Class X Session 2024-25
Subject - Mathematics (Standard)
Sample Question Paper - 16

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.

3. Which of the following is the zero of the polynomial $x^2 - 5x + 6$.

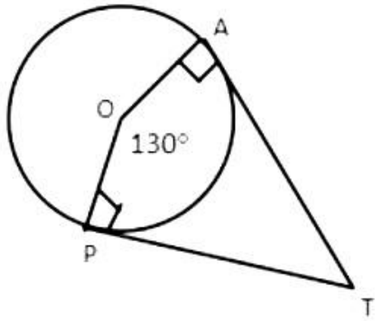
A. 2
B. −1
C. 0
D. −2

4. What is the value of 10^{th} term of an A.P., if its first term is p and common difference is q?

A. p
B. 10q
C. p − 9q
D. p + 9q

5. If the system of equations $3x - 2y = 0$ and $kx + 5y = 0$ has infinitely many

9. In the given figure, if TA and TP are tangents to a circle with centre O, so that m∠AOP = 130° then find m∠ATP.



A. 50°
B. 130°
C. 80°
D. 260°

10. The perimeters of two similar triangles ABC and PQR are 32 cm and 24 cm, respectively. If PQ = 12 cm, then find AB.

A. 24 cm
B. 32 cm
C. 12 cm
D. 16 cm

15. The volume of a hemisphere is given by the formula

A. $\frac{2}{3}\pi r^3$

B. $\frac{2}{3}\pi r^2$

C. $\frac{2}{3}r^3$

D. $\frac{2}{3}r\pi^3$

16. Find the median of the following data:

3, 11.5, 5, 2.1, 6, 8.92, 7

A. 5

B. 5.4

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.

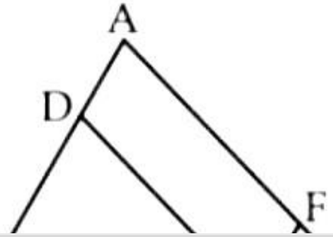
20. Statement A (Assertion): If one zero of $3x^2 + 8x + k$ is the reciprocal of the other only when k is equal to 1.
Statement R (Reason): For a quadratic polynomial $ax^2 + bx + c$, we have, product of zeroes $= \frac{c}{a}$
A. Both assertion (A) and reason (R) are true and reason (R) is the correct

Section B

21. Mr. Shastri's cell phone PIN is dbac such that $42000 = a^4 \times b \times c^3 \times d$. Find the PIN. [2]

22. In the given figure, D, E, F are the points on sides AB, BC and AC of triangle ABC such that ADEF is a parallelogram. Prove that

$$\frac{CF}{FA} = \frac{AD}{BD}$$



Section C

Section C consists of 6 questions of 3 marks each.

26. 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. [3]

27. Which term of the A.P. 3, 8, 13, 18, … is 78? [3]

28. Check whether −150 is a term of the A.P. 11, 8, 5, 2, … [3]

Section D

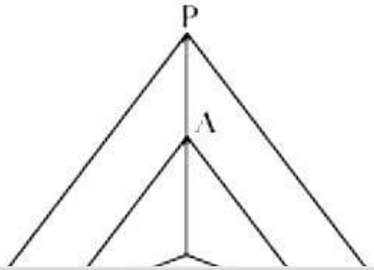
Section D consists of 4 questions of 5 marks each.

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

The difference of squares of two numbers is 180. The square of the smaller number is 8 times the larger number. Find the two numbers.

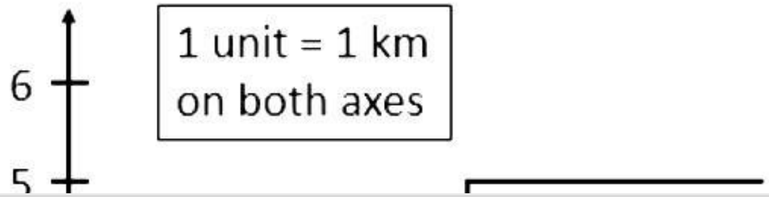
33. In figure, A, B and C are points on OP, OQ and OR respectively such that AB || PQ and AC || PR. Show that BC || QR. [5]



Section E

Case study based questions are compulsory.

