

D.A.V. PUBLIC SCHOOL, SECTOR 8-C, CHANDIGARH
PRE-BOARD EXAMINATION - 2023
CLASS - X [MATHEMATICS]

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)
7. All Questions are compulsory.

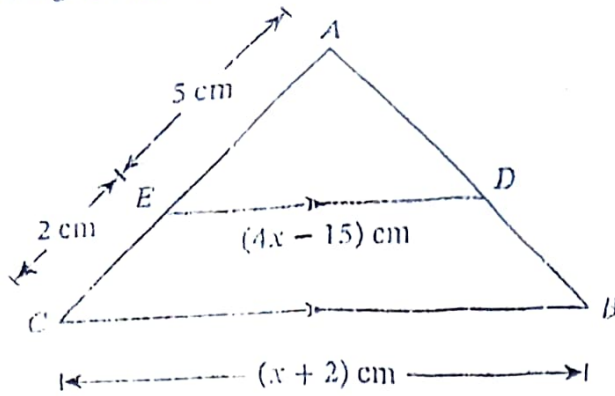
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

SECTION - A

Section A consists of 20 questions of 1 mark each.

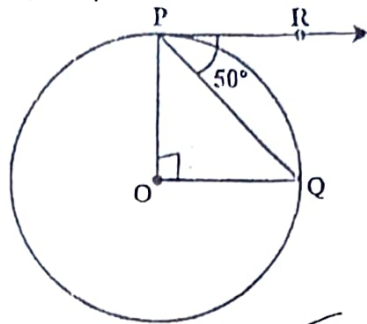
1. $2 \times 3 \times 5 \times 11 \times 17 + 11$ is a
(a) Prime number (b) Composite number
(c) Neither prime nor composite (d) None of the above
2. The largest number which divides 60 and 75, leaving remainders 8 and 10 respectively, is
(a) 260 (b) 75 (c) 65 (d) 13
3. If the zeroes of the quadratic polynomial $x^2 + (a+1)x + b$ are 2 and -3, then
(a) $a = -7, b = -1$ (b) $a = 5, b = -1$ (c) $a = 0, b = -6$ (d) $a = 2, b = -6$
4. The pair of equations $3x - 5y = 7$ and $-6x + 10y = 7$ have
(a) no solution (b) infinitely many solutions
(c) a unique solution (d) two solutions
5. The roots of the equation $7x^2 - x + 1 = 0$ are
(a) real and distinct (b) real and equal
(c) not real (d) none of these
6. The mid-point of the line segment joining A $(2a, 4)$ and B $(-2, 3b)$ is M $(1, 2a + 1)$. The value of a and b are
(a) 2, 3 (b) 1, 1 (c) 2, -2 (d) 2, 2
7. If the point C $(k, 4)$ divides the join of the points A $(2, 6)$ and B $(5, 1)$ in the ratio 2 : 3 then the value of k is
(a) 16 (b) $\frac{28}{5}$ (c) $\frac{16}{5}$ (d) $\frac{8}{5}$

8. In the given figure, $\angle AED = \angle ACB$, the value of x is



- (a) ~~5~~ (b) $\frac{40}{3}$ (c) $\frac{1}{5}$ (d) $\frac{3}{40}$

9. In the given fig., if O is 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 $\tan \theta = \frac{12}{5}$, then $\frac{1 + \sin \theta}{1 - \sin \theta}$ is equal to

- (a) 24 (b) $\frac{12}{13}$ (c) 25 (d) 9

11. Value of $2 \tan^2 45^\circ + \cos^2 30^\circ - \sin^2 60^\circ$ is

- (a) 1 (b) 2 (c) 3 (d) 4

12. If $2 \cos^2 \left(\frac{A}{2} \right) = 1$, then A is

- (a) 90° (b) 45° (c) 30° (d) ~~60°~~

13. The minute hand of a clock is 7.5 cm long. Find the area of the face of the clock described by the minute hand in 56 minutes.

- (a) 164 cm^2 (b) 165 cm^2 (c) ~~168 cm^2~~ (d) 154 cm^2

14. The length of an arc of a circle, subtending an angle of 54° at the centre, is 16.5 cm, then the radius of the circle is

- (a) 17.5 cm (b) 18.5 cm (c) 21 cm (d) 28 cm

The ratio of the total surface area to the lateral surface area of a cylinder with base radius 80 cm and height 20 cm is

- (a) 1 : 2 (b) 2 : 1 (c) 3 : 1 (d) ~~5 : 1~~

16. The median class of the following data is:

Marks	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60
No. of students	3	10	12	22	30	18

- (a) 20 - 30 (b) 30 - 40 (c) ~~40~~ - 50 (d) 50 - 60

17. If the mean of frequency distribution is 7.5, $\sum f_i x_i = 120 + 3k$ and $\sum f_i = 30$, then k is equal to:

- (a) 40 (b) ~~35~~ (c) 50 (d) 45

18. If the probability of an event is p , the probability of its complementary event will be

- (a) $p - 1$ (b) p (c) $1 - p$ (d) $1 - \frac{1}{p}$

DIRECTION: In the 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):** The H.C.F. of two numbers is 16 and their product is 3072. Then their L.C.M. = 162.

