



COMMON PRE-BOARD EXAMINATION 2022-23

CLASS: X

Subject: MATHEMATICS (BASIC) (241)



Date:

Time Allowed: 3 hours

Maximum Marks: 80

General Instructions:

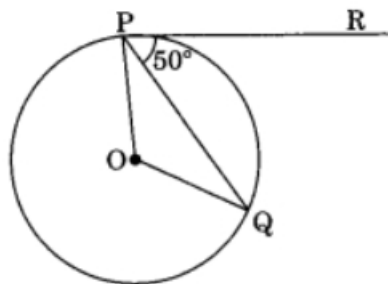
1. This Question Paper has 5 Sections A - E.
2. Section **A** has 20 Multiple Choice Questions (MCQs) carrying 1 mark each.
3. Section **B** has 5 questions carrying 02 marks each.
4. Section **C** has 6 questions carrying 03 marks each.
5. Section **D** has 4 questions carrying 05 marks each.
6. Section **E** has 3 Case Based integrated units of assessment (04 marks each) with 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 5 marks, 2 Qs of 3 marks and 2 Questions of 2 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.

1. If two positive integers a and b are written as $a = x^3y^2$ and $b = xy^3$; x and y are prime numbers then LCM(a,b) is
 - a) xy
 - b) xy^2
 - c) x^3y^3
 - d) x^2y^2
2. There is a circular path around a sports field. Priya takes 18 minutes to drive one round of the field. Harish takes 12 minutes. Suppose they both start at the same point and at the same time and go in the same direction. After how many minutes will they meet?
 - a) 36 minutes
 - b) 18 minutes
 - c) 6 minutes
 - d) They will not meet
3. The two consecutive odd positive integers, sum of whose squares is 290 are
 - a) 13,15
 - b) 11,13
 - c) 7,9
 - d) 5,7

4. If the difference of zeroes of the quadratic polynomial $x^2 + kx + 12$ is 1, the positive value of k is
 a) -7 b) 7 c) 4 d) 8
5. The pair of equations $x + 2y + 5 = 0$ and $-3x - 6y + 1 = 0$ have
 a) a unique solution b) exactly two solutions
 c) infinitely many solutions d) no solution
6. Find the coordinates of the point A, where AB is a diameter of the circle with centre (3, -1) and the point B is (2,6).
 a) (-7,0) b) (0, -7) c) (4,0) d) (2,3)
7. The points (1,1), (-2, 7) and (3, -3) are
 a) vertices of an equilateral triangle b) collinear
 c) vertices of an isosceles triangle d) none of these
8. If in two triangles ABC and PQR, $\frac{AB}{QR} = \frac{BC}{PR} = \frac{AC}{PQ}$, then
 a) $\Delta PQR \sim \Delta CAB$ b) $\Delta PQR \sim \Delta ABC$ c) $\Delta CBA \sim \Delta PQR$ d) $\Delta BCA \sim \Delta PQR$
9. In Fig., if O is the centre of a circle PQ is a chord and the tangent PR at P makes an angle of 50° with PQ, then $\angle POQ$ is equal to



- a) 100° b) 80° c) 90° d) 75°
10. If $x \tan 45^\circ \sin 30^\circ = \cos 30^\circ \tan 30^\circ$, then x is equal to
 a) $\sqrt{3}$ b) 12 c) $12\sqrt{3}$ d) 1
11. Given that $\sin \theta = \frac{a}{b}$, then $\tan \theta =$
 (a) $\frac{b}{\sqrt{b^2 - a^2}}$ (b) $\frac{\sqrt{b^2 - a^2}}{b}$
 (c) $\frac{a}{\sqrt{b^2 - a^2}}$ (d) $\frac{\sqrt{b^2 - a^2}}{a}$
12. $5 \tan^2 A - 5 \sec^2 A + 1$ is equal to
 a) 6 b) -5 c) 1 d) -4

13. The diameter of a circle whose area is equal to sum of the areas of the two circles of radii 40 cm and 9 cm is

- a) 41 cm b) 49 cm c) 82 cm d) 62 cm

14. The perimeter of the sector with radius 10.5 cm and sector angle 60° is

- a) 32 b) 23 cm c) 41 cm d) 11 cm

15. The curved surface area of a right circular cone of height 15 cm and base diameter 16 cm is:

- a) $60\pi \text{ cm}^2$ b) $68\pi \text{ cm}^2$
c) $1200\pi \text{ cm}^2$ d) $136\pi \text{ cm}^2$

