Time Allowed: 3 Hrs.   Maximum Marks: 80

General Instructions:

1.   This Question Paper has 5 Sections A-E.
2.   Section A has 20 MCQs carrying 1 mark each
3.   Section B has 5 questions carrying 02 marks each.
4.   Section C has 6 questions carrying 03 marks each.
5.   Section D has 4 questions carrying 05 marks each.
6.   Section E has 3 case based integrated units of assessment (04 marks each) with subparts of the values of 1, 1 and 2 marks each respectively.
7.   Draw neat figures wherever required.
8.   Take $\pi = 22/7$ wherever required if not stated.

SECTION A
Section A consists of 20 questions of 1 mark each.

1.   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 the result obtained by dividing the product of the positive integers by the HCF (a, b) is

   (a) xy   (b) xy^2 (c) x^3y^3 (d) x^2y^2

2.   If x = a, y = b is the solution of the equations x + y = 5 and 2x − 3y = 4, then the values of a and b are respectively

   (a) 6, -1   (b) 2, 3   (c) 1, 4   (d) $\frac{19}{5}$, $\frac{6}{5}$

3.   A pair of linear equations $a_1x + b_1y + c_1 = 0$; $a_2x + b_2y + c_2 = 0$ is said to be inconsistent, if

   (a) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ (b) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

   (c) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ (d) $\frac{a_1}{a_2} \neq \frac{c_1}{c_2}$

4.   The quadratic equation $5x^2 - 4x - 1 = 0$ has:
   (a) No real roots   (b) 2 equal real roots

   (c) 2 distinct real roots   (d) More than 2 real roots

5.   If the sum of three numbers in an A.P is 9 and their product is 24, then numbers are

   (a) 2, 4, 6   (b) 1, 5, 3   (c) 2, 8, 4   (d) 2, 3, 4

6.   Find the ratio in which the y-axis divides the line segment joining the points (5, -6) & (-1, -4).
   (a) 5:1   (b) 4:1   (c) 3:1   (d) 2:3

1

7. The coordinates of the centroid of a triangle ABC whose vertices are A (1, 2), B (- 1, 3) and C (3, - 1) are

(a) (3/2, 2)　　　(b) (1, 4/3)　　　(c) (3, 4)　　　(d) (1, 3/4)

8. In the given figure, XY ‖ BC. If AX = 3cm, XB = 1.5cm and BC = 6cm, then XY is equal to

(a) 6cm　　　(b) 4.5cm　　　(c) 4cm　　　(d) 3cm
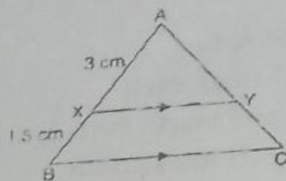
9. CP and CQ are tangents to a circle with centre O. ARB is another tangent touching the circle at R. If CP=11cm, BC=7cm, then the length BR is

(a) 11 cm　　　(b) 5 cm　　　(c)4 cm　　　(d) 3 cm
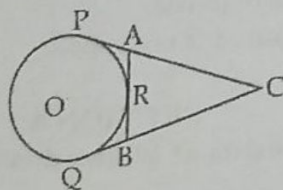
10. If A and (2A – 45°) are acute angles such that $\sin A = \cos(2A - 45°)$, then tan A is equal to

(a) 0　　　(b) 1√3　　　(c) 1　　　(d) $\sqrt{3}$

11. In the given figure, if ∠RPS = 25°, the value of ∠ROS is
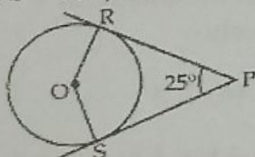
(a) 135°　　　(b) 145°　　　(c) 165°　　　(d) 155°

12. If $2\sin 3x = \sqrt{3}$, then the value of x,

(a)5°　　　(b)30°　　　(c) 15°　　　(d) 20°

13. The angle of depression of a car, standing on the ground, from the top of a 75 m high tower is 30°. The distance of the car from the base of tower (in m) is:

(a) 25√3　　　(b) 50√3　　　(c)75√3　　　(d) 150

14. If the perimeter and the area of a circle are numerically equal, then the diameter of the circle is

(a) 4 units　　　(b) 2π units　　　(c) 8 units　　　(d) 14 units

15. If the difference between the circumference and the radius of a circle is 37 cm, then using $\pi = \frac{22}{7}$, calculate the circumference (in cm) of the circle.

(a) 22　　　(b) 33　　　(c) 44　　　(d) 55

16. In a family of 3 children, find the probability of having at least 1 boy.

(a) $\frac{7}{8}$

(b) $\frac{1}{8}$

(c) $\frac{5}{8}$

(d) $\frac{3}{8}$

17. A piggy bank contains hundred 50 p coins, fifty ₹ 1 coins, twenty ₹ 2 coins and ten ₹ 5 coins. If it is equally likely that one of the coins will fall out when the piggy bank is turned upside down, what is the probability that the coin will be a 50p coin?

