Class X Session 2026-27
Subject - Mathematics (Standard)
Sample Question Paper - 8

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

General Instructions:

Read the following instructions carefully and follow them:

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 Assertion- Reason 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 Questions 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 $\pi = 22/7$ wherever required if not stated.
11. Use of calculators is not allowed.

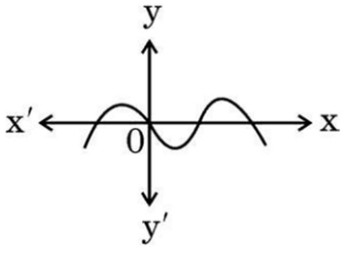
Section A

1. (HCF $\times$ LCM) for the numbers 30 and 70 is: **[1]**

   a) 70 b) 2100

   c) 21 d) 210

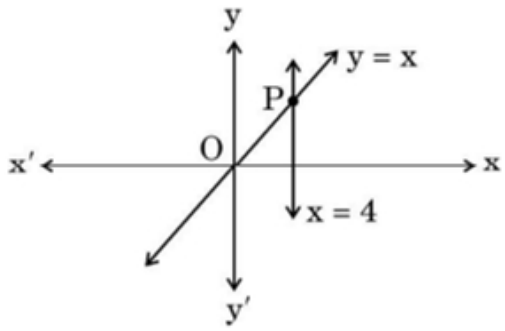
2. In the given figure, graph of a polynomial p(x) is given. Number of zeroes of p(x) is: **[1]**



   a) 5 b) 4

c) 3 d) 2

3. The lines represented by the linear equations y = x and x = 4 intersect at P. The coordinates of the point P are: **[1]**



a) (4, 4) b) (-4, 4)

c) (4, 0) d) (0, 4)

4. The roots of the quadratic equation $x^2 + 3x - 10 = 0$ are: **[1]**

a) -5, 2 b) 5, 2

c) 5, -2 d) -5, -2

5. The common difference of the A.P. whose n^{th} term is given by $a_n = 3n + 7$, is: **[1]**

a) 3 b) 7

c) 3n d) 1

6. The points $(-5, 0), (5, 0)$ and $(0, 4)$ are the vertices of a triangle which is a/an: **[1]**

a) scalene triangle b) isosceles triangle

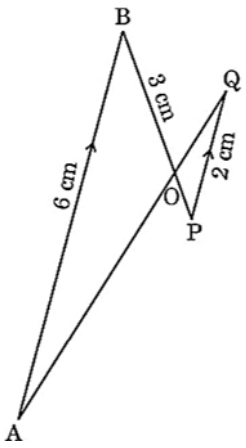
c) equilateral triangle d) right-angled triangle

7. The point $(x, 0)$ divides the line segment joining the points $(-4, 5)$ and $(0, -10)$ in the ratio **[1]**

a) $1 : 2$ b) $1 : 3$

c) $1 : 1$ d) $2 : 1$

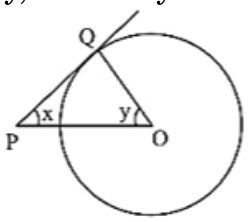
8. In the given figure, AB || PQ. If AB = 6 cm, PQ = 2 cm and OB = 3 cm, then the length of OP is: **[1]**



a) 3 cm b) 1 cm

c) 9 cm d) 4 cm

9. In the given figure, PQ is a tangent to the circle with centre O. If $\angle OPQ = x$, $\angle POQ = y$, then $x + y$ is: **[1]**



a) 60° b) 90°

c) 180° d) 45°

10. The degree measure of the angle at the centre of a semicircle is: **[1]**

a) 180° b) 60°

c) 90° d) 120°

11. $9 \sec^2 A - 9 \tan^2 A$ is equal to: **[1]**

a) 9 b) 0

c) $\frac{1}{9}$ d) 8

12. $\left(\frac{1}{\cot^2 \theta}\right) - \left(\frac{1}{\cos^2 \theta}\right)$ is equal to: **[1]**

a) 1 b) $\sec^2\theta$

c) -1 d) 0

13. Raina is 1.5 m tall. At an instant, his shadow is 1.8 m long. At the same instant, the shadow of a pole is 9 m long. How tall is the pole? **[1]**

