Class X Session 2026-27
Subject - Mathematics(Standard)
Sample Question Paper - 2

Time Allowed: 3 hours **Maximum Marks: 80**

General Instructions:

1. This question paper contains 38 questions.
2. This Question Paper is divided into 5 Sections A, B, C, D and E.
3. In Section A, Questions no. 1-18 are multiple choice questions (MCQs) and questions no. 19 and 20 are AssertionReason based questions of 1 mark each.
4. In Section B, Questions no. 21-25 are very short answer (VSA) type questions, carrying 02 marks each.
5. In Section C, Questions no. 26-31 are short answer (SA) type questions, carrying 03 marks each.
6. In Section D, Questions no. 32-35 are long answer (LA) type questions, carrying 05 marks each.
7. In Section E, Questions no. 36-38 are case study based questions carrying 4 marks each with sub parts of the
values of 1, 1 and 2 marks each respectively.
8. All Questions are compulsory. However, an internal choice in 2 Question of Section B, 2 Questions of Section C
and 2 Questions of Section D has been provided. An internal choice has been provided in all the 2 marks questions
of Section E .
9. Draw neat and clean figures wherever required.
10. Take wherever required if not stated.
11. Use of calculators is not allowed.

Section A

1. If the prime factorisation of 2520 is $2^3 \times 3^a \times b \times 7$, then the value of a + 2b is: **[1]**

   a) 9 b) 10

   c) 7 d) 12

2. If a is a non-zero rational and $\sqrt{b}$ is irrational, then $a\sqrt{b}$ is: **[1]**

   a) a natural number b) a rational number

   c) an integer d) an irrational number

3. If α, β are zeroes of a polynomial $p(x) = 2x^2 - x - 1$ then $\alpha^2 + \beta^2$ is equal to **[1]**

a) $\frac{1}{4}$ b) $\frac{5}{4}$

c) $\frac{3}{4}$ d) $\frac{-3}{4}$

4. It is given that the difference between the zeros of $4x^2$ - 8kx + 9 is 4 and k > 0. Then, k =? **[1]**

a) $\frac{1}{2}$ b) $\frac{7}{2}$

c) $\frac{5}{2}$ d) $\frac{3}{2}$

5. The line $2x - 3y = 6$ intersects x-axis at **[1]**

a) $(3, 0)$ b) $(0, -2)$

c) $(0, 3)$ d) $(-2, 0)$

6. The value of 'k' for which the system of linear equations $6x + y = 3k$ and $36x + 6y = 3$ have infinitely many solutions is: **[1]**

a) $\frac{1}{2}$ b) $\frac{1}{6}$

c) $\frac{1}{3}$ d) 6

7. Two numbers whose sum is 12 and the absolute value of whose difference is 4 are the roots of the equation _____. **[1]**

a) $2x^2$ - 6x + 7 = 0 b) $2x^2$ - 24x + 43 = 0

c) x^2 - 12x + 30 = 0 d) x^2 - 12x + 32 = 0

8. $9x^2$ - 6x - 4 = 0 have **[1]**

a) Real and Equal roots b) No Real roots

c) Real roots d) Real and Distinct roots

9. If 18th and 11th terms of an A.P. are in the ratio 3 : 2, then its 21st and 5th terms are in the ratio **[1]**

a) 3 : 1 b) 3 : 2

c) 1 : 3 d) 2 : 3

10. How many three-digit numbers are divisible by 9? **[1]**

a) 86 b) 100

c) 96 d) 90

11. **Assertion (A):** $\triangle ABC \sim \triangle PQR$ such that $\angle A = 65^\circ, \angle C = 60^\circ$. Hence $\angle Q = 55^\circ$. **[1]**

Reason (R): Sum of all angles of a triangle is 180°.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

12. $\triangle$ABC is such that AB = 3 cm, BC = 2 cm and CA = 2.5 cm. If $\triangle$DEF ~ $\triangle$ABC and EF = 4 cm, then perimeter of $\triangle$DEF is **[1]**

a) 22.5 cm
b) 7.5 cm
c) 30 cm
d) 15 cm

13. **Assertion (A):** If (0, 3), (1, 1), and (-1, 2) be the midpoints of the sides of a triangle, then the centroid of the original triangle is (0, 2) **[1]**

Reason (R): The centroids of the triangle and joins the midpoints of the sides of triangle are same.

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

14. In what ratio does x-axis divide the line segment joining the points A(2, -3) and B(5, 6)? **[1]**

a) 2 : 3
b) 3 : 5
c) 2 : 1
d) 1 : 2

15. The value of $\left(\frac{1}{\sec^2 A} + \frac{1}{\text{cosec}^2 A}\right)$ is: **[1]**

a) 0
b) -1
c) 1
d) more than 1

16. If $\sin A = \frac{2}{3}$, then value of cot A is: **[1]**

a) $\frac{3}{2}$
b) $\frac{\sqrt{5}}{2}$
c) $\frac{2}{3}$
d) $\frac{5}{4}$

17. AP and PQ are tangents drawn from a point A to a circle with centre O and radius 9 cm. If OA = 15 cm, then AP + AQ = **[1]**

a) 18 cm
b) 12 cm
c) 36 cm
d) 24 cm

18. A solid consists of a circular cylinder with an exact fitting right circular cone placed at the top. The height of the cone is h. If the total volume of the solid is 3 times the volume of the cone, then the height of the circular cylinder is **[1]**

a) 2h
b) $\frac{2h}{3}$
c) h
d) 4h

19. The relation between mean, mode and median is **[1]**

a) mode = (3 $\times$ mean) - (2 $\times$ median)
b) mode = (3 $\times$ median) - (2 $\times$ mean)
c) median = (3 $\times$mean) - (2 $\times$ mode)
d) mean = (3 $\times$ median) - (2 $\times$mode)