36. Amey's school has organized an inter-school race competition. The race track is constructed as shown in the diagram. Initially, the track follows a straight path AB, then it takes a 90° left and follows a straight path BC for some distance. Finally, it takes a 90° right and then follows a straight path CD to the endpoint. Now using the given information answer the following questions.



37. Ajay has decided to visit different parts of his state, and to travel from one place to another, he will book a taxi each time. Now the taxi rates are fixed and it costs Rs. 15 for the first km and Rs. 8 for each additional km. Now using the given data answer the following questions.

i. Find the taxi fare for Ajay, if he travels for 4 km. [1]

ii. If the taxi fare comes out to be Rs. 63, then find the total kilometers travelled. [2]

OR

If it takes Rs. 103 to travel from place A to B, then find the distance between places A and B. [2]

iii. If Ajay has decided to visit a place that is 5 km away, rather than visiting a place which is 3 km away, then how much would it cost extra for him? [1]

Solution

Section A

1. Correct option: B

Explanation:

336 and 54

$336 = 2 \times 2 \times 2 \times 2 \times 3 \times 7 = 2^4 \times 3 \times 7$

$54 = 2 \times 3 \times 3 \times 3 = 2 \times 3^3$

$HCF = 2 \times 3 = 6$

2. Correct option: C

Explanation:

7. Correct option: C

Explanation:

Let P(x, y) be the point which divides the line segment AB in the ratio 1: 3.

Therefore, $x = \frac{1(5) + 3(-3)}{1 + 3} = -1$ and $y = \frac{1(2) + 3(6)}{1 + 3} = 5$

Hence, the coordinates of P are (−1, 5).

8. Correct option: A

Explanation:

$\angle A + \angle B + \angle C = 180°$

$\Rightarrow x + 3x + y = 180$

$4x + y = 180 \quad ....(1)$

Also, $3y - 5x = 30$

12. Correct option: A

Explanation:

$$\text{L.H.S.} = \cos 1^\circ \cos 2^\circ \cos 3^\circ \ldots \cos 180^\circ$$

$$= \cos 1^\circ \cos 2^\circ \cos 3^\circ \ldots \cos 90^\circ \ldots \cos 180^\circ$$

$$= \cos 1^\circ \cos 2^\circ \cos 3^\circ \ldots . \times 0 \times \ldots \cos 180^\circ \qquad (\text{Since } \cos 90^\circ = 0)$$

$$= 0$$

13. Correct option: B

Explanation:

$$\cos 45^\circ = \sin 45^\circ = \frac{1}{\sqrt{2}}$$

14. Correct option: C

17. Correct option: D

Explanation:

We have,

Class	Frequency (f_i)	Class mark (x_i)	f_ix_i
10 – 20	11	15	165
20 – 30	15	25	375
30 – 40	20	35	700
40 – 50	30	45	1350
50 – 60	14	55	770
60 – 70	10	65	650
	$\sum f_i = 100$		$\sum f_ix_i = 4010$

$$\text{Mean } \bar{x} = \frac{\sum(f_ix_i)}{} \quad \frac{4010}{}$$

Section B

21. $42000 = 2 \times 2 \times 2 \times 2 \times 3 \times 5 \times 5 \times 5 \times 7$

$= 2^4 \times 3 \times 5^3 \times 7$

$= a^4 \times b \times c^3 \times d$

Then, PIN = dbac = 7325

22.

ADEF is a ||gm $\Rightarrow$ AD||EF and AF||DE

DR = DS ... (4) {tangents from D}
Adding (1), (2), (3) and (4), we get
$\therefore$ AP + BP + CR + DR = AS + BQ + CQ + DS
$\Rightarrow$ (AP + BP) + (CR + DR) = (AS + DS) + (BQ + CQ)
$\Rightarrow$ AB + CD = AD + BC
$\Rightarrow$ AD = (AB + CD) – BC = {(6 + 4) – 7} cm = 3 cm
Hence, AD = 3 cm.