16. The mean of following distribution is:

| | | | | |
|-------|----|----|----|----|
| x_i | 11 | 14 | 17 | 20 |
| f_i | 3 | 6 | 8 | 7 |

- (a) 15.6 b) 17 c) 14.8 d) 16.4

17. Modal class for the following frequency distribution table is

| Marks | No. of students |
|---------------|-----------------|
| Less than 20 | 4 |
| Less than 40 | 12 |
| Less than 60 | 25 |
| Less than 80 | 56 |
| Less than 100 | 74 |
| Less than 120 | 80 |

- a) 20 – 40 b) 40 – 60
c) 60 – 80 d) 80 -100

18. The probability that a number selected at random from the numbers 1, 2, 3, 4, ..., 15 is a multiple of 4 is

- a) $\frac{4}{15}$ b) $\frac{2}{15}$ c) $\frac{1}{5}$ d) $\frac{1}{3}$

In question numbers 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.

19. **Assertion:** The H.C.F. of two numbers is 16 and their product is 3072. Then their L.C.M. = 162.

Reason: If a and b are two positive integers, then H.C.F. \times L.C.M. = a \times b

- (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. **Assertion (A):** The value of y is 6, for which the distance between the points P(2, -3) and Q (10, y) is 10.

Reason (R): Distance between two given points A (x_1, y_1) and B (x_2, y_2) is given by $AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

- (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.

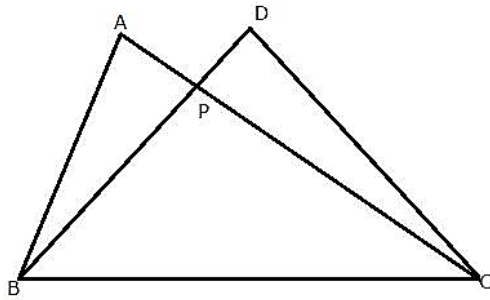
Section B

Section B consists of 5 questions of 2 marks each.

21. Solve by elimination:

$$3x = y + 5 ; 5x - y = 11$$

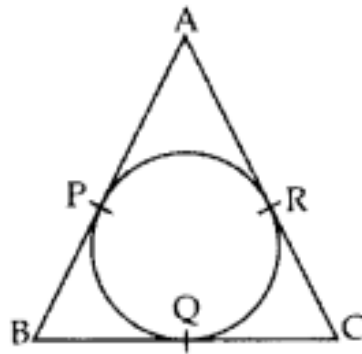
22. In the figure ABC and DBC are two right triangles with common hypotenuse BC. Prove that $AP \times PC = BP \times PD$.



OR

A vertical pole of length 8 m casts a shadow 6 m long on the ground and at the same time a tower casts a shadow 30 m long. Find the height of tower.

23. In the given figure, the sides AB, BC and CA of a triangle ABC touch a circle at P, Q and R respectively. If $PA = 4$ cm, $BP = 3$ cm and $AC = 11$ cm, find the length of BC (in cm).

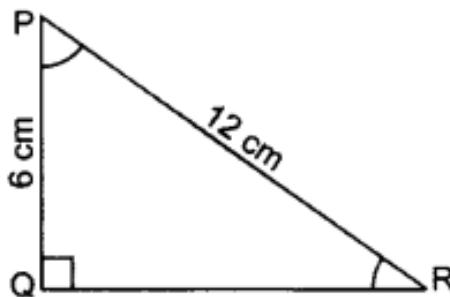


24. The length of the minute hand of a clock is 14 cm. Find the area swept by the minute hand in 5 minutes.

OR

The circumference of a circle is 22 cm. Calculate the area of its quadrant (in cm^2)

25. In figure, ΔPQR right angled at Q, $PQ = 6$ cm and $PR = 12$ cm. Determine $\angle QPR$ and $\angle PRQ$.



Section C

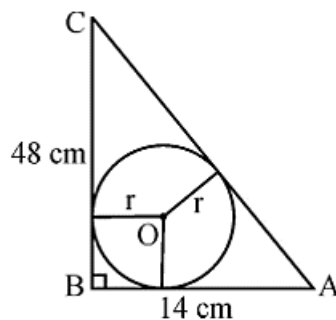
Section C consists of 6 questions of 3 marks each

26. Prove that $3 + 2\sqrt{3}$ is an irrational number.
27. If α and β are the zeroes of the quadratic polynomial $f(x) = x^2 - 4x + 3$, find the value of $\alpha^4 \beta^2 + \alpha^2 \beta^4$.
28. A two-digit number is 4 times the sum of its digits and twice the product of the digits. Find the number. (with steps)

OR

Points A and B are 70 km apart on a highway. A car starts from A and another car starts from B simultaneously. If they travel in the same direction, they meet in 7 hours, but if they travel towards each other, they meet in one hour. Find the speed of the two cars.