20. Two friends were born in the year 1996. The probability that they have the same birth date is **[1]**

a) $\frac{1}{366}$
b) $\frac{2}{365}$
c) $\frac{1}{365}$
d) $\frac{1}{183}$

Section B

21. Prove that $5\sqrt{2}$ - 3 is an irrational number, given that $\sqrt{2}$ is an irrational number. **[2]**

22. Is the pair of linear equations consistent? Justify your answer. **[2]**

    2ax + by = a, 4ax + 2by – 2a = 0; a, b ≠ 0

23. Find the co-ordinates of the points of trisection of the line segment joining the points (-2, 2) and (7, -4). **[2]**

    OR

    Find the distance between the points:

    A(1, -3) and B(4, -6)

24. Prove that: $1 + \frac{\cot^2 \theta}{1+\text{cosec}\,\theta} = \text{cosec}\,\theta$ **[2]**

    OR

    Prove that $\frac{1+\sec\theta}{\sec\theta} = \frac{\sin^2\theta}{1-\cos\theta}$

25. A card is drawn from a well-shuffled deck of playing cards. Find the probability of drawing **[2]**

    i. a face card

    ii. a red face card.

Section C

26. The area of a rectangle gets reduced by 8 m^2, when its length is reduced by 5 m and its breadth is increased by 3 m. If we increase the length by 3 m and breadth by 2 m, the area is increased by 74 m^2. Find the length and the breadth of the rectangle. **[3]**

    OR

    A man sold a chair and a table together for ₹1520 thereby making a profit of 25% on the chair and 10% on table. By selling them together for ₹1535 he would have made a profit of 10% on the chair and 25% on the table. Find the cost price of each.

27. Prove that the points (2,3), (-4, -6) and (1,3/2) do not form a triangle. **[3]**

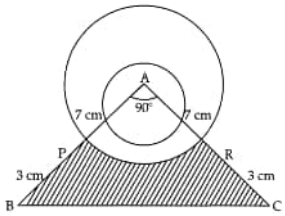
28. Prove that: $(\sin\theta + 1 + \cos\theta)(\sin\theta - 1 + \cos\theta) \cdot \sec\theta\,\text{cosec}\,\theta = 2$ **[3]**

29. In the given figure, E is a point on side CB produced of an isosceles $\triangle ABC$ with AB = AC. If $AD \perp BC$ and $EF \perp AC$, Prove that $\triangle ABD \sim \triangle ECF$. **[3]**

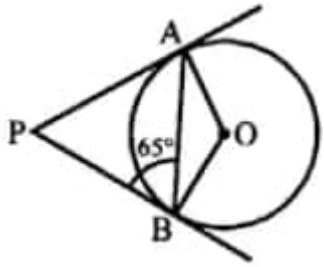
    OR

    P and Q are points on the sides AB and AC respectively of a $\triangle ABC$. If AP = 2 cm, PB = 4 cm, AQ = 3 cm and QC = 6 cm, show that BC = 3PQ.

30. A momento is made as shown in the figure. Its base PBCR is silver plated from the front side. Find the area which is silver plated. $\left(\pi = \frac{22}{7}\right)$ **[3]**



31. In the given figure, PA and PB are two tangents from an external point P to a circle with centre O. If ∠PBA = 65°, find ∠OAB and ∠APB. **[3]**



Section D

32. The difference of squares of two numbers is 204. The square of the smaller number is 4 less than 10 times the larger number. Find the two numbers. **[5]**

OR

The denominator of a fraction is 2 more than the numerator. If 2 is added to both its numerator and denominator, then the sum of the new fraction and the original fraction is $\frac{46}{35}$. Find the original fraction.

33. The 16th term of an AP is 5 times its 3rd term. If its 10th term is 41, find the sum of its first 15 terms. **[5]**

34. A statue 1.6 m tall, stands on the top of a pedestal. From a point on the ground, the angle of elevation of the top of the statue is 60° and from the same point the angle of elevation of the top of the pedestal is 45°. Find the height of the pedestal. (Use $\sqrt{3}$ = 1.732) **[5]**

OR

A spherical balloon of radius r subtends an angle of 60° at the eye of an observer. If the angle of elevation of its centre is 45° from the same point, then prove that height of the centre of the balloon is $\sqrt{2}$ times its radius.

