CLASS X (2019-20)
MATHEMATICS BASIC(241)
SAMPLE PAPER-15

Time : 3 Hours   **Maximum Marks : 80**

General Instructions :

(i)   All questions are compulsory.
(ii)   The questions paper consists of 40 questions divided into four sections A, B, C and D.
(iii)   Section A comprises of 20 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each. Section C comprises of 8 questions of 3 marks each. Section D comprises of 6 questions of 4 marks each.
(iv)   There is no overall choice. However, an internal choices have been provided in two questions of 1 mark each, two questions of 2 marks each, three questions of 3 marks each, and three questions of 4 marks each. You have to attempt only one of the alternatives in all such questions.
(v)   Use of calculators is not permitted.

SECTION A

Q.1-Q.10 are multiple choice questions. Select the most appropriate answer from the given options.

Q1.   If α and $\frac{1}{\alpha}$ are the zeroes of the polynomial $6x^2 + 11x - (k-2)$, then the value of k is   [1]

    (a) -4 (b) -6
    (c) 6   (d) 4

Q2.   The pair of equations $x = a$ and $y = b$ graphically represents the lines which are   [1]

    (a) parallel   (b) intersecting at (b, a)
    (c) coincident   (d) intersecting at (a, b)

Q3.   If the sum of the roots of the quadratic equation $2x^2 + (2k-1)x - (k-4) = 0$ is equal to the product of its roots, then the value of k is   [1]

    (a) -3 (b) 3
    (c) 2   (d) 0

Q4.   Which term of the A.P. 21, 42, 63, 84, ... is 210?   [1]

    (a) 9th   (b) 10th
    (c) 11th   (d) 12th

Q5.   The perimeter of a circle is equal to that of a square, then the ratio of their areas is   [1]

    (a) 22 : 7   (b) 14 : 11
    (c) 7 : 22   (d) 11 : 14

Q6.   If a bicycle wheel makes 5000 revolutions in moving 11 km, then the diameter of the wheel is   [1]

    (a) 35 cm   (b) 70 cm
    (c) 1.4 m   (d) 70 m

Q7.   A girl calculates that the probability of her winning the first prize in a lottery is 0.08. If 6000 tickets are sold, how many tickets she has bought?   [1]

    (a) 40   (b) 240
    (c) 480   (d) 750

Q8.   An event is very unlikely to happen. Its probability is closes to   [1]

    (a) 0.0001   (b) 0.001
    (c) 0.01   (d) 0.1

Q9.   The lengths of the diagonals of a rhombus are 16 m and 12 m. The length of side of the rhombus is   [1]

(a) 9 m   (b) 10 m

(c) 8 m   (d) 20 m

Q10.   If the area of a circle is 154 cm^2, then its perimeter is   [1]

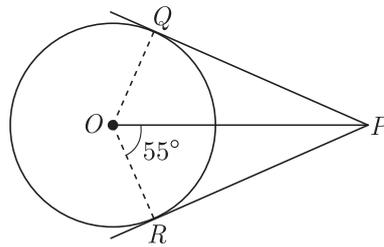(a) 11 cm   (b) 22 cm

(c) 44 cm   (d) 55 cm

(Q.11-Q.15) Fill in the blanks.

Q11.   The sum of first 10 terms of AP 1, 3, 5, 7 ....., is ....   [1]

OR

The 9th term from the end of the AP 5, 8, 11, ..., 80 is ....

Q12.   In the given figure, PQ and PR are tangents from P to a circle with centre O. If $\angle POR = 55°$, then $\angle QPR = $ ....   [1]

Q13.   The probability of a certain or sure event is ....   [1]

Q14.   The area of the circular ring included between two concentric circles of radii 14 cm and 10.5 cm is ....   [1]

Q15.   If a rectangular piece of paper of dimensions 60 cm $\times$ 88 cm is rolled to form a hollow circular cylinder of height 60 cm, then the radius of the cylinder is ....   [1]

(Q.16-Q.20) Answer the following

Q16.   Which term of the sequence 114, 109, 104, ... is the first negative term?   [1]

OR

Find the value of k for which the following are the consecutive terms of an AP : k, $2k-1$, $2k+1$.

Q17.   Find the distance between the points $\left(-\frac{8}{5}, 2\right)$ and $\left(\frac{2}{5}, 2\right)$.   [1]

Q18.   Which measure of central tendency is given by the x-coordinate of the point of intersection of the "more than ogive" and "less than ogive"?   [1]

Q19.   What is the distance between two parallel tangents of a circle of radius 4 cm?   [1]

Q20.   In the given figure, O is the centre of a circle. The area of sector $OAPB$ is $\frac{5}{18}$ of the area of the circle. Find x.   [1]
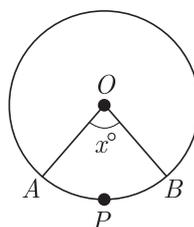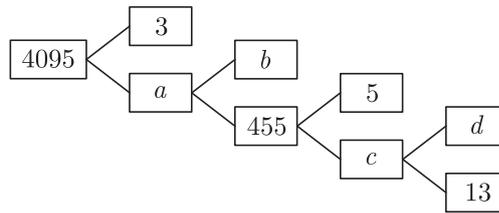
SECTION B