(a) $\frac{5}{9}$

(b) $\frac{5}{8}$

(c) $\frac{7}{8}$

(d) $\frac{7}{9}$

18. If the median and mode of a distribution are 26 and 29 respectively. find its mean

a) 20

b) 20.5

c) 24

d) 24.5

DIRECTION: In question number 19 and 20, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct option

19. Statement A (Assertion): 184 is the 50th term of the sequence 3, 7, 11, ...

Statement R (Reason): The nth term of AP is given by a+ (n-1) d

(a) Both assertion (A) and reason (R) are true and reason(R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason(R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

20. Statement A (Assertion): No. of spherical balls that can be made from a solid cube of lead whose edge is 44 cm, each ball being 4 cm. in diameter, is 2541

Statement R (Reason): Number of balls = Volume of one ball ÷ Volume of lead

(a) Both assertion (A) and reason (R) are true and reason(R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason(R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

SECTION B
Section B consists of 5 questions of 2 marks each.

21. Prove that $5-3\sqrt{2}$ is an irrational number, given that $\sqrt{2}$ is irrational.

22. What is the ratio between the areas of the circle and the square when a square is inscribed in a circle?

OR

The area of a sector of a circle of radius 36 cm is 54π sq cm. Find the length of the corresponding arc of the sector.

23. A circle is inscribed in a $\triangle ABC$ having sides BC=8 cm, CA=10 cm and AB=12 cm as shown in the figure. Find AD, BE and CF.
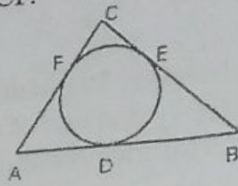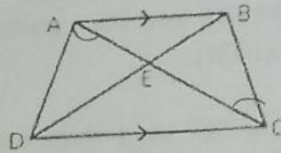

24. If $\dfrac{\cos\theta - \sin\theta}{\cos\theta + \sin\theta} = \dfrac{1-\sqrt{3}}{1+\sqrt{3}}$, then find the value of θ.

OR

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

25. ABCD is a trapezium with AB ∥ DC. If $\triangle AED \sim \triangle BEC$, then prove that AD = BC.

SECTION C
Section C consists of 6 questions of 3 marks each.

26. If the mean of the following distribution is 2.6, then find the value of k.

x_i	1	2	3	4	5
f_i	k	5	8	1	2

27. A quadrilateral ABCD is drawn to circumscribe a circle.
Prove that $AB + CD = AD + BC$.

OR

If PA and PB are two tangents drawn to a circle with the centre O, from an external point P such that PA=2.8cm and $\angle APB = 60°$. Find the length of chord AB.

28. If sum and product of zeros of a quadratic polynomial are 2 and -8 respectively, then find a quadratic polynomial and zeroes of the polynomial so obtained.

29. If $\operatorname{cosec}\theta + \cot\theta = \lambda$, then show that $(\lambda^2 + 1)\cos\theta = \lambda^2 - 1$

30. For the first three days of a lending library, there is a fixed charge, and then there is an additional charge for each consecutive day. For a book that she kept for seven days, Saritha paid ₹ 27, while Susy paid ₹ 21 for a book, she kept for five days. Find the fixed charge and the charge for each extra day.

OR

If third and ninth terms of an A.P. are 4 and -8 respectively, then is there any term of this A.P which is zero?

31. Sum of LCM and HCF of two numbers is 1260 and their difference is 900. If one number is 360, then find the other.

4

SECTION D

Section D consists of 4 questions of 5 marks each.

32. The sum of the reciprocals of Rehman's ages (in years) 3 years ago and 5 years from now is $\frac{1}{3}$. Find his present age.

OR

Find that non-zero value of k, for which the quadratic equation $kx^2 + 1 - 2(k-1)x + x^2 = 0$ has equal roots. Hence find the roots of the equation.

33. The following frequency distribution gives the monthly consumptions of electricity in locality of 80 families. If the median is 206, find the missing frequency x and y

Monthly Consumption of electricity (in units)	Number of families
170–180	4
180–190	x
190–200	12
200–210	15
210–220	13
220–230	y
230–240	14
240–250	6

34. Show that $\triangle ABC$ with vertices A (-2, 0), B (2, 0) and C (0, 2) is similar to $\triangle PQR$ with vertices P (-4, 0), Q (4, 0) and R (0,4).

