Class X Session 2024-25
Subject - Mathematics (Standard)
Sample Question Paper - 18

Time: 3 Hours **Total Marks: 80**

General Instructions:

1. This Question Paper has 5 Sections A - E.
2. Section A has 18 multiple choice questions and 2 Assertion-Reason based questions carrying 1 mark each.
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.

4. Which term of the A.P. 3, 8, 13, 18,... is 78?

A. 14

B. 16

C. 18

D. 20

5. Points that satisfy a polynomial .....

i. are called its zeros

ii. lie on the graph of polynomial

iii. are called its roots

A. (i) only

B. (i) and (ii)

8. If $2\sin^2\theta - \cos^2\theta = 2$, then find the value of θ.

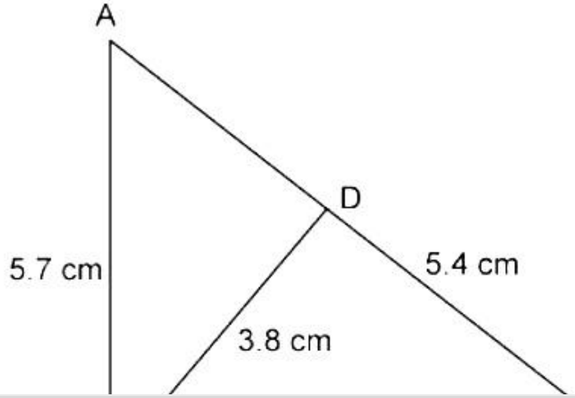
A. 100°

B. 70°

C. 90°

D. 80°

9. In the given figure, $\angle ABC = 90^\circ$ and $BD \perp AC$. Find BC.



12. Find the area of a sector with radius 7 cm and central angle 90°.

A. 38 cm^2

B. 39 cm^2

C. 38.5 cm^2

D. 37.5 cm^2

13. The volume of a following object with diameter 42 cm is given by

A. 6174π cm^3

B. 6417π cm^3

16. From the set of numbers −2, −1, 0, 1, 2, the probability that the square of a chosen number is 1 will be

A. $\frac{2}{5}$

B. $\frac{1}{5}$

C. $\frac{1}{2}$

D. $\frac{2}{3}$

17. Cards bearing numbers 1, 3, 5, ..., 35 are kept in a bag. A card is drawn at random from the bag. Find the probability of getting a card bearing a prime

20. **Statement A (Assertion)**: $\Delta LMN \sim \Delta XYZ$ by AA similarity criterion where $\angle L = \angle X$ and $\angle M = \angle Y$.
Statement R (Reason): Two triangles are similar by AA similarity criterion if only one of the corresponding angles are equal.
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

21. The number of fruits of each kind A, B and C are 50, 90 and 110 respectively. In each basket, the equal number of fruits of same kind are to be kept. Find the minimum number of baskets required to accommodate all fruits. [2]

22. E is a point on the side AD produced of a parallelogram ABCD and BE intersects CD at F. Show that $\Delta ABE \sim \Delta CFB$. [2]

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. [2]

24. ΔABC is right angled at B. If $\tan A = \frac{1}{\sqrt{}}$, find the value of sin A cos C + cos A sin

Section C

Section C consists of 6 questions of 3 marks each.

26. Prove that $\frac{1}{\sqrt{3}}$ is irrational. [3]

27. If one of the zero of the quadratic polynomial $2x^2 - 3x + p$ is 3, then find its other zero. Also find the value of p. [3]

28. Find two numbers whose sum is 27 and product is 182. [3]

OR

A cottage industry produces a certain number of toys in a day. The cost of production of each toy (in rupees) was found to be 55 minus the number of

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. [5]

OR

A rectangular field is 16 m long and 10 m wide. There is a path of uniform width all around it with an area of 120 m^2. Find the width of the path. [5]

33. In the figure, altitudes AD and CE of ΔABC intersect each other at the point P. Show that [5]

35. The following distribution shows the daily pocket allowance of children of a locality. The mean pocket allowance is Rs. 18. Find the missing frequency f. [5]

