Time: 3 hour   MM: 80
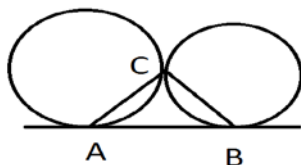
General Instruction: -

1. All questions are compulsory.

2. This question paper consists of 40 questions divided into four sections- A, B, C and D.

3. **Section A** contains 20 questions of **1 mark each. Section B** contains 6 questions of 2 marks each. **Section C** contains 8 questions of 3 marks each and **Section D** contains 6 questions of 4   marks each.

4. Use of calculator is not permitted.

5. There is no overall choice. However, an internal choice has been provided in two questions of Section A, two questions of Section B, three questions of Section C and three questions of Section D. You have to attempt only one of the alternatives in all such questions .

SECTION - A

Q1   The product of non zero rational and an irrational number is: 1
(a) Always irrational   (b) Always rational   (c) Rational or irrational   (d) One

Q2   The LCM of two numbers is 1200. Which of the following cannot be their HCF?   1
(a)600   (b) 500   (c) 400   (d) 200

Q3   The 6th term from end of the AP: 5, 2, -1,..., -31 is   1
(a) - 16   (b) - 19   (c) -22   (d) - 25

Q4 ΔABC and ΔBDE are two equilateral triangles such that D is the mid-point of BC. Ratio of the area of ΔABC to   1
ΔBDE is
(a) 2 : 1   (b) 1 : 2   (c) 1 : 4   (d) 4 : 1

Q5   The coordinates of the point which is equidistant from the three vertices of the triangle ABC , A(0,2y), B(2x,0) and   1
C(0,0) are
 (a) (x, y)   (b) (y, x)   (c) (x/2 , y/2)   (d) (y/2,x/2)

Q6   Two circles touch each other externally at C and AB is a common tangent of circles, then   1

(a) 70^0 (b) 60^0 (c) 100^0 (d) 90^0

Q7   Given that sin A = $\frac{1}{2}$ and cos B = $\frac{1}{2}$, then the value of (A + B) is   1
(a)0^0 (b)30^0 (c)60^0 (d)90^0

Q8   If $\sin^2 37^0 + \sin^2 53^0 + \sin^2 90^0$ = x, then x is equals to   1
(a) 0   (b) 3   (c) 2   (d) 1

Q9   The length of the diagonal of a cube is 8√3 cm. Its total surface area is   1
(a) 321 cm²   (b) 350 cm²   (c) 384 cm²   (d) 256 cm²

Q10   The arithmetic mean of 1,2,3 .... n is   1
(a) $\frac{n+1}{2}$ (b) $\frac{n}{2}$ (c) $\frac{n-1}{2}$ (d) $\frac{n}{2} + 1$

Q11   What is the HCF of the smallest composite number and the smallest prime number?   1

Q12   Find the co-ordinate where the line x - y = 8 will intersect y-axis.   1
OR
For what value of k pair of given lines 3x + 2ky = 2 and 2x + 5y + 1 = 0 are parallel.

Q13   The coordinates of the points P and Q are respectively (4, -3) and (-1, 7). Find the abscissa of a point R on the line   1

segment PQ such that $\frac{PR}{PQ} = \frac{3}{5}$.

Q14   If sin θ = $\frac{1}{3}$, then find the values of (2cot^{2}θ + 2)   1

Q15   Cards are marked with number 3,4,5, ..., 50 are placed in a box and mixed thoroughly. A card is drawn at random   1
from the box. Find the probability that the selected card bears a perfect square number.

Q16   The graph of the polynomial intersects the x- axis at only one point, hence it is a quadratic polynomial.   1
State whether the above statement is True or False. Justify your answer.

Q17   If a, b, c are in AP then 2a = b + c.   1
State whether the above statement is True or False. Justify your answer.

Q18   If $\frac{2}{3}$ is one of the root of the quadratic equation 6x^2 - x - k = 0, then k = ...   1

OR

If x = - 1 and x = - 2 are roots of px^2 + 3x + q = 0, the value of q - p is ....

Q19   Centroid of triangle formed by the points (a, b), (b, c) and (c, a) is at origin, then a + b + c = ...   1

Q20   State Thales Theorem.   1

SECTION - B

Q21   If the ratio of the sum of the first m and n terms of an AP is m^2 : n^2 , show that the ratio of its mth and nth term is   2
(2m - 1):(2n - 1).

OR

The first term of the AP is 5, the last term is 45 and the sum is 400. Find the number of terms and the common
difference.

