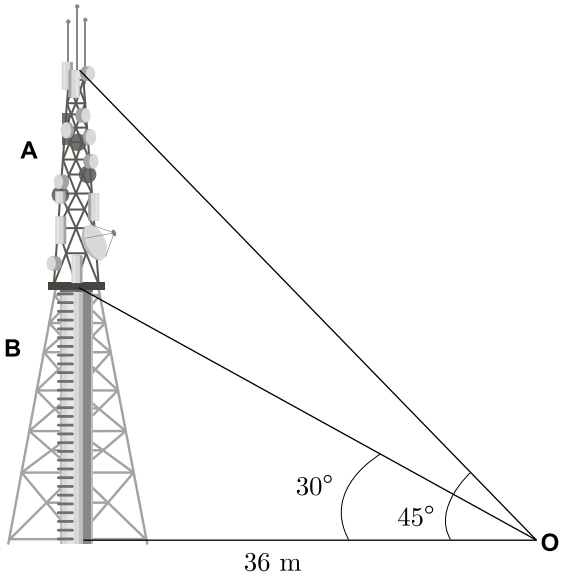
(c) $2\sqrt{17}$ (d) $2\sqrt{5}$

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

Q19. 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

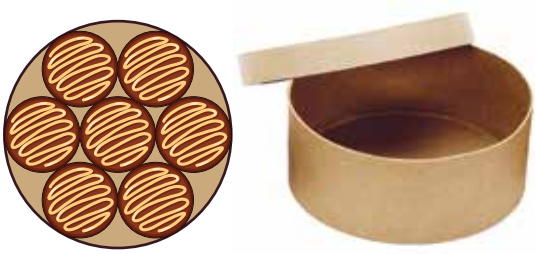
(v) What is the angle of depression from top of tower to point O ?

(a) 30° (b) 45°

(c) 15° (d) 75°

Q20. A bakery is an establishment that produces and sells flour-based food baked in an oven such as bread, cookies, cakes, pastries, and pies. Some retail bakeries are also categorized as cafés, serving coffee and tea to customers who wish to consume the baked goods on the premises.

Tania runs a bakery shop and her bakery is very famous for tasty biscuits. The amount of mixture required to make one biscuit is 18 cu cm. Before it is cooked, the mixture is rolled into a sphere. After the biscuit is cooked, the biscuit becomes a cylinder of radius 3 cm and height 0.7 cm. The increase in volume is due to air being trapped in the biscuit. Biscuits are packed in a cylindrical card box of height 14 cm. The arrangement of biscuits is shown below.



(i) What is the volume of the biscuits after it is cooked ?

(a) 17.8 cu cm (b) 18.7 cu cm

(c) 19.8 cu cm (d) 21.2 cu cm

(ii) What is the volume of air trapped, while cooking the biscuit ?

(a) 1.8 cu cm (b) 0.7 cu cm

(c) 1.5 cu cm (d) 3.2 cu cm

(iii) How many biscuits will be there in a box ?

(a) 120 (b) 70

(c) 140 (d) 60

(iv) How much space is vacant in box after biscuits are packed ?

(a) $940\ cm^3$ (b) $792\ cm^3$

(c) $846\ cm^3$ (d) $912\ cm^3$

(v) If weight of 7 biscuits is 50 grams, what will be the weight of box of biscuits?

(a) 750 gram (b) 1.4 kg

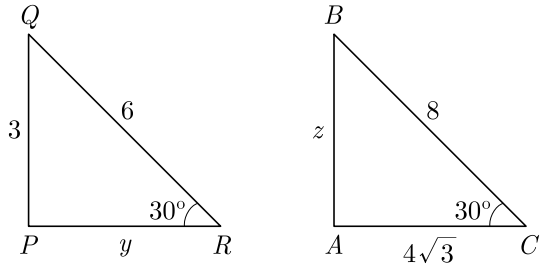
(c) 900 gram (d) 1 kg

PART - B

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

Q21. Find the roots of the quadratic equation $6x^2 - x - 2 = 0$.

Q22. In the given figure, $\Delta ABC \sim \Delta PQR$. Find the value of $y + z$.



Q23. Prove that $\frac{\tan^2\theta}{1+\tan^2\theta} + \frac{\cot^2\theta}{1+\cot^2\theta} = 1$.

OR

Prove that $\frac{\operatorname{cosec}\theta}{\operatorname{cosec}\theta - 1} + \frac{\operatorname{cosec}\theta}{\operatorname{cosec}\theta + 1} = 2\sec^2\theta$.

Q24. Find the length of kite string flying at 100 m above the ground with the elevation of 60°.

Q25. In a lottery, there are 10 prizes and 25 blanks. What is the probability of getting a prize?

Q26. A bag contains cards with numbers written on it from 1–80. A card is pulled out at random. Find the probability that the card shows a perfect square.

Q27. If one the zero of a polynomial $3x^2 - 8x + 2k + 1$ is seven times the other, find the value of k.

OR

Quadratic polynomial $2x^2 - 3x + 1$ has zeroes as α and β. Now form a quadratic polynomial whose zeroes are 3α and 3β.

Q28. Solve for x : $\sqrt{3}\,x^2 - 2\sqrt{2}\,x - 2\sqrt{3} = 0$

OR

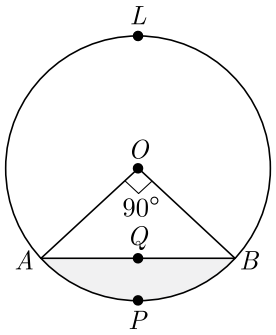
Solve for x : $x^2 + 5x - (a^2 + a - 6) = 0$

Q29. If the point $C(-1,2)$ divides internally the line segment joining the points $A(2,5)$ and $B(x,y)$ in the ratio $3{:}4$, find the value of $x^2 + y^2$.

Q30. Construct a tangent to a circle of radius 4 cm from a point on the concentric circle of radius 6 cm.

Q31. Two ships are approaching a light house from opposite directions. The angle of depression of two ships from top of the light house are 30º and 45º. If the distance between two ships is 100 m, Find the height of light-house.

Q32. In the given figure, a chord AB of the circle with centre O and radius 10 cm, that subtends a right angle at the centre of the circle. Find the area of the minor segment $AQBP$. Hence find the area of major segment $ALBQA$. (Use $\pi = 3.14$)



Q33. Find the mean and median for the following data :

Class	0-10	10-20	20-30	30-40	40-50
Frequency	8	16	36	34	6

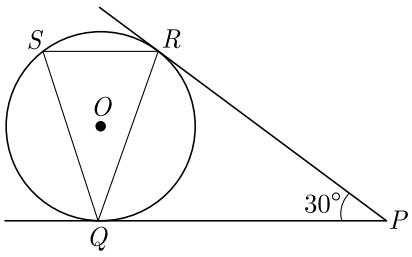
Q34. Show that there is no positive integer n, for which $\sqrt{n-1}+\sqrt{n-1}$ is rational.

Q35. A train covered a certain distance at a uniform speed. If the train would have been 10 km/hr scheduled time. And, if the train were slower by 10 km/hr, it would have taken 3 hr more than the scheduled time. Find the distance covered by the train.

OR

If a bag containing red and white balls, half the number of white balls is equal to one-third the number of red balls. Thrice the total number of balls exceeds seven times the number of white balls by 6. How many balls of each colour does the bag contain ?

Q36. In the figure, tangents PQ and PR are drawn from an external point P to a circle with centre O, such that $\angle RPQ = 30^\circ$. A chord RS is drawn parallel to the tangent PQ. Find $\angle RQS$.



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