35. The following is the cummulative frequency distribution (of less than type) of 1000 persons each of age 20 years and above. Determine the mean age. **[5]**

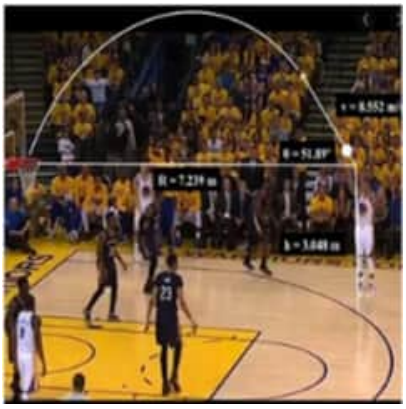
Age below (in years)	30	40	50	60	70	80
Number of persons	100	220	350	750	950	1000

Section E

36. **Read the following text carefully and answer the questions that follow:** **[4]**

Basketball and soccer are played with a spherical ball. Even though an athlete dribbles the ball in both sports, a basketball player uses his hands and a soccer player uses his feet. Usually, soccer is played outdoors on a large field and basketball is played indoor on a court made out of wood. The projectile (path traced) of soccer ball

and basketball are in the form of parabola representing quadratic polynomial.

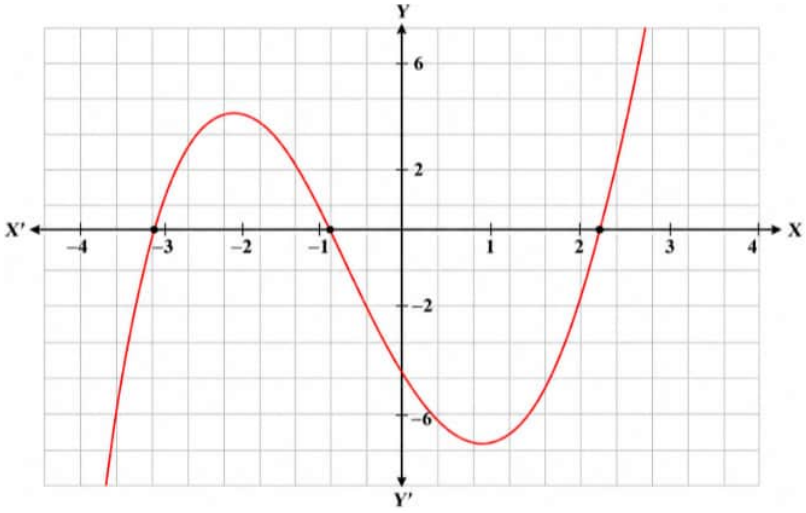




i. Which type the shape of the path traced shown in given figure? (1)

ii. Why the graph of parabola opens upwards? (1)

iii. In the below graph, how many zeroes are there? (2)



OR

What is the condition for the graph of parabola to open downwards? (2)

37. **Read the following text carefully and answer the questions that follow:** **[4]**

A wooden toy is shown in the picture. This is a cuboidal wooden block of dimensions 14 cm × 17 cm × 4 cm. On its top there are seven cylindrical hollows for bees to fit in. Each cylindrical hollow is of height 3 cm and radius 2 cm.



i. Find the volume of wood carved out to make one cylindrical hollow. (1)

ii. Find the lateral surface area of the cuboid to paint it with green colour. (1)

iii. Find the volume of wood in the remaining cuboid after carving out seven cylindrical hollows. (2)

OR

Find the surface area of the top surface of the cuboid to be painted yellow. (2)

38. **Read the following text carefully and answer the questions that follow:** **[4]**

Teaching Mathematics through activities is a powerful approach that enhances students' understanding and engagement. Keeping this in mind, Ms. Mukta planned a prime number game for class 5 students. She announces the number 2 in her class and asked the first student to multiply it by a prime number and then pass it to second student. Second student also multiplied it by a prime number and passed it to third student. In this way by multiplying to a prime number, the last student got 173250.

Now, Mukta asked some questions as given below to the students:

i. What is the least prime number used by students? **(1)**

ii. a. How many students are in the class? **(2)**

OR

b. What is the highest prime number used by students? **(2)**

iii. Which prime number has been used maximum times? **(1)**

Solution

Section A

1.

(d) 12

Explanation:

$2520 = 2^3 \times 3^2 \times 5 \times 7$

on comparing

a = 2, b = 5

So,

a + 2b = $2 + 2 \times 5$

= 12

2.

(d) an irrational number

Explanation:

If possible let $a\sqrt{b}$ be rational.

Then $a\sqrt{b} = \frac{p}{q}$, where p and q are non-zero integers, having no common factor other than 1.

Now, $a\sqrt{b} = \frac{p}{q}$

$\Rightarrow \sqrt{b} = \frac{p}{aq}$ ... (i)

But, p and aq are both rational and aq $\neq 0$

$\because \frac{p}{aq}$ is rational.

Therefore, from eq. (i), it follows that $\sqrt{b}$ is rational.

The contradiction arises by assuming that $a\sqrt{b}$ is rational.

Hence, $a\sqrt{b}$ is irrational.

3.