29. In figure, ABC is a triangle in which $\angle B = 90^\circ$, BC = 48 cm and AB = 14 cm. A circle is inscribed in the triangle, whose centre is O. Find the radius r of the circle.



30. Prove that $(1 + \cot A - \operatorname{cosec} A)(1 + \tan A + \sec A) = 2$

OR

Find an acute angle θ when $\frac{\cos \theta - \sin \theta}{\cos \theta + \sin \theta} = \frac{1 - \sqrt{3}}{1 + \sqrt{3}}$

31. Two different dice are thrown together. Find the probability that the numbers obtained
- have a sum less than 7
 - have a product less than 16
 - is a doublet of odd numbers

Section D

Section D consists of 4 questions of 5 marks each

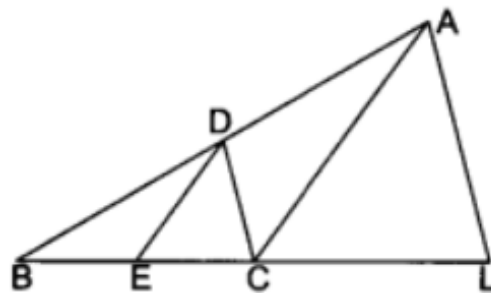
32. In a class test, the sum of the marks obtained by Puneet in Mathematics and Science is 28. Had he got 3 marks more in Maths and 4 marks less in Science, the product of their marks would have been 180. Find his marks in two subjects.

OR

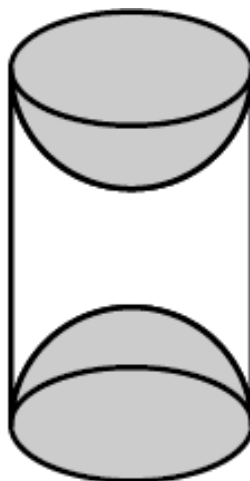
A faster train takes one hour less than a slower train for a journey of 200 km. If the speed of the slower train is 10 km/hr less than that of faster train, find the speeds of two trains.

33. a) 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.

b) In the given figure, $CD \parallel LA$ and $DE \parallel AC$. Find the length of CL , if $BE = 4$ cm and $EC = 2$ cm.



34. A wooden article was made by scooping out a hemisphere from each end of a solid cylinder, as shown in figure. If the height of the cylinder is 10 cm, and its base is of radius 3.5 cm, find the total surface area of the article. (Refer the figure)



OR

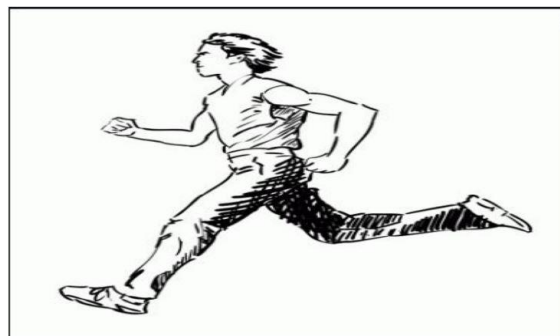
A solid is in the form of a cylinder with hemispherical ends. The total height of the solid is 20 cm and the diameter of the cylinder is 7 cm. Find the total volume of the solid.

35. Calculate the median for the following data:

| Rent (in Rupees) | Number of tenants |
|------------------|-------------------|
| 1500-2500 | 8 |
| 2500-3500 | 10 |
| 3500-4500 | 15 |
| 4500-5500 | 25 |
| 5500-6500 | 40 |
| 6500-7500 | 20 |
| 7500-8500 | 15 |
| 8500-9500 | 7 |

36. **Case study 1:**

Veer of class 10 wants to participate in a 200m race. He can currently run that distance in 51 seconds and with each day of practice it takes him 2 seconds less. He wants to do it in 31 seconds.