Q21.   Using Euclid's algorithm, find the HCF of 1656 and 4025.   [2]

OR

Write the missing numbers a, b, c and d in the following factor tree:

Q22.   Find the two numbers whose sum is 75 and difference is 15.   [2]

Q23.   If m and n are the zeroes of the polynomial $3x^2 + 11x - 4$, find the value of $\frac{m}{n} + \frac{n}{m}$.   [2]

Q24.   If the distances of $P(x, y)$ from the points $A(3, 6)$ and $B(-3, 4)$ are equal, prove that $3x + y = 5$.   [2]

Q25.   If $\tan \theta = \frac{1}{\sqrt{5}}$, find the value of $\frac{\csc^2\theta - \sec^2\theta}{\csc^2\theta + \sec^2\theta}$.   [2]

Q26.   The metallic solid cubes whose edges are 3 cm, 4 cm and 5 cm are melted and formed into a single cube. Find the edge of the cube so formed.   [2]

OR

The radius and height of a cylinder are in the ratio $7 : 9$. If the volume of the cylinder is 1386 cm^3. Find the total surface area of the cylinder.

SECTION C

Q27.   In an equilateral triangle ABC, a point D is taken on base BC such that $BD : DC = 2 : 1$. Prove that $9AD^2 = 7AB^2$. [3]

Q28.   Find the values of a and b so that $8x^4 + 14x^3 - 2x^2 + ax + b$ is exactly divisible by $4x^2 + 3x - 2$.   [3]

OR

If one zero of the polynomial $3x^2 - 8x - (2k + 1)$ is seven times the other, find both zeroes of the polynomial and the value of k.

Q29.   Solve for x and y: [3]

$$(a - b)x + (a + b)y = a^2 - 2ab - b^2$$
$$(a + b)(x + y) = a^2 + b^2.$$

Q30.   Find the area of the triangle formed by joining the mid points of the sides of the triangle whose vertices are $A(2, 1), B(4, 3)$ and $C(2, 5)$.   [3]

Q31.   There are 100 cards in a box on which numbers from 1 to 100 are written. A card is taken out from the box at random. Find the probability that the number on the selected card is   [3]

(i)   divisible by 3 and is a perfect square
(ii) a prime number greater than 80.

Q32.   A bucket is in the form of a frustum of a cone and holds 28.490 litres of water. The radii of the top and bottom are 28 cm and 21 cm respectively. Find the height of the bucket.   [3]

OR

A solid right-circular cone of height 60 cm and radius 30 cm is dropped in a right-circular cylinder full of water of height 180 cm and radius 60 cm. Find the volume of water left in the cylinder in cubic metre. $\left(\text{Use } \pi = \frac{22}{7}\right)$

Q33.   Prove the following: $\sin^6\theta + \cos^6\theta + 3\sin^2\theta\cos^2\theta = 1$.

OR

Prove that $\sqrt{\dfrac{1+\sin\theta}{1-\sin\theta}} + \sqrt{\dfrac{1-\sin\theta}{1+\sin\theta}} = 2\sec\theta$

Q34.   If $\cos\theta + \sin\theta = \sqrt{2}\cos\theta$, show that $\cos\theta - \sin\theta = \sqrt{2}$.   [3]

SECTION D

Q35.   If the roots of the quadratic equation $x^2 + 2px + mn = 0$ are real and equal, show that the roots of the quadratic equation $x^2 - 2(m+n)x + (m^2 + n^2 + 2p^2) = 0$ are also real and equal.   [4]

OR

The sums 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 their common differences are 1, 2 and 3 respectively. Prove that $S_1 + S_3 = 2S_2$.

Q36.   Dudhnath has two vessels containing 720 mL of milk. Milk from these containers is poured into glasses of equal capacity to their brim. Find the minimum number of glasses that can be filled.   [4]

OR

Show that the cube of any positive integer is of the form $4m$, $4m+1$ or $4m+3$ for some integer m.

Q37.   The following table gives production yield per hectare of wheat of 100 farms of a village.   [4]

Production in yield (in kg/ha)	50-55	55-60	60-65	65-70	70-75	75-80
No. of farms	2	8	12	24	38	16

Change the distribution to more than type, and draw its ogive. Using the ogive, find the median of the given data.

Q38.   In the given figure, AB is a chord of length 16 cm of a circle with centre O and of radius 10 cm. The tangents at A and B intersect at the point P. Find the length of PA.   [4]
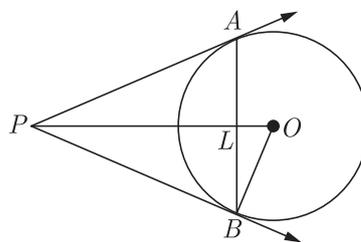
OR

Prove that the opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.

Q39.   The angle of elevation of a cloud from a point h metres above the surface of a lake is θ and the angle of depression of its reflection in the lake is ϕ. Prove that the height of the cloud above the lake is $h\left(\dfrac{\tan\phi + \tan\theta}{\tan\phi - \tan\theta}\right)$.   [4]

Q40.   Draw a circle of radius 3.5 cm. From a point P outside the circle at a distance of 6 cm from the centre of the circle, draw two tangents to the circle. Also measure their lengths.   [4]