(b) $\frac{5}{4}$

Explanation:

P(x) = $2x^2$ - x - 1

$\alpha + \beta = -\left(\frac{-1}{2}\right) = \frac{1}{2}$

$\alpha\beta = \frac{-1}{2}$

$(\alpha + \beta)^2 = \alpha^2 + \beta^2 + 2\alpha\beta$

$(\frac{1}{2})^2 = \alpha^2 + \beta^2 + 2\left(\frac{-1}{2}\right)$

$\frac{1}{4} + 1 = \alpha^2 + \beta^2$

$\alpha^2 + \beta^2 = \frac{5}{4}$

4.

(c) $\frac{5}{2}$

Explanation:

Let a, β are the zeros of $4x^2$ - 8kx + 9

Then, we have

$\alpha + \beta = -\frac{(-8k)}{4} = 2k$

$\alpha\beta = \frac{9}{4}$

GIven, $\alpha - \beta = 4$
Now, $(\alpha + \beta)^2 = (\alpha - \beta)^2 + 4\alpha\beta$
$\Rightarrow (2k)^2 = (4)^2 + 4 \times \frac{9}{4}$
$\Rightarrow 4k^2 = 16 + 9$
$\Rightarrow 4k^2 = 25$
$\Rightarrow k^2 = \frac{25}{4}$
$\Rightarrow \text{k} = \pm\frac{5}{2}$
Since k > 0, we have $k = \frac{5}{2}$

5. **(a)** $(3, 0)$
Explanation:
$(3, 0)$

6. **(b)** $\frac{1}{6}$
Explanation:
$\frac{1}{6}$

7. **(d)** x^2 - 12x + 32 = 0
Explanation:
Let the two roots be a and b, then
a + b = 12 ...(i)
and a - b = 4 ...(ii)
$\Rightarrow$ a = 8 and b = 4 (from (i) and (ii))
$\therefore$ Required equation is x^2 - 12x + 32 = 0

8. **(d)** Real and Distinct roots
Explanation:
D = b^2 - 4ac
D = $(-6)^2$ - 4 $\times$ 9 $\times$ (-4)
D = 36 + 144
D = 180
D > 0. Hence Real and Distinct roots.

9. **(a)** 3 : 1
Explanation:
Here, 18th term : 11th term = 3: 2
$\Rightarrow \frac{a_{18}}{a_{11}} = \frac{3}{2} \Rightarrow \frac{a+17d}{a+10d} = \frac{3}{2}$
$\Rightarrow 2a + 34d = 3a + 30d$
$\Rightarrow 34d - 30d = 3a - 2a \Rightarrow a = 4d$
Now $\frac{a_{21}}{a_5} = \frac{a+20d}{a+4d} = \frac{4d+20d}{4d+4d}$
$= \frac{24d}{8d} = \frac{3}{1}$
$a_{21} : a_5 = 3 : 1$

10. **(b)** 100

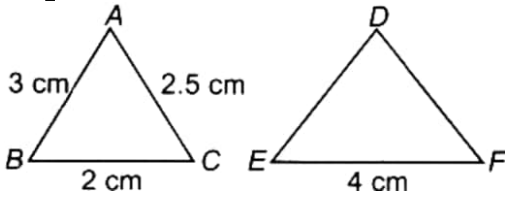
Explanation:
Three-digit numbers divisible by 9 are 108, 117, 126,..., 999.
Let T_n = 999. Then, 108 + (n - 1) × 9 = 999.
∴ (n -1) × 9 = 891 ⇒ (n -1) = 99 ⇒ n = 100.

11.

(b) Both A and R are true but R is not the correct explanation of A.
Explanation:
Both A and R are true but R is not the correct explanation of A.

12.

(d) 15 cm
Explanation:



Since, △DEF ~ △ABC [Given]
$\Rightarrow \frac{AB}{DE} = \frac{BC}{EF} \Rightarrow \frac{3}{DE} = \frac{2}{4} \Rightarrow$ DE = 6 cm
Also, $\frac{AC}{DF} = \frac{BC}{EF} \Rightarrow \frac{2.5}{DF} = \frac{2}{4} \Rightarrow$ DF = 5 cm
∴ Perimeter of △DEF = DE + EF + FD
= 6 cm + 4 cm + 5 cm = 15 cm

13. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation:
Both A and R are true and R is the correct explanation of A.

14.

(d) 1 : 2
Explanation:
Let the x axis cut AB at P(x, 0) in the ratio K : 1
Then $\frac{6k-3}{k+1} = 0 \Rightarrow 6k - 3 - 0 \Rightarrow 6k = 3 \Rightarrow k = \frac{1}{2}$
required ratio = $\left(\frac{1}{2} : 1\right) = 1 : 2$

15.

(c) 1
Explanation:
1

16.

