COMMON PRE-BOARD EXAMINATION 2022-23

Subject: MATHEMATICS (BASIC) 241

SET - 1

Maximum marks: 80   Time allowed: 3 hours

General Instructions:

1. This Question Paper has 5 Sections A, B, C, D, and E.

2. Section A has 20 Multiple Choice Questions (MCQs) carrying 1 mark each.

3. Section B has 5 Short Answer-I (SA-I) type questions carrying 2 marks each.

4. Section C has 6 Short Answer-II (SA-II) type questions carrying 3 marks each.

5. Section D has 4 Long Answer (LA) type questions carrying 5 marks each.

6. Section E has 3 Case Based integrated units of assessment (4 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.

7. All Questions are compulsory. However, an internal choice in 2 Qs of 2 marks, 2 Qs of 3 marks and 2 Questions of 5 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.

8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$, wherever required if not stated.

SECTION A

Section A consists of 20 questions of 1 mark each.

Q.1. If (3, – 6) is the mid-point of the line segment joining (0, 0) and (x, y), then the point (x, y) is

(A)	(-3, 6)	**(B)**	(6, -6)	**(C)**	(6, -12)	**(D)**	(2 -3)

Q.2. The HCF of two numbers is 27 and their LCM is 162. If one of the numbers is 54, then the other number is

(A)	36	**(B)**	35	**(C)**	9	**(D)**	81

Q.3. The discriminant of the quadratic equation $4x^2 - 6x + 3 = 0$ is

(A)	-12	**(B)**	84	**(C)**	$2\sqrt{3}$	**(D)**	12

Q.4. In the given fig, the number of tangents parallel to tangent PQ is
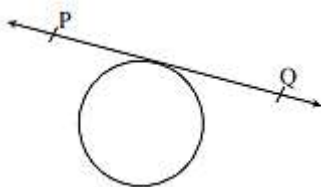
(A)   0   (B)   3   (C)   1   (D)   2

Q.5. A box contains cards numbered from 6 to 50. A card is drawn at random from the box. The probability that the drawn card has a number which is a perfect square is

(A) $\dfrac{1}{44}$ (B) $\dfrac{2}{15}$ (C) $\dfrac{4}{45}$ (D) $\dfrac{1}{9}$

Q.6. In a circle of diameter 42cm, if an arc subtends an angle of 60° at the centre where $\pi = \dfrac{22}{7}$, then the length of the arc is

(A) $\dfrac{22}{7}$ cm   (B)   11 cm   (C)   22 cm   (D)   44 cm

Q.7. The co-ordinates of the point P dividing the line segment joining the points A (1,3) and B (4,6) internally in the ratio 2:1 are

(A)   (2, 4)   (B)   (4, 6)   (C)   (4, 2)   (D)   (3, 5)

Q.8. The LCM of $2^3 \times 3^2$ and $2^2 \times 3^3$ is

(A) 3^3 (B) 2^3 (C) $2^3 \times 3^3$ (D) $2^2 \times 3^2$
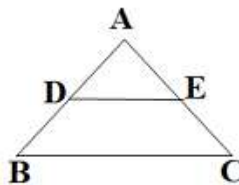
Q.9. If the perimeter and the area of a circle are numerically equal, then the radius of the circle is:

(A)   11 units   (B)   2 units   (C)   7 units   (D)   4 units

Q.10. What is the value of $(\tan\theta \ \mathrm{cosec}\theta)^2 - (\sin\theta \ \sec\theta)^2$

(A)   1   (B)   0   (C)   -1   (D)   2

Q.11. In the figure, if DE ∥ BC, AD = 3cm, BD = 4cm and BC= 14 cm, then DE equals

(A)   7 cm   (B)   6 cm   (C)   4 cm   (D)   3 cm

Q.12. If one zero of the polynomial $(3x^2 + 8x + k)$ is the reciprocal of the other, then value of k is

(A) $\dfrac{1}{3}$ (B)   -3   (C)   3   (D) $-\dfrac{1}{3}$

Q.13. Consider the following distribution:

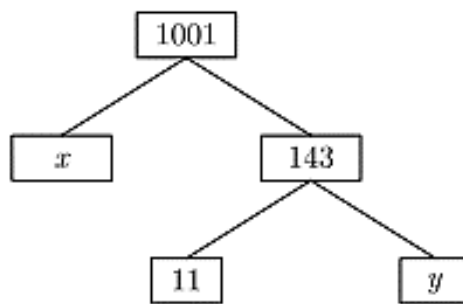| Classes	0 - 5	5 - 10	10 - 15	15 - 20	20 - 25
Frequency	10	15	12	20	9

The sum of lower limits of the median class and the modal class is

(A)   15   (B)   25   (C)   30   (D)   35

Q.14. The point P on the x-axis equidistant from the points A (−1, 0) and B (5, 0) is

(A)   (2, 0)   (B)   (0, 2)   (C)   (3, 0)   (D)   (2, 2)