35. Rachel, an engineering student, was asked to make a model shaped like a cylinder with two cones attached at its two ends by using a thin aluminium sheet. The diameter of the model is 3 cm and its length is 12 cm. If each cone has a height of 2 cm, find the volume of air contained in the model that Rachel made. (Assume the outer and inner dimensions of the model to be nearly the same.)

OR

A tent is in the shape of a cylinder surmounted by a conical top. If the height and diameter of the cylindrical part are 2.1 m and 4 m respectively, and the slant height of the top is 2.8 m, find the area of the canvas used for making the tent. Also, find the cost of the canvas of the tent at the rate of Rs 500 per m². (Note that the base of the tent will not be covered with canvas.)

Case study-based questions are compulsory.

36. **CASE STUDY-1**

A lighthouse is a tall tower with light near the top. These are often built on islands, coasts or on cliffs. Lighthouses on water surface act as a navigational aid to the mariners and send warning to boats and ships for dangers. Initially wood, coal would be used as illuminators. Gradually it was replaced by candles, lanterns, electric lights. Nowadays they are run by machines and remote monitoring.

Prongs Reef lighthouse of Mumbai was constructed in 1874-75. It is approximately 40 meters high and its beam can be seen at 30 kilometres. A ship and boat are coming towards the lighthouse from opposite directions. Angles of depression of flash light from the lighthouse to the boat and the ship are 30^0 and 60^0 respectively.
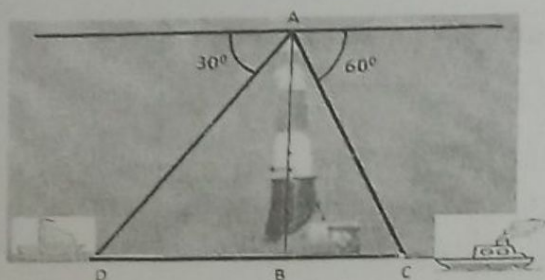
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i)	Which of the two, boat or the ship is nearer to the light house. 1
ii)	Find its distance from the lighthouse? 1
iii)	Find the time taken by the boat to reach the light house if it is moving at the rate of 2 km per hour. 2

37. **CASE STUDY-2**

Vikram gets pocket money from his father every day. Out of the pocket money, he saves money for poor people in his locality. On first day, he saves ₹ 27.50, and on each succeeding day, he increases his savings by ₹ 2.50

Based on the above information, answer the following questions:

i)	Check whether savings done by Vikram every day forms an A.P. or not. Give reason(s). 1
ii)	If yes, then find the 10th and nth terms of the A.P. 1
iii)	Suppose Vikram saved a total amount of ₹2450. In how many days, will this amount be saved by him? 2

38. The top of a table is shown in the figure given below:

Scale : 1 Square = 1 unit
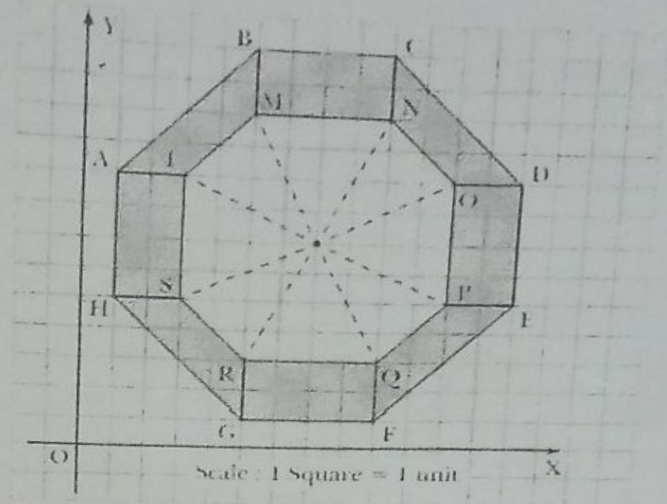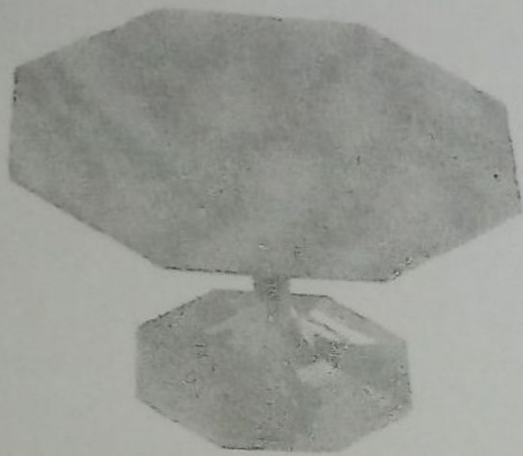
(i) Find the coordinates of the points H and G are respectively.   1

(ii) Find the distance between the points A and B.   1

(iii) Find the coordinates of the mid-point of line segment joining points M and Q.   2