(b) $\frac{\sqrt{5}}{2}$
Explanation:
$\text{Sin } A = \frac{2}{3}$
We know
$\sin A = \frac{P}{H}$
here P = 2k, H = 3k
By Pyth. Theorem
$(3k)^2 = (2k)^2 + B^2$

$9k^2 - 4k^2 = B^2$

$B = k\sqrt{5}$

$\cot A = \frac{B}{P} = \frac{k\sqrt{5}}{2K}$

$\cot A = \frac{\sqrt{5}}{2}$

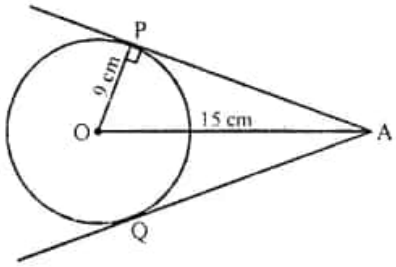
17.

(d) 24 cm

Explanation:

OP is radius, PA is the tangent

$OP \perp AP$



Now in right ΔOAP

$OA^2 = OP^2 + AP^2$

$(15)^2 = (9)^2 + AP^2$

$225 = 81 + AP^2$

$\Rightarrow AP^2 = 225 - 81 = 144 = (12)^2$

AP = 12 cm

But AP = AQ = 12 cm (tangents from A to the circle)

AP + AQ = 12 + 12 = 24 cm

18.

(b) $\frac{2h}{3}$

Explanation:

Height of cone = h

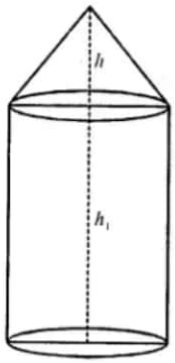
Volume of solid = 3 $\times$ volume of cone

Let h be the height of the cylinder and r be its radius, then

Volume of cylinder and r be its radius, then

Volume of cylinder = $\pi r^2 h_1$

and volume of cone = $\left(\frac{1}{3}\right) \pi r^2 h_1$



Then volume of solid = $\pi r^2 h_1 + \frac{1}{3}\pi r^2 h$

$= \pi r^2 \left(h_1 + \frac{1}{3}h\right)$

Now $\pi r^2 \left(h_1 + \frac{1}{3}h\right) = 3 \times \frac{1}{3}\pi r^2 h = \pi r^2 h$

$\Rightarrow h_1 + \frac{1}{3}h = h$ (comparing)

$h_1 = h - \frac{1}{3}h = \frac{2}{3}h$

Hence, height of cylinder = $\frac{2h}{3}$

19.

(b) mode = (3 × median) - (2 × mean)

Explanation:

mode = (3 × median) - (2 × mean)

20. **(a)** $\frac{1}{366}$

Explanation:

As 1996 was a leap year, so total number of days in the year 1996 = 366

∴ Total number of possible outcomes = 366

Number of favourable outcomes that two friends have the same birth date = 1

∴ Required probability = $\frac{1}{366}$

Section B

21. Let us assume that x = $5\sqrt{2}$ - 3 is a rational number

∴ $\sqrt{2} = \frac{x+3}{5}$

RHS is a rational number

$\Rightarrow \sqrt{2}$ is rational

Which contradicts the fact that $\sqrt{2}$ is an irrational number

∴ our assumption is wrong.

Hence, $5\sqrt{2}$ - 3 is irrational

22. Yes

Conditions for pair of linear equations are consistent

$a_1/a_2 \neq b_1/b_2$. [unique solution]

and $a_1/a_2 = b_1/b_2 = c_1/c_2$ [coincident or infinitely many solutions]

The given pair of linear equations -

2ax + by –a = 0 and 4ax + 2by - 2a = 0

Comparing with ax + by + c = 0;

Here, a_1 = 2a, b_1 = b, c_1 = - a;

And a_2 = 4a, b_2 = 2b, c_2 = - 2a;

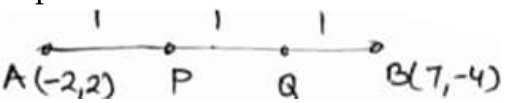
a_1/a_2 = 1/2

b_1/b_2 = 1/2

c_1/c_2 = 1/2

Here, $a_1/a_2 = b_1/b_2 = c_1/c_2$

Hence, the given pair of linear equations has infinitely many solutions, i.e., consistent or dependent.

23. 

Let points P and Q trisect the line segment AB.

Therefore AP : PB = 1 : 2.

Co-ordinates of point P are $\left(\frac{7-4}{3}, \frac{-4+4}{3}\right)$ i.e. (1, 0)

Also AQ : QB = 2 : 1

Co-ordinates of point Q are $\left(\frac{14-2}{3}, \frac{-8+2}{3}\right)$ i.e. (4, -2)

OR

The given points are A(1, -3) and B(4, -6)

Then, (x_1 = 1, y_1 = -3) and (x_2 = 4, y_2 = -6)

$\therefore AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(4-1)^2 + (-6+3)^2} = \sqrt{(3)^2 + (-3)^2}$

$= \sqrt{18} = 3\sqrt{2}\ units$

24. LHS

$= 1 + \frac{\text{cosec}^2\,\theta - 1}{1 + \text{cosec}\,\theta}$

$= 1 + \frac{(\text{cosec}\,\theta - 1)(\text{cosec}\,\theta + 1)}{1 + \text{cosec}\,\theta}$