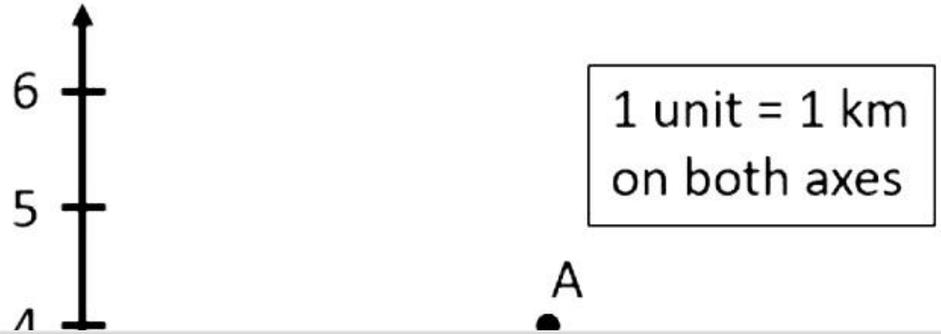
Daily pocket allowance (in Rs.)	11 – 13	13 – 15	15 –17	17 – 19	19 – 21	21 – 23	23 – 25
Number of children	7	6	9	13	f	5	4

Section E

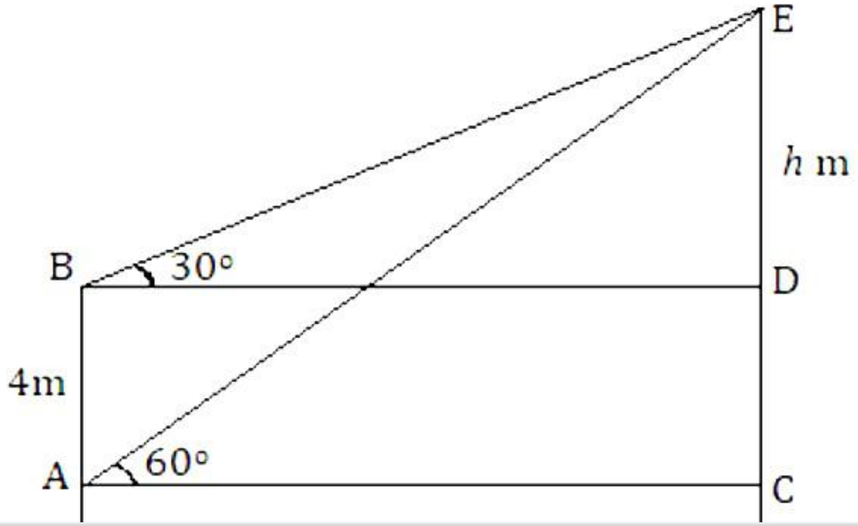
Case study based questions are compulsory.

36. Bus number 735 travels from source O to A, and Bus number 736 travels from Source O to B, then reaches A. The routes taken by both the buses are shown below. Using the details given, answer the following questions.

37.



39. Reema's house has two windows. First is at the height of 2 m above the ground and the second is at the height of 4 m above the first window. Reema and her brother Rishabh are watching outside from the two windows at points A and B respectively. Now, the angles of elevation of an airplane from these windows are observed to be 60° and 30° as shown below.



Solution

Section A

1. Correct option: B

Explanation:

On dividing 2520 by 405, quotient = 6, remainder = 90

$\therefore$ 2520 = (405 × 6) + 90

Dividing 405 by 90, quotient = 4, remainder = 45

$\therefore$ 405 = 90 × 4 + 45

Dividing 90 by 45, quotient = 2, remainder = 0

6. Correct option: B

Explanation:

$\Delta OAB \sim \Delta OCD$,

$$\Rightarrow \frac{OA}{OC} = \frac{AB}{CD} = \frac{BO}{DO}$$

$$\Rightarrow \frac{OA}{3.5} = \frac{8}{5} = \frac{6.4}{DO}$$

$$\Rightarrow \frac{6.4}{DO} = \frac{8}{5}$$

$$DO = \frac{6.4 \times 5}{8} = 4 \text{ cm}$$

7. Correct option: C

Explanation:

9. Correct option: D

Explanation:

In ΔCBA and ΔCDB,

$\angle CBA = \angle CDB = 90°$

And $\angle C = \angle C$ (Common)

$\Delta CBA \sim \Delta CDB$ (by AA similarity)

$$\Rightarrow \frac{CB}{CD} = \frac{BA}{DB}$$

$$\Rightarrow \frac{BC}{5.4} = \frac{5.7}{3.8}$$

$$\Rightarrow BC = \frac{5.7 \times 5.4}{3.8} = 8.1 \text{ cm}$$

10. Correct option: D

13. Correct option: A

Explanation:

Volume of a given hemispherical object $= \frac{2}{3}\pi r^3 = \frac{2}{3}\pi(21)^3 = 6174\pi \text{ cm}^3$

14. Correct option: C

Explanation:

As the class 85–95 has the maximum frequency, it is the modal class.

15. Correct Option: A

Explanation:

Let the radius of the park be r metres.

Thus, $\pi r + 2r = 90$

19. Correct option: D

Explanation:

$\sqrt{7}$ is an irrational number as it can be expressed as a nonterminating and nonrepeating decimal.

Hence, assertion is false.

The statement given in reason is correct and hence, reason is true.

20. Correct option: C

Explanation:

The statement given in assertion is correct and hence, assertion is true.

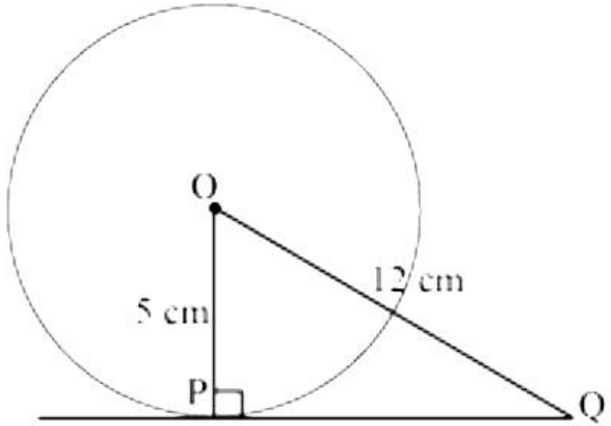
For two triangles to be similar by AA similarity criterion two angles of one triangle need to be equal to corresponding two angles of another triangle.

Hence, reason is false.

Section B

21. To find minimum number of baskets, we need to first find the maximum and equal number of fruits of same kind to be kept in each basket.
That is, HCF of 50, 90 and 110.
$50 = 2 \times 5 \times 5$
$90 = 2 \times 3 \times 3 \times 5$
$110 = 2 \times 5 \times 11$

23. Radius is perpendicular to the tangent at the point of contact. So, OP $\perp$ PQ.



Now, applying Pythagoras theorem in ΔOPQ,

$OP^2 + PQ^2 = OQ^2$

$5^2 + PQ^2 = 12^2$

$PQ^2 = 144 - 25$

$$= \left(\frac{1}{2}\right)\left(\frac{1}{2}\right) + \left(\frac{\sqrt{3}}{2}\right)\left(\frac{\sqrt{3}}{2}\right)$$

$$= \frac{1}{4} + \frac{3}{4}$$

$$= \frac{4}{4}$$

$$= 1$$

OR

Given that PR + QR = 25 cm and PQ = 5 cm

Let PR = x

So, QR = 25 – x

$$r = \frac{22}{2\pi} = \frac{11}{\pi}$$

Quadrant of circle will subtend 90° angle at centre of circle.

Then, area of such quadrant of a circle $= \frac{90°}{360°} \times \pi \times r^2$

$$= \frac{1}{4} \times \pi \times \left(\frac{11}{\pi}\right)^2$$

$$= \frac{121}{4\pi} = \frac{121 \times 7}{4 \times 22}$$

$$= \frac{77}{8} \text{ cm}^2$$

OR

We know the in 1 hour (i.e. 60 minutes), minute hand rotates 360°.