Statement R (Reason): If a and b are two positive integers, then $\text{H.C.F.} \times \text{L.C.M.} = a \times b$.

- (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 and 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):** The value of y is 3, for which the distance between the points P (-5, 7) and Q (-1, y) is $4\sqrt{2}$.

Statement R (Reason): Distance between two given points A (x_1, y_1) and B (x_2, y_2) is given

by $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

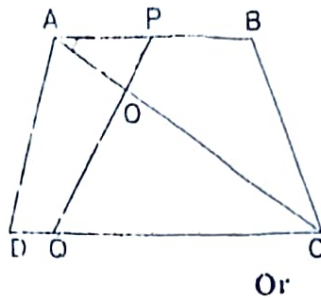
- (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)
 (b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)
 (c) Assertion (A) is true but reason (R) is false.
 (d) Assertion (A) is false but reason (R) is true.

SECTION - B

Section B consists of 5 questions of 2 marks each

21. For what value of k , will the following system of equations have infinitely many solutions?
 $2x + 3y = 4$ and $(k + 2)x + 6y = 3k + 2$.

22. In the given fig., if $AB \parallel DC$ and AC and PQ intersect each other at the point O , then prove that $OA \times CQ = OC \times AP$.



Or

E and F are points on the sides PQ and PR respectively of a ΔPQR . If $PQ = 1.28$ cm, $PR = 2.56$ cm, $PE = 0.18$ cm and $PF = 0.36$ cm, state whether $EF \parallel QR$ or not?

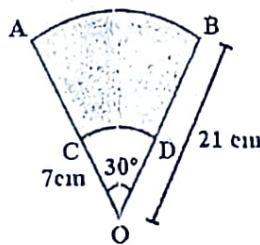
23. A tangent PQ at a point P of a circle of radius 5 cm meets a line through the centre O at a point Q so that $OQ = 12$ cm. Find the length of PQ .

24. Using $15 \tan A = 8$, show that: $\cot^2 A - \cos^2 A = \cos^2 A \times \cot^2 A$.

25. A brooch is made with silver wire in the form of a circle with diameter 35 mm. The wire is also used in making 5 diameters which divide the circle into 10 equal sectors. Find the total length of the silver wire required.

Or

AB and CD are respectively arcs of two concentric circles of radii 21 cm and 7 cm and centre O . If $\angle AOB = 30^\circ$, find the area of the shaded region.



an
 Quadrilateral
 $\sqrt{a} + \sqrt{b}$
 $\sqrt{a} + \sqrt{b}$

SECTION - C

Section C consists of 6 questions of 3 marks each.

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

27. If α and β are the zeroes of the polynomial $p(x) = 2x^2 + 5x + k$ satisfying the relation, $\alpha^2 + \beta^2 + \alpha\beta = \frac{21}{4}$, then find the value of k .

28. A fraction becomes $\frac{9}{11}$, if 2 is added to both the numerator and the denominator. If, 3 is added to both the numerator and the denominator it becomes $\frac{5}{6}$. Find the fraction.

Or

If twice the son's age in years is added to the age of his father, the sum is 90. If twice the father's age in years is added to the age of the son, the sum is 120. Find their ages.

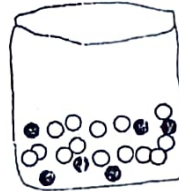
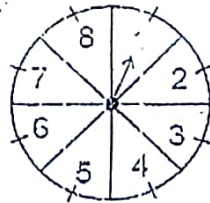
29. Prove that the parallelogram circumscribing a circle is a rhombus.

30. Prove that $(1 + \tan^2 A) + \left(1 + \frac{1}{\tan^2 A}\right) = \frac{1}{\sin^2 A - \sin^4 A}$

Or

If $x = a \sec \theta + b \tan \theta$ and $y = a \tan \theta + b \sec \theta$, prove that $x^2 - y^2 = a^2 - b^2$.

31. A game in a booth at a Diwali Fair involves using a spinner first. Then, if the spinner stops on an even number, the player is allowed to pick a marble from a bag. The spinner and the marbles in the bag are represented in the figure. Prizes are given, when a black marble is picked. Shweta plays the game once.



- (i) What is the probability that she will be allowed to pick a marble from the bag?
 (ii) Suppose she is allowed to pick a marble from the bag, what is the probability of getting a prize, when it is given that the bag contains 20 balls out of which 6 are black?

SECTION - D

Section C consists of 4 questions of 5 marks each.

32. A train travels at a certain average speed for a distance of 63 km and then travels at a distance of 72 km at an average speed of 6 km/hr more than its original speed. If it takes 3 hours to complete total journey, what is the original average speed?