Q.15. The values of x and y in the given figure are

(A)   12, 9   (B)   13, 7   (C)   9, 12   (D)   7, 13

Q.16. If $\sec\theta = \dfrac{25}{7}$, then the value of $\cot\theta$ is

(A) $\dfrac{7}{25}$ (B) $\dfrac{25}{7}$ (C) $\dfrac{7}{24}$ (D) $\dfrac{24}{7}$

Q.17. Three solid spheres of diameters 6 cm, 8 cm and 10 cm respectively are melted to form a single solid sphere. The radius of the new sphere is

(A)   6 cm   (B)   4.5 cm   (C)   3 cm   (D)   12 cm

Q.18. If $\tan(A + B) = \sqrt{3}$ and $\tan(A - B) = \dfrac{1}{\sqrt{3}}$, $0° < (A + B) \le 90°$; A > B, then the value of A is

(A)   45°   (B)   60°   (C)   90°   (D)   30°

DIRECTION: In question numbers 19 and 20, a statement of **Assertion (A)** is followed by a statement of **Reason (R).**

Choose the correct option:

   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.

Q.19. *Statement A (Assertion):* If the values of mode and mean are 60 and 66 respectively, then the value of median is 64.

Statement R (Reason): Median = Mode + 2 Mean

Q.20. *Statement A (Assertion):* x + y − 4 = 0 and 2x + ky − 3 = 0 have no solution if k = 2.

Statement R (Reason): The pair of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are consistent if $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

SECTION B

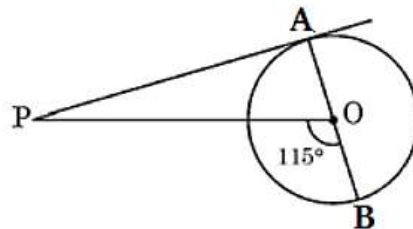### Section B consists of 5 questions of 2 marks each.

Q.21. The wheel of a motorcycle is of radius 35 cm. How many revolutions are required to travel a distance of 11 m?

OR

Find the area of a quadrant of a circle whose circumference is 22 cm.

Q.22. In Fig., PA is a tangent from an external point P to a circle with centre O and diameter AB.
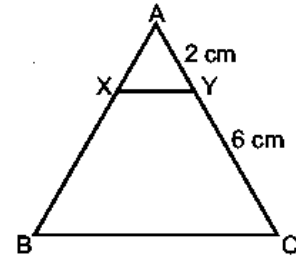
If ∠POB = 115°, find ∠APO.

Q.23. For what value of k, will the following pair of linear equations have infinitely many solutions?

2x + 3y = 7

(k + 2) x − 3(1 − k) y = 5k + 1

Q.24 X and Y are points on the sides AB and AC respectively of a triangle ABC such that $\frac{AX}{AB} = \frac{1}{4}$,

AY= 2 cm and YC = 6 cm. Find whether XY ∥ BC or not.

Q.25. Evaluate: $4 \cot^2 45° - \sec^2 60° + \sin^2 60° + \cos^2 90°$.

OR

In a ΔABC, right angled at A, if AB = 12 cm, CA = 5 cm and BC = 13 cm, find sin B, cos B, tan B and cosec B.

SECTION C

Section C consists of 6 questions of 3 marks each.

Q.26. Prove that if x = a sinθ + b cosθ and y = a cosθ − b sin θ, then $x^2 + y^2 = a^2 + b^2$.

OR

Prove that: $(\sin\theta + \csc\theta)^2 + (\cos\theta + \sec\theta)^2 = 7 + \tan^2\theta + \cot^2\theta$

Q.27. Prove that $3 + 2\sqrt{5}$ is an irrational number, given that $\sqrt{5}$ is irrational.

Q.28. Two concentric circles are of radii 5 cm and 3 cm. Find the length of chord of the larger circle which touches the smaller circle.

Q.29 The numerator of a fraction is 4 less than its denominator. If the numerator is decreased by 2 and the denominator is increased by 1, the denominator becomes 8 times its numerator. Find the fraction.

Q.30. Find the zeroes of the quadratic polynomial $5x^2 – 8x - 4$ and verify the relationship between the zeroes and the coefficient of the polynomial.

Q.31. From a pack of 52 playing cards, Jacks, Queens and Kings of red colour are removed. From the remaining, a card is drawn at random. Find the probability that the drawn card is

  (i)   a black king   (ii) a card of red colour   (iii) a card of black colour.

OR

Two coins are tossed simultaneously. Find the probability of getting:

  (i)   at least one head   (ii) at most one head   (iii) no head.

SECTION D

Section D consists of 4 questions of 5 marks each.

Q.32. Prove that if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.

Q.33. The weight (in kg) of 50 wrestlers are recorded in the following table:

Weight (in kg)	100 - 110	110 - 120	120 - 130	130 - 140	140 - 150
No. of wrestlers	4	14	21	8	3

Find the mean weight of the wrestlers.