24.

$$\text{L.H.S.} = (\sin\theta + \cos\theta)(\tan\theta + \cot\theta)$$

$$= (\sin\theta + \cos\theta)\left(\frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta}\right)$$

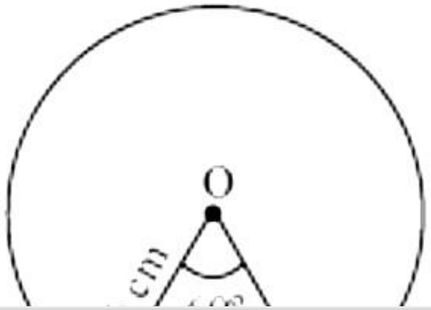
$$= (\sin\theta + \cos\theta)\left(\frac{\sin^2\theta + \cos^2\theta}{\sin\theta\cos\theta}\right)$$

$$\sin P = \frac{\text{Side opposite to } \angle P}{\text{hypotenuse}} = \frac{QR}{PR} = \frac{12}{13}$$

$$\cos P = \frac{\text{side adjacent to } \angle P}{\text{hypotenuse}} = \frac{PQ}{PR} = \frac{5}{13}$$

$$\tan P = \frac{\text{Side opposite to } \angle P}{\text{side adjacent to } \angle P} = \frac{QR}{PQ} = \frac{12}{5}$$

25.



$$= \left[\frac{1}{2}\pi \times (2)^2 + \frac{1}{2} \times \pi \times (6)^2 - \frac{1}{2} \times \pi \times (4)^2\right] \text{cm}^2$$

$$= \left[2\pi + 18\pi - 8\pi\right] = 12\pi \text{ cm}^2 = (12 \times 3.14)\text{cm}^2$$

$$= 37.68 \text{ cm}^2$$

Section C

26. 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.

$50 = 2 \times 5 \times 5$

$90 = 2 \times 3 \times 3 \times 5$

$110 = 2 \times 5 \times 11$

Therefore, HCF (50, 90, 110) $= 2 \times 5 = 10$

So, minimum number of baskets required $= \frac{50 + 90 + 110}{10} = \frac{250}{10} = 25$

27. For an A.P., 3, 8, 13, 18, ...

First term, $a = 3$

Common difference, $d = a_2 - a_1 = 8 - 3 = 5$

Let n^{th} term of this A.P. be 78.

$35 = 5d$

$\Rightarrow d = 7$

From equation (1),

$38 = a + 10 \times (7)$

$\Rightarrow a = -32$

Therefore, 31^{st} term is given by

$a_{31} = a + (31 - 1)d$

$= -32 + 30(7)$

$= -32 + 210$

$= 178$

Hence, 31^{st} term of the given A.P. is 178.

29. $x = \cot A + \cos A$ and $y = \cot A - \cos A$

Thus, we have

So, the area swept by minute hand in 10 minutes is $\frac{308}{3}$ cm^2.

OR

AD = 2 × radius = 2 × 12 = 24 cm

$AB = BC = CD = \frac{24}{3} = 8$ cm

BD = BC + CD = 8 + 8 = 16 cm

Perimeter of the shaded region

= Length of an arc ATD + Length of an arc ARB + Length of an arc BSD

= ($\pi \times 12 + \pi \times 4 + \pi \times 8$) cm

= 24π cm

= 24 × 3.14 cm

= 75.36 cm

Section D

Section D consists of 4 questions of 5 marks each.

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 $\frac{1}{3}$.

OR

Let the larger and smaller numbers be x and y respectively.