Q22   The length of the diagonals of a rhombus are 16 cm and 12 cm. Find the length of side of the rhombus.   2

Q23   Prove that : $\dfrac{sin\theta - 2\,sin^3\theta}{2\,cos^3\,\theta - cos\theta}$ = tan θ   2

Q24   Prove that the lengths of two tangents drawn from an external point to a circle are equal.   2

Q25   Water in a canal, 5.4 m wide and 1.8 m deep, is flowing with the speed of 25km/hour. How much area can it irrigate   2
in 40 minutes, if 10 cm of standing water is required for irrigation?

Q26   Find the probability of getting 53 Wednesdays and 53 Thursdays in a leap year.   2

OR

A jar contains 24 marbles, some are green and other are blue. If a marble is drawn at random from the jar, the
probability that it is green is $\frac{2}{3}$. Find the number of blue marbles in the jar.

SECTION - C

Q27   Prove that $\frac{2}{3}$ + √5 is an irrational number.   3

Q28   If α and β are the zeroes of the quadratic polynomial f(x) = 2x^2 -5x +7, find a polynomial whose zeroes are   3
(2α + 3β) and (3α + 2β).

OR

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

Q29   A boat goes 30 km upstream and 44 km downstream in 10 hours. In 13 hours, it can go 40 km upstream and 55 km   3
downstream. Determine the speed of the stream and that of the boat in still water.

OR

Determine graphically, the vertices of the triangle formed by the lines y = x, 3y = x, x + y = 8.

Q30   A dense toxic smog in New Delhi blocks out the sun. In November 2019, Delhi's chief minister described the city as a   3
"gas chamber". The air quality in Delhi, the capital territory of India, according to a WHO survey of 1650 world cities,
is the worst of any major city in the world. It also affects the districts around Delhi. Air pollution in India is estimated
to kill about 2.5 million people every year; it is the fifth largest killer in India. India has the world's highest death rate
from chronic respiratory diseases and asthma, according to the WHO. In Delhi, poor quality air irreversibly damages
the lungs of 2.2 million or 50 percent of all children.
India's Ministry of Earth Sciences published a research paper in October 2018 attributing almost 41% to vehicular

emissions, 21.5% to dust and 18% to industries. The director of Centre for Science and Environment (CSE) alleged that the Society of Indian Automobile Manufacturers (SIAM) is lobbying "against the report" because it is "inconvenient" to the automobile industry.

ASN SENIOR SECONDARY SCHOOL took initiative to spread awareness and organises a quiz for people of different age group. Following histograms depict the visual representation of data showing % of harmful gases which are emitted in atmosphere by human activities and number of people who are aware about those activities.
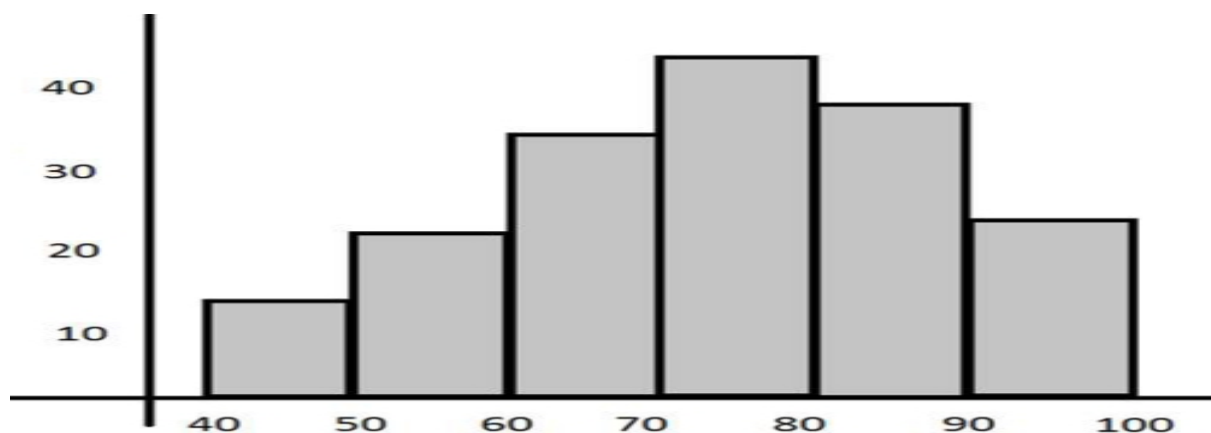
Read the above data carefully and answer the following questions carefully

(i) Prepare frequency distribution table for given data.

(ii) Find the difference between the frequencies of median class and modal class.

(iii) Find mode of given data.