Q.34. In the figure, a decorative block is shown which is made of two solids, a cube and a hemisphere. The base of the block is a cube with edge 6cm and the hemisphere fixed on the top has a diameter of 4.2cm. Find

  (a) the total surface area of the block

  (b) the volume of the block formed.
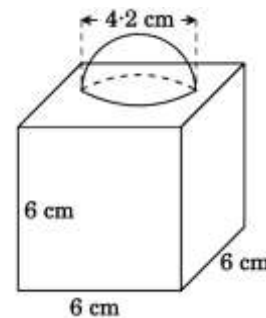
OR

A well of diameter 4 m is dug 21 m deep. The earth taken out of it has been spread evenly all around it in the shape of a circular ring of width 3 m to form an embankment. Find the height of the embankment.

Q.35. A train travels at a certain average speed for a distance of 54 km and then travels a distance of 63 km at an average speed of 6 km/h more than the first speed. If it takes 3 hours to complete the total journey, what is its first speed?

OR

The diagonal of a rectangular field is 16 m more than the shorter side. If the longer side is 14 m more than the shorter side, then find the lengths of the sides of the field.

SECTION E

Case study- based questions are compulsory.

Q.36.

Case Study- Based 1

The Fox Theater creates a "theater in the round" when it shows any of Shakespeare's plays. The first row has 80 seats, the second row has 88, the third row has 96 and so on.
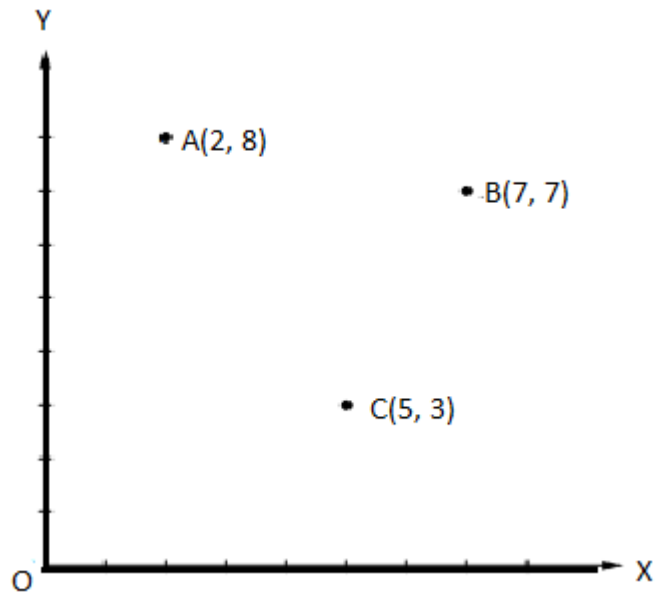

Based on the above information answer the following questions:

(i)	How many seats are there in the 10th row?	1m
(ii)	How many seats are there in the 15th row?	1m
(iii)	If there is room for 25 rows, how many seats will be needed to set up the theatre? **OR** In which row can 200 seats be arranged in the theatre?	2m

Q.37.

Case Study Based-2

Three friends Amar, Bandhu and Chakradev lives in societies represented by the points A, B and C respectively. They all work in offices located in the same building represented by the point O. Since they all go to same building every day, they decided to do carpooling to save money on petrol.


Based on the above information, answer the following questions.

(i)	Which society is nearest to the office O?	1m
(ii)	What is the distance between A and C?	1m
(iii)	If Bandhu and Chakradev planned to meet at a club situated at the mid-point D of the line segment joining the points B and C, find the coordinates of the point D. **OR** Find which is the shortest distance, AB or BC?	2m

Q.38.

Case Study Based-3

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°.
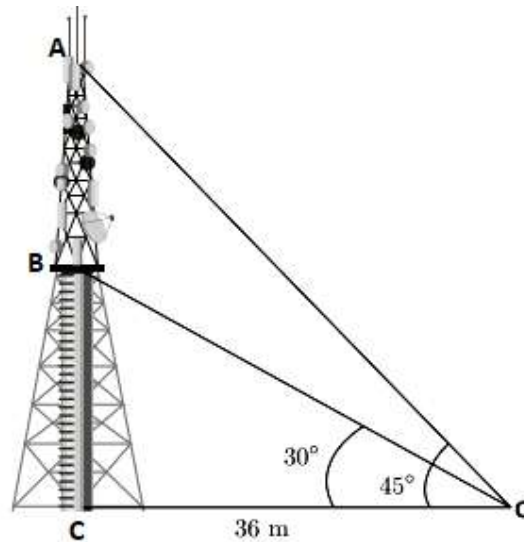
(i)	What is the angle of depression from top of tower A to point O?	1m
(ii)	Find the height BC.	1m
(iii)	Find the height AB. **OR** What is the length of the wire structure from the point O to the top of section B?	2m