Section C

26. $\frac{1}{\sqrt{3}} = \frac{1}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{1}{3}\sqrt{3}$ ....(1)

If possible, let $\frac{1}{\sqrt{3}}$ be rational.

Then, from (1), it follows that $\frac{1}{3}\sqrt{3}$ is rational.

27. Let $p(x) = 2x^2 - 3x + p$

If $p(a) = 0$, then it is said that 'a' is a zero of $p(x)$.

Given, 3 is a zero of $p(x)$.

$\therefore\ p(3) = 0$

$2(3)^2 - 3(3) + p = 0$

$18 - 9 + p = 0$

$p = -9$

$\therefore\ p(x) = 2x^2 - 3x - 9$

$= 2x^2 - 6x + 3x - 9$

$= 2x(x - 3) + 3(x - 3)$

$= (x - 3)(2x + 3)$

$= x = 3$ and $x = \frac{-3}{2}$

29. In a cyclic quadrilateral ABCD,

$\angle A = (x + y + 10)°$, $\angle B = (y + 20)°$, $\angle C = (x + y - 30)°$, $\angle D = (x + y)°$

Then, $\angle A + \angle C = 180°$ and $\angle B + \angle D = 180°$

Now, $\angle A + \angle C = (x + y + 10)° + (x + y - 30)° = 180°$

$\Rightarrow 2x + 2y - 20° = 180°$

$\Rightarrow x + y = 100$ ....(1)

And, $\angle B + \angle D = (y + 20)° + (x + y)° = 180°$

$\Rightarrow x + 2y + 20° = 180°$

$\Rightarrow x + 2y = 160°$ ....(2)

Subtracting (1) from (2), we get $y = 160 - 100 = 60$

and $x = 100 - y = 100 - 60 = 40$

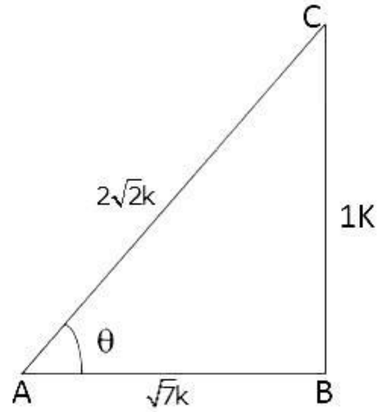
$\angle A = (x + y + 10)° = (100 + 10)° = 110°$

$$\operatorname{cosec}\theta = \frac{AC}{BC} = \frac{2\sqrt{2}k}{1k} = 2\sqrt{2}$$

$$\sec\theta = \frac{AC}{AB} = \frac{2\sqrt{2}k}{\sqrt{7}k} = \frac{2\sqrt{2}}{\sqrt{7}}$$

$$\frac{\left(\operatorname{cosec}^2\theta - \sec^2\theta\right)}{\left(\operatorname{cosec}^2\theta + \sec^2\theta\right)} = \frac{\left(2\sqrt{2}\right)^2 - \left(\frac{2\sqrt{2}}{\sqrt{7}}\right)^2}{\left(2\sqrt{2}\right)^2 + \left(\frac{2\sqrt{2}}{\sqrt{7}}\right)^2}$$

$$= \frac{8 - \frac{8}{7}}{8 + \frac{8}{7}}$$



Section D

32. Let the present age of Rehman be x years.

Three years ago, his age was (x – 3) years.

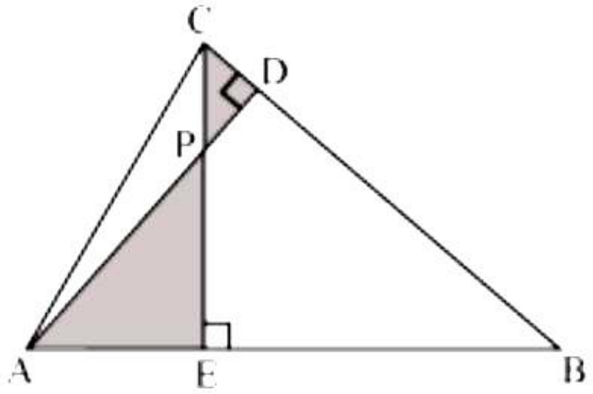
Five years hence, his age will be (x + 5) years.