a) $7 \cdot 5\ m$ b) $6 \cdot 2\ m$

c) 6.5 m d) 8.5 m

14. In a circle of radius 21 cm, an arc subtends an angle of 60^0 at the centre. The length of the arc is **[1]**

a) 21 cm b) 22 cm

c) 23.5 cm d) 18.16 cm

15. If the sector of a circle with diameter 14 cm makes an angle 90° at the centre, then the perimeter of the sector is: **[1]**

a) 11 cm b) 22 cm

c) 36 cm d) 25 cm

16. For an event E, if $P(E) + P(\bar{E}) = q$, then the value of $q^2 - 4$ is: **[1]**

a) -3 b) 5

c) 3 d) -5

17. In an experiment of throwing a pair of dice, the probability of not getting a doublet is: **[1]**

a) $\frac{1}{5}$ b) $\frac{1}{6}$

c) d)

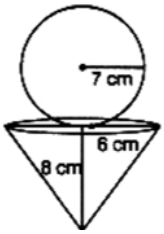
$\frac{5}{6}$ $\frac{1}{30}$

18. If the mean of 6, 7, x, 8, y, 14 is 9, then: **[1]**

a) x + y = 21 b) x - y = 21

c) x - y = 19 d) x + y = 19

19. **Assertion (A):** A sphere of radius 7 cm is m ounted on the solid cone of radius 6 cm and height 8 cm. the volume of the combined solid is 1737.47 cm^3. [Take π = 3.14] **[1]**



Reason (R): Volume of sphere and surface area of cone is given by $\frac{4}{3}\pi r^3$ and $\frac{1}{3}\pi r^2 h$ respectively.

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.

20. **Assertion (A):** The sum of series with the nth term t_n = (9 - 5n) is 220 when no. of terms n = 6. **[1]**

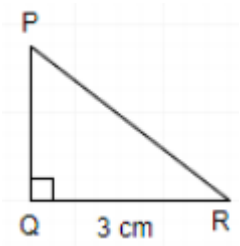
Reason (R): Sum of first n terms in an A.P. is given by the formula: $\frac{n}{2}[2a + (n-1)d]$

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.

Section B

21. In a $\triangle PQR$ right angled at Q, QR = 3 cm and PR - PQ = 1 cm. Determine the values of sin R, cos R and tan R **[2]**



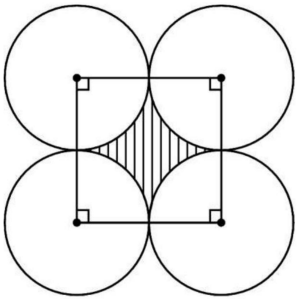
OR

Find A and B if sin (A + 2B) = $\frac{\sqrt{3}}{2}$ and cos (A + 4B) = 0, where A and B are acute angles.

22. Find the HCF and LCM of 26, 65 and 117, using prime factorisation. **[2]**

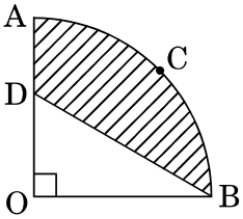
23. In $\triangle ABC$ and $\triangle PQR$, AD and PS are altitudes such that $\triangle ABD \sim \triangle PQS$ and $\triangle ACD \sim \triangle PRS$. Prove that $\triangle ABC \sim \triangle PQR$. **[2]**

24. Find the area of the shaded region if length of radius of each circle is 7 cm. Each circle touches the other two externally. **[2]**



OR

In Figure, OACB is a quadrant of a circle with centre O and radius 7 cm. If OD = 3 cm, then find the area of the shaded region.



25. A quadrilateral ABCD is drawn to circumscribe a circle. Prove that AB + CD = AD + BC **[2]**

Section C

26. Find the LCM and HCF of 404 and 96 and verify that LCM × HCF = product of the two numbers **[3]**

27. If α and β are the zeroes of the polynomial $ax^2 - x + c$. Obtain a polynomial whose zeroes are $\alpha - 3$ and $\beta - 3$. **[3]**

28. Prove the trigonometric identity: **[3]**
$\sqrt{\sec^2\theta + cosec^2\theta}$ = tan θ + cot θ.

29. Find the common difference of an AP whose first term is 5 and the sum of its first four terms is half the sum of the next four terms. **[3]**

OR

If the mth term of an A.P. is $\frac{1}{n}$ and n^{th} term be $\frac{1}{m}$, then show that its $(mn)^{th}$ term is 1.

30. The table below shows the salaries of 280 persons: **[3]**