According to the given question,

$x^2 - y^2 = 180$ and $y^2 = 8x$

$\Rightarrow x^2 - 8x = 180$

$\Rightarrow x^2 - 8x - 180 = 0$

$\Rightarrow x^2 - 18x + 10x - 180 = 0$

$\Rightarrow x(x - 18) + 10(x - 18) = 0$

$\Rightarrow (x - 18)(x + 10) = 0$

$\Rightarrow x = 18, -10$

However, the larger number cannot be negative as 8 times of the larger number will be negative and hence, the square of the smaller number will be negative

In ΔPOR, $AC \parallel PR$,

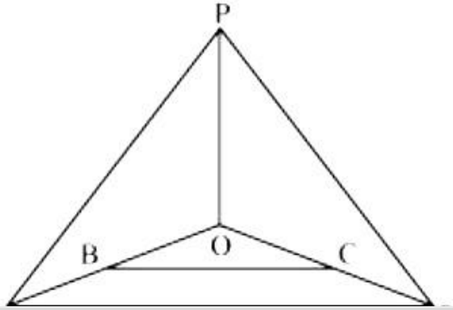
$\therefore \frac{OA}{AP} = \frac{OC}{CR}$ (ii) [By basic proportionality theorem]

From (i) and (ii)

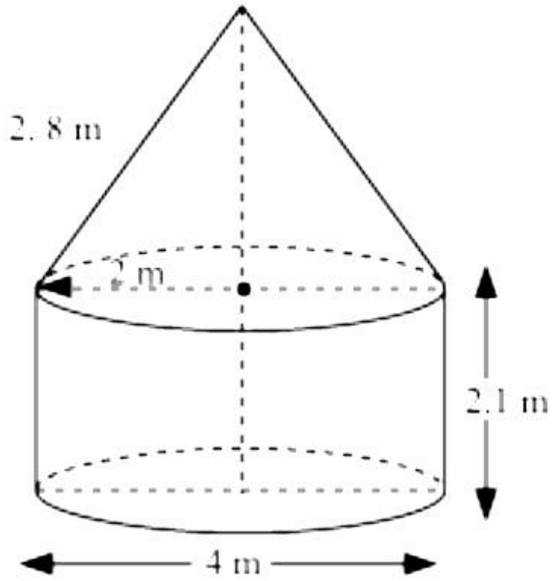
$\frac{OB}{BQ} = \frac{OC}{CR}$

Therefore $BC \parallel QR$

(By converse of basic proportionality theorem)



OR



Given that
Height (h) of the cylindrical part = 2.1 m

Now, $\sum f_i = 40$ and $\sum f_i d_i = -181$

mean $\bar{x} = a + \left(\frac{\sum f_i d_i}{\sum f_i}\right)$

$= 17 + \left(\frac{-181}{40}\right)$

$= 17 - 4.525$

$= 12.475$

≈ 12.48

So, mean number of days is 12.48 days, for which a student was absent.

Section E

36.

i. From the graph, the coordinates of points A and B are (1, 1) and (4, 1) respectively.

$\therefore AB = \sqrt{(1-4)^2 + (1-1)^2} = 3$ km

ii. From the graph, the coordinates of points B and C are (4, 1) and (4, 5) respectively.

OR

From the graph, the coordinates of points B and D are (4, 1) and (7, 5) respectively.

$\therefore BD = \sqrt{(7-4)^2 + (5-1)^2} = 5$ km

37.

i. The given situation can form the A.P.

Here,

Rate for first km = Rs. 15 = a = first term of A.P.

Rate for additional km = Rs. 8 = d = common difference

Travel fare for 4 km = a_4 = fourth term

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

$a_4 = 15 + (4-1)8 = 39$

38.

i.

In ΔABH,

$$\tan 45^\circ = \frac{AB}{BH}$$

$$\Rightarrow 1 = \frac{10}{BH}$$

$$\Rightarrow BH = 10 \text{ m}$$

Therefore, the distance between Harsh and building AB is 10 m.

ii.

In ΔCDH,

$$\tan 60^\circ = \frac{CD}{DH}$$