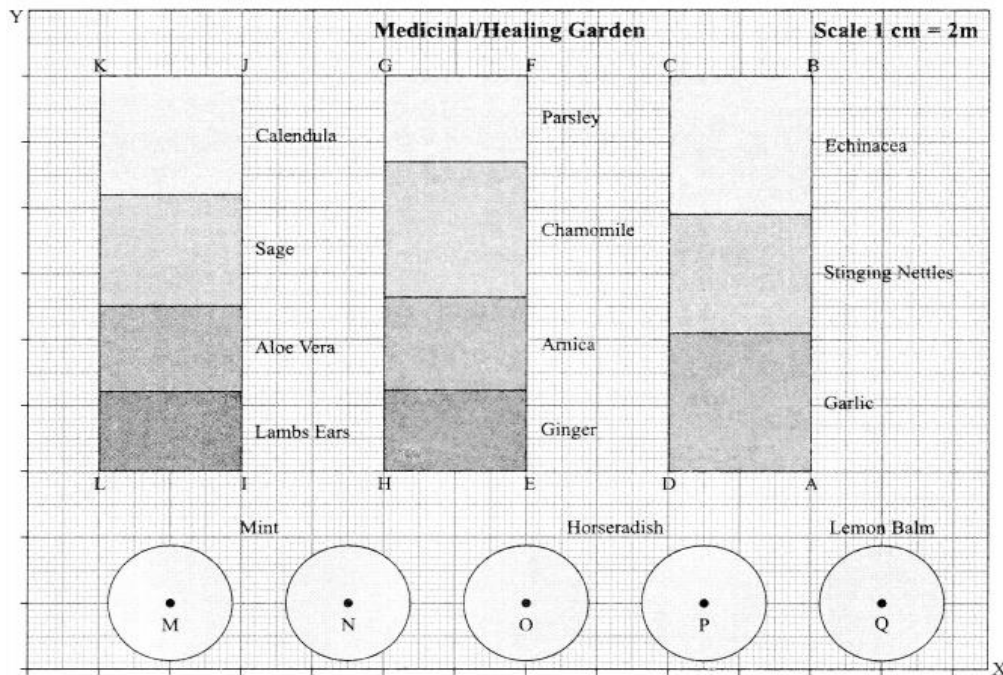
- i) Find the AP for the given situation. (1)
- ii) What is the minimum number of days he needs to practice to achieve his goal? (1)
- iii) If n th term of an AP is given by $a_n = 2n + 3$, then find common difference of an AP. (2)

OR

Find the value of x , for which $2x$, $x+ 10$, $3x + 2$ are three consecutive terms of an AP

37. Case study -2:

A medicinal garden is a garden in which different kinds of medicinal plants, like Aloe Vera, Mint, Lemon Balm etc. are planted with the goal of serving the need of general health maintenance.



- i) Find the mid-point of the segment joining the points I(6,6) and J(6,18). (1)
- ii) Find the distance between points H (10, 6) and F (14, 18). (1)
- iii) The coordinates of a point A and B are (22, 6) and (22, 18) respectively. Find the x coordinate of a point R on the line segment AB such that $\frac{AR}{AB} = \frac{3}{5}$ (2)

OR

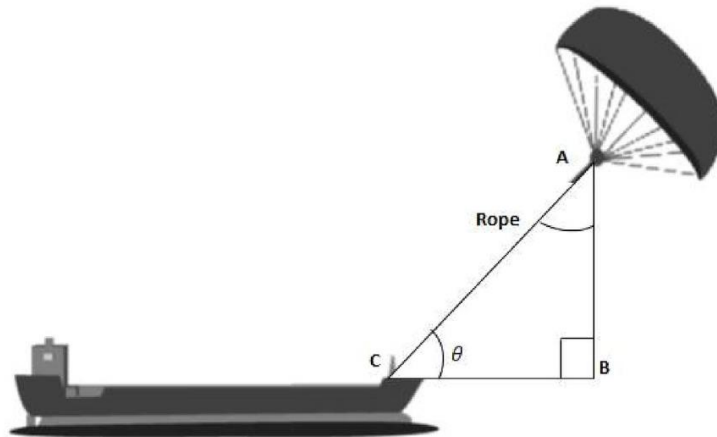
Find the ratio in which the points (20, k) divides the line segment joining the points M (4, 2) and Q (24, 2)

38. Case study 3:

Sky Sails:

Skysails' is that genre of engineering science that uses extensive utilization of wind energy to move a vessel in the sea water. The 'Skysails' technology allows the towing kite to gain a height of anything between 100 metres to 300 metres. The

sailing kite is made in such a way that it can be raised to its proper elevation and then brought back with the help of a 'telescopic mast' that enables the kite to be raised properly and effectively.



- (i) What should be the length of the rope of the kite sail in order to pull the ship at the angle $\theta = 30^\circ$ and be at a vertical height of 200 m? (1)
- ii) If $AB = BC = 12$ m, then find the value of θ . (1)
- iii) If $BC = 15$ m, $\theta = 30^\circ$, then find AB . (2)

OR

Given that $BC = 6$ m and $\theta = 45^\circ$. Find the values of AB and AC .