Q31 The sum of the 5th and the 9th terms of an AP is 30. If its 25th term is three times its 8th term, find the AP.   3

OR

If the sum of the first p terms of an AP is q and the sum of the first q terms is p; then show that the sum of the first (p + q) terms is {- (p + q) }.

Q32 The coordinates of Kolkata is 22.6^0 N and 88.4^0 E and the coordinates of Bangalore is 13^0 N & 77.5^0 E .   3

To find the distance between the Bangalore and Kolkata use the following information:

Equator divides the entire earth into two equal halves horizontally.
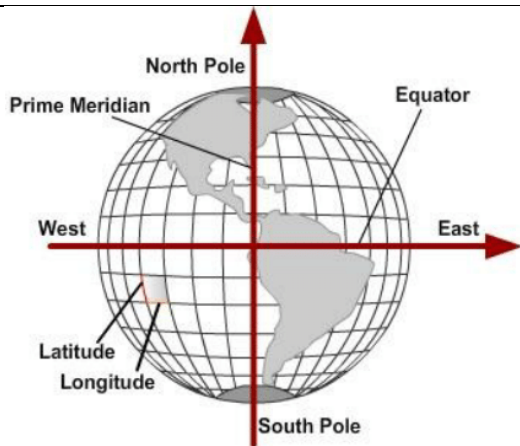
Prime Meridian divides the entire earth into two equal halves vertically.

Lines parallel to equator are called latitudes.

Lines parallel to Prime Meridian are called longitudes.

To locate position of any place on map longitudes and latitudes are used.

Distance between two parallel longitudes 1^0 apart = 104 km

Distance between two parallel latitudes 1^0 apart = 110 km

Use the above information find

    a)   Distance between longitudes of Bangalore and Kolkata

    b)   Distance between latitudes of Bangalore and Kolkata

    c)   Distance between Bangalore and Kolkata using Pythagoras Theorem.

Q33   Under what conditions an equation is called identity. Prove that $1 + \cot^2 A = \text{cosec}^2 A$.   3
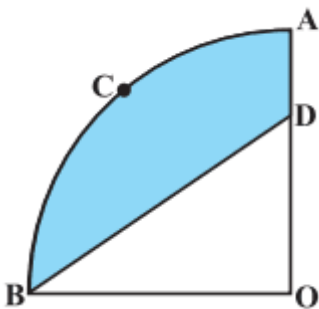
<div align="center">OR</div>

Without using trigonometric tables, evaluate the following:

$\frac{2}{3} \text{cosec}^2 58° - \frac{2}{3} \cot 58° \tan 32° - \frac{5}{3} \tan 13° \tan 37° \tan 45° \tan 53° \tan 77°$

Q34   In the given figure , OACB is a quadrant of a circle with centre O and radius 3.5 cm. If OD = 2 cm , find the area of   3
the
i) quadrant OACB
ii) shaded region

<div align="center">SECTION - D</div>

Q35   Two water taps together can fill a tank in 9 hours 36 minutes. The tap of larger diameter takes 8 hours less than the   4
smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank.

<div align="center">OR</div>

Solve for x: $3\left(\frac{3x-1}{2x+3}\right) - 2\left(\frac{2x+3}{3x-1}\right) = 5; \ x \neq \frac{1}{3}, -\frac{3}{2}$

Q36   State and prove Pythagoras Theorem.   4

<div align="center">OR</div>

Sides AB and AC and median AD of a triangle ABC are respectively proportional to sides PQ and PR and median PM
of another triangle PQR. Show that $\triangle ABC \sim \triangle PQR$.

Q37   A boy standing on a horizontal plane finds a bird flying at a distance of 100m from him at an angle of elevation of   4

30^0. A girl standing on the roof of 20m high building, finds the angle of elevation of the same bird to be 45^0. Both the boy and girl are on the opposite sides of the bird. Find the distance of bird from the girl.

OR

The angles of depression of the top and the bottom of an 8 m tall building from the top of a multi-storeyed building are 30^0 and 45^0 , respectively. Find the height of the multi-storeyed building and the distance between the two buildings.

Q38 Draw a pair of tangents to a circle of radius 4cm which are inclined to each other at an angle of 60^0 . 4

Q39 A cone of radius 10cm is divided into two parts by drawing a plane through the mid-point of its axis, parallel to its base. Compare the volume of two parts. 4

Q40 The marks obtained by 100 students of a class are given below. Draw ' a less than' type cumulative frequency curves. Hence find median. 4

MARKS	NO. OF STUDENTS
0 - 5	2
5 -10	5
10 - 15	6
15 -20	8
20 - 25	10
25 - 30	25
30 - 35	20
35 - 40	18
40 - 45	4
45 -50	2