$= 1 + \text{cosec}\,\theta - 1$

$= \text{cosec}\,\theta$ = RHS

OR

L.H.S

$\frac{1+\sec\theta}{\sec\theta} = \frac{1+\frac{1}{\cos\theta}}{\frac{1}{\cos\theta}}$

$= \frac{\frac{\cos\theta+1}{\cos\theta}}{\frac{1}{\cos\theta}}$

$= \frac{1+\cos\theta}{1}$

Multiplying the numerator and denominator by $(1 - \cos\theta)$, we have

$\frac{1+\sec\theta}{\sec\theta} = \frac{(1+\cos\theta)(1-\cos\theta)}{(1-\cos\theta)}$

$= \frac{1-\cos^2\theta}{1-\cos\theta}$

$= \frac{\sin^2\theta}{1-\cos\theta}$

25. $n(S) = 52$

Number of face cards$= 4 \times 3 = 12$

Number of red face cards $= 3 \times 2 = 6$

i. Let A be the event of drawing a face card

$n(A) = 12$

$P(A) = \frac{12}{52} = \frac{3}{13}$

ii. Let B be the event of drawing a red face card

$n(B) = 6$

$P(B) = \frac{6}{52} = \frac{3}{26}$

Section C

26. Let the length of a rectangle be x meters and breadth be y meters.

Then, area = xy sq. m

Now,

$xy - (x-5)(y+3) = 8$

$\Rightarrow xy - [xy - 5y + 3x - 15] = 8$

$\Rightarrow xy - xy + 5y - 3x + 15 = 8$

$\Rightarrow 3x - 5y = 7$ .....(i)

And

$(x+3)(y+2) - xy = 74$

$\Rightarrow xy + 3y + 2x + 6 - xy = 74$

$\Rightarrow 2x + 3y = 68$ .....(ii)

Multiplying (i) by 3 and (ii) by 5, we get

$9x - 15y = 21$ .....(iii)

$10x + 15y = 340$ .....(iv)

Adding (iii) and (iv), we get

$19x = 361 \Rightarrow x = \frac{361}{19} = 19$

Putting x = 19 in (iii), we get

$9 \times 19 - 15y = 21$

$\Rightarrow 171 - 15y = 21$

$\Rightarrow y = \frac{150}{15} = 10$

$\therefore$ x = 19 meters and y = 10 meters

Hence, length = 19 m and breadth = 10 m

OR

Let the cost price of one chair be ₹x and that of one table be ₹y.

Profit on a chair = 25%

$\therefore$ Selling price of one chair $= x + \frac{25}{100}x = \frac{125}{100}x$

Profit on a table = 10%

$\therefore$ Selling price of one table $= y + \frac{10y}{100} = \frac{110}{100}y$

According to the given condition, we have

$\frac{125}{100}x + \frac{110}{100}y = 1520 \Rightarrow 125x + 110y = 152000 \Rightarrow 25x + 22y = 30400$ .....(i)

If profit on a chair is 10% and on a table is 25%, then total selling price is ₹1535.

$\therefore \left(x + \frac{10}{100}x\right) + \left(y + \frac{25}{100}y\right) = 1535$

$\Rightarrow \quad \frac{110}{100}x + \frac{125}{100}y = 1535$

$\Rightarrow 110x + 125y = 153500$

$\Rightarrow 22x + 25y = 30700$ .....(ii)

Subtracting equation (ii) from equation (i), we get

$3x - 3y = -300 \Rightarrow$ x - y = -100 .....(iii)

Adding equation (ii) and (i), we get

47x + 47y = 61100 $\Rightarrow$ x + y = 1300 .....(iv)

Solving equations (iii) and (iv), we get

x = 600 and y = 700

Hence, the cost price of a chair is ₹600 and that of a table is ₹700

27. Let A(2, 3), B(-4, -6) and C(1, 3/2) be the given points.

$AB = \sqrt{(-4-2)^2 + (-6-3)^2}$

$\Rightarrow \quad AB = \sqrt{(-6)^2 + (-9)^2}$

$\Rightarrow \quad AB = \sqrt{36 + 81}$

$\Rightarrow \quad AB = \sqrt{117}$

$BC = \sqrt{(1+4)^2 + \left(\frac{3}{2} + 6\right)^2}$

$\Rightarrow \quad BC = \sqrt{(5)^2 + \left(\frac{15}{2}\right)^2}$

$\Rightarrow \quad BC = \sqrt{25 + \frac{225}{4}}$

$\Rightarrow \quad BC = \sqrt{\frac{325}{4}}$

$\Rightarrow \quad BC = \sqrt{81.25}$

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

$\Rightarrow \quad AC = \sqrt{(1)^2 + \left(\frac{3}{2}\right)^2}$

$\Rightarrow \quad AC = \sqrt{1 + \frac{9}{4}}$

$\Rightarrow \quad AC = \sqrt{\frac{13}{4}}$

$\Rightarrow \quad AC = \sqrt{3.25}$

We know that for a triangle sum of two sides is greater than the third side.

Here Ac + BC is not greater than AB.

$\therefore$ ABC is not a triangle.