It is given that the sum of the reciprocals of Rehman's ages 3 years ago and 5 years from now is $\frac{1}{3}$.

$$\therefore \frac{1}{x-3}+\frac{1}{x+5}=\frac{1}{3}$$

33.

i.



In ΔAEP and ΔCDP,

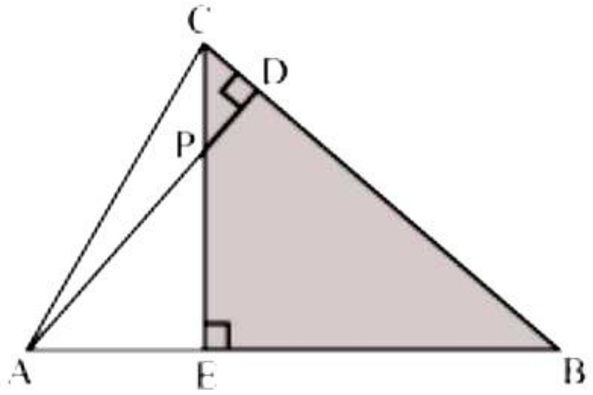
∠CDP = ∠AEP = 90°

∠CPD = ∠APE … (vertically opposite angles)

∠PCD = ∠PAE … (remaining angle)

Therefore, ΔAEP ~ ΔCDP (by AAA rule)

iv.



In ΔPDC and ΔBEC

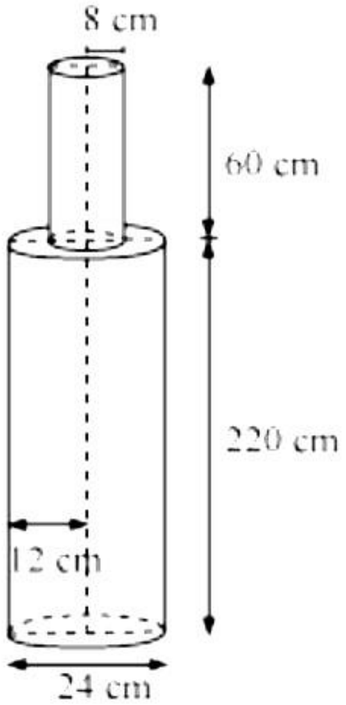
∠PDC = ∠BEC = 90°

∠PCD = ∠BCE (common angle)

∠CPD = ∠CBE (remaining angle)

Therefore, ΔPDC ~ ΔBEC (by AAA rule)

OR



From the figure we have

From the table,

$$\bar{x} = a + \frac{\sum f_i d_i}{\sum f_i}$$

$$18 = 18 + \left(\frac{2f - 40}{44 + f}\right)$$

$$0 = \left(\frac{2f - 40}{44 + f}\right)$$

$$2f - 40 = 0$$

$$2f = 40$$

$$f = 20$$

Hence, the missing frequency f is 20.

Section E

Case study based questions are compulsory.

36.

i. From the graph, the coordinates of points O and A are (0, 0) and (4, 4) respectively.

∴ Distance covered by bus no. 735 = OA = $\sqrt{(0-4)^2+(0-4)^2} = 4\sqrt{2}$ km

ii. $d = -2$

And, $a_3 = a + 2d = 4$

$\Rightarrow a = 4 - 2(-2) = 4 + 4 = 8$

iii. Let n^{th} term of A.P. be -160.

Then, $a = 8$, $d = -2$ and $a_n = -160$

Now, $a_n = a + (n - 1)d$

$\Rightarrow -160 = 8 + (n - 1)(-2)$

$\Rightarrow -168 = (n - 1)(-2)$

$\Rightarrow n - 1 = 84$

$\Rightarrow n = 85$

Hence, 85^{th} term of the A.P. is -160.

OR

For a given A.P., $a = 8$ and $d = -2$