Or

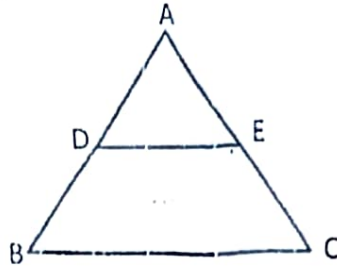
A shopkeeper buys a number of books for ₹80. If he had bought 4 more books for the same amount, each book would have cost ₹1 less. How many books did he buy?

33. The mean of the frequency table is 132; f_1 and f_2 in class 80 - 120 and 160 - 200 are missing. Find f_1 and f_2 if $\sum f_i = 50$.

Class	0 - 40	40 - 80	80 - 120	120 - 160	160 - 200	200 - 240
Frequency	4	7	f_1	12	f_2	9

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

Using the above theorem, find the value of x in a $\triangle ABC$, if D and E are points on the sides AB and AC respectively such that $DE \parallel BC$ and $AD = 2x + 8$, $AC = 36$, $BD = 5x$ and $CE = 20$.



35. A building is in the form a cylinder surmounted by a hemispherical vaulted dome and contains $41\frac{19}{21}$ m³ of air. If the internal diameter of dome is equal to its total height above the floor, find the height of the building?

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 ₹500 per m².



SECTION - E
Case Study based questions

36. Jessica arranges soda cans as shown in figure. The bottom row has 9 cans, next row has 6 cans and top row have 3 cans.



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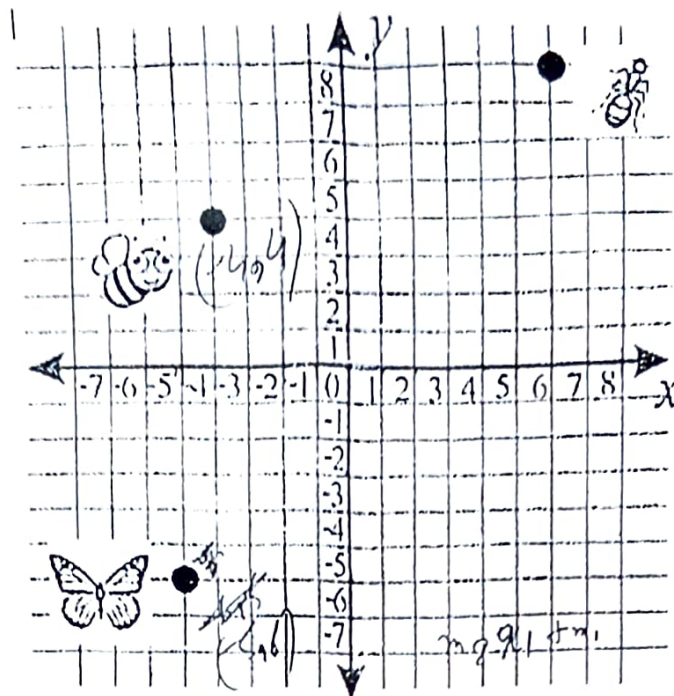
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(a) If in the same arrangement, the bottom most row have 42 cans, then how many rows this arrange have? 1

(b) If the cans are to be stacked 47 rows high, how many cans will it take to build the display? 2

(c) How many cans will be there in the 23rd row from the bottom, if there total 47 rows? 1

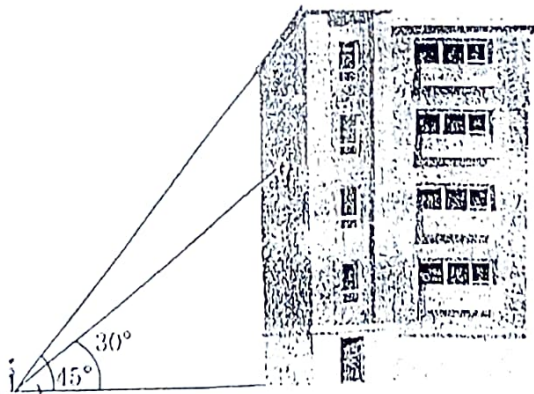
37. Position of three insects, butterfly, ant and bee are given below.



On the basis of above information, answer the following questions.

- (i) Find the distance between butterfly and bee. 1
- (ii) Find the ratio in which the y -axis divides the line segment joining the coordinate points of bee and ant. 1
- (iii) If a grasshopper is seating on x -axis and is equidistance from bee and butterfly, find the coordinate of grasshopper. 2

38. Clinometer : A clinometer is a tool that is used to measure the angle of elevation. We can use a clinometer to measure the height of tall things that you can't possibly reach to the top of flag poles, buildings, trees. Ravish got a clinometer from school lab and started the measuring elevation angle in surrounding. He saw a building on which society logo is painted on wall of building.



From a point P on the ground level, the angle of elevation of the roof of the building is 45° . The angle of elevation of the centre of logo is 30° from same point. The point P is at a distance of 24 m from the base of the building.

- (i) Draw a neat labelled figure to show the above situation diagrammatically. 1
- (ii) What is the height of the building logo from ground? 1
- (iii) What is the height of the building from ground? 1
- (iv) What is the aerial distance of the point P from the top of the building? 1