28. Here:

$L.H.S = (sin\theta + cos\theta + 1)(sin\theta + cos\theta - 1)sec\theta cosec\theta$

$= [(sin\theta + cos\theta)^2 - 1]\frac{1}{cos\theta sin\theta}$

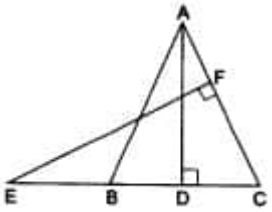
$= [(sin^2\theta + cos^2\theta + 2sin\theta cos\theta) - 1]\frac{1}{cos\theta sin\theta}$

$= [1 + 2sin\theta cos\theta - 1]\frac{1}{cos\theta sin\theta}$

$= 2sin\theta cos\theta \times \frac{1}{cos\theta sin\theta}$

$= 2$

$= R.H.S$

29. 

Given A $\triangle ABC$ in which AB = AC and $AD \perp BC$. Side CB is produced to E and $EF \perp AC$.

To Prove $\triangle ABD \sim \triangle ECF$.

Proof: We know that the angles opposite to equal sides of a triangle are equal.

$\therefore \quad \angle B = \angle C$ [$\because$ AB = AC].

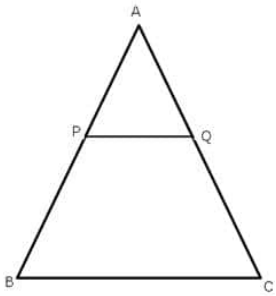
Now, in $\triangle ABD$ and $\triangle ECF$, we have

$\angle B = \angle C$ [proved above]

$\angle ADB = \angle EFC = 90^\circ$

$\therefore \quad \triangle ABD \sim \triangle ECF$ [by AA-similarity],

OR



It is given that, AP = 2 cm, PB = 4 cm, AQ = 3 cm, and QC = 6 cm.

To Prove: BC = 3PQ

Proof: From the given figure, we have AB = AP + PB = 2 + 4 = 6 cm and AC = AQ + QC = 3 + 6 = 9 cm.

Now, $\frac{AP}{PB} = \frac{2}{4} = \frac{1}{2}$

and $\frac{AQ}{QC} = \frac{3}{6} = \frac{1}{2}$

$\Rightarrow \frac{AP}{PB} = \frac{AQ}{QC}$

$\Rightarrow \angle A = \angle A$

Therefore, by SAS criteria of similarity, we obtain

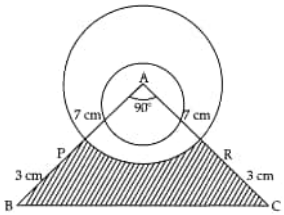
$\triangle$APQ $\sim \triangle$ABC

$\Rightarrow \frac{AP}{AB} = \frac{PQ}{BC} = \frac{AQ}{AC}$

$\Rightarrow \frac{PQ}{BC} = \frac{AQ}{AC}$

$\Rightarrow \frac{PQ}{BC} = \frac{3}{9}$

$\Rightarrow$ BC = 3PQ

30. 

Base = 7 + 3 = 10cm and height = 7 + 3 =10 cm

From the given figure

Area of right-angled$\triangle ABC = \frac{1}{2} \times base \times height$

$= \frac{1}{2} \times 10 \times 10$

$= 50$ cm^2

Area of quadrant APR of the circle of radius 7 cm

$= \frac{1}{4} \times \pi \times (7)^2$

Area of quadrant$= \frac{1}{4} \times \frac{22}{7} \times 49 = 38.5$cm^2

Area of base PBCR = Area of $\triangle$ABC - Area of quadrant APR

$= 50 - 38.5$ = 11.5 cm^2.

So, Area of shaded portion is 11.5 cm^2.

31. In the given figure, PA and PB are two tangents to the circle with centre O from an external point P.

$\angle$PBA = 65°,

To find: $\angle$OAB and $\angle$APB

In $\triangle$APB

AP = BP (Tangents from P to the circle)

$\angle$PAB = $\angle$PBA = 65°

$\angle$APB = 180° – ($\angle$PAB + $\angle$PBA)

= 180° – (65° + 65°) = 180° – 130° = 50°

OA is radius and AP is tangent AP

$\angle$OAP = 90°

$\angle$OAB = $\angle$OAP – $\angle$PAB = 90° – 65° = 25°

Hence, $\angle$OAB = 25° and $\angle$APB = 50°

Section D

32. Let the numbers are x and (x > y)

$x^2 - y^2 = 204$ ...(i)

$y^2 = 10x - 4$ ...(ii)

By (i) and (ii)

$x^2 - 10x + 4 - 204 = 0$

$x^2 - 10x + 200 = 0$

(x - 20) (x + 10) = 0

x = 20, x = -10 (rejected)

y = 14

OR

Let the fraction be $\frac{x}{x+2}$

Therefore, $\frac{x}{x+2} + \frac{x+2}{x+4} = \frac{46}{35}$

$\Rightarrow 24x^2 + 4x - 228 = 0$ or $6x^2 + x - 57 = 0$

$\Rightarrow (6x+19)(x-3)=0$

$x \neq -\frac{19}{6}$

$\therefore x=3$

So, the required fraction is $\frac{3}{5}$

33. The general term of an AP is given by

a_n=a+(n-1)d

Given that $a_{16}=5a_3$

$\Rightarrow$a+15d=5(a+2d)

$\Rightarrow$a+15d=5a+10d

$\Rightarrow$4a=5d...(i)

Now,

a_{10}=41

$\Rightarrow$a+9d=41

$\Rightarrow$4a+36d=164

$\Rightarrow$5d+36d=164....(from (i))

$\Rightarrow$41d=164

$\Rightarrow$d=4

Substituting in (i), we get a=5.

We know that, $S_n = \frac{n}{2}[2a+(n-1)d]$

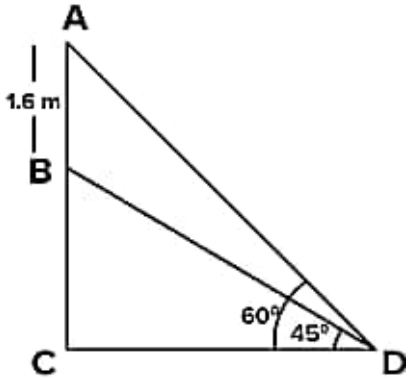
Sum of the first 15 terms=S_{15}

$= \frac{15}{2}[2(5)+14(4)]$

$= \frac{15}{2}[10+56]$

=495

34.



Let AB be the height of statue and BC be the height of pedestal

Now In ΔBCD,

tan 45° = $\frac{BC}{CD}$

1 = $\frac{BC}{CD}$

CD = BC ...(i)

Now, In ΔACD

tan 60° = $\frac{AC}{CD}$

$\sqrt{3}$ = $\frac{AB+BC}{CD}$

$\sqrt{3}$ CD = 1.6 + BC

$\sqrt{3}$ BC = 1.6 + BC [from eqn (i)]

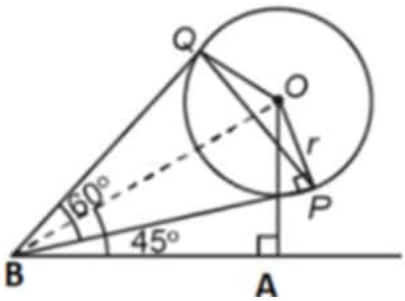
1.73 BC - BC = 1.6

0.73 BC = 1.6

BC = $\frac{1.6}{0.73}$

BC = 2.19 m

OR



Let Point B represents observer.

$\therefore \angle QBP = 60^o; \angle ABO = 45^o$

Using geometry $\angle PBO = \frac{1}{2} \times 60^o = 30^o$

Now, $\frac{r}{OB} = \sin 30^o = \frac{1}{2} \Rightarrow OB = 2r$ ...(i)

Also $\frac{OA}{OB} = \sin 45^o = \frac{1}{\sqrt{2}} \Rightarrow OB = OA\sqrt{2}$ ...(ii)

Using (i) and (ii) $OA = \sqrt{2}\, r$

or height of center of balloon = $\sqrt{2}\, r$ units

35.

Class interval	**Frequency f_i**	**Mid-value X_i**	$u_i = \frac{x_i - A}{h} = \frac{x_i - 45}{10}$	**f_iu_i**
20-30	100	25	-2	-200
30-40	120	35	-1	-120
40-50	130	45=A	0	0
50-60	400	55	1	400
60-70	200	65	2	400
70-80	50	75	3	150
	$\Sigma f_i = 1000$			$\sum f_iu_i = 630$

A = 45, h = 10,

$\Sigma f_i = 1000$, $\sum f_iu_i = 630$

Mean = $A + \left\{h \times \frac{\sum f_iu_i}{\sum f_i}\right\}$

$= 45 + \left\{10 \times \frac{630}{1000}\right\}$

= 45 + 6.3

= 51.3

Section E

36. i. Parabola

ii. a > 0

iii. $\because$ The graph cut the x-axis thrice

$\therefore$ No of zeroes = 3

OR

a < 0

37. i. Volume of wood carved out to make one hollow

$= \frac{22}{7} \times 2 \times 2 \times 3 = \frac{264}{7}$ cm^3 or 37.7 cm^3

ii. LSA of cuboid = $2(14 \times 4 + 17 \times 4) = 248$ cm^2.

iii. Volume of 7 cylindrical hollows = 264 cm^3.

Volume of original cuboid = $14 \times 17 \times 4 = 952$ cm^3.

$\therefore$ Volume of remaining solid = 952 – 264 = 688 cm^3.

OR

Area of top surface to be painted = $(l \times b) - 7 \times \pi r^2$

$= (14 \times 17) - (\frac{22}{7} \times 4 \times 7)$

$= 150\ cm^2$

38. $173250 = 2 \times 5^3 \times 3^2 \times 7 \times 11$

i. 3

ii. a. $173250 = 2 \times 5^3 \times 3^2 \times 7 \times 11$

Number of students in the class = 3 + 2 + 1 + 1 = 7

OR

b. $173250 = 2 \times 5^3 \times 3^2 \times 7 \times 11$

Highest prime number used by students = 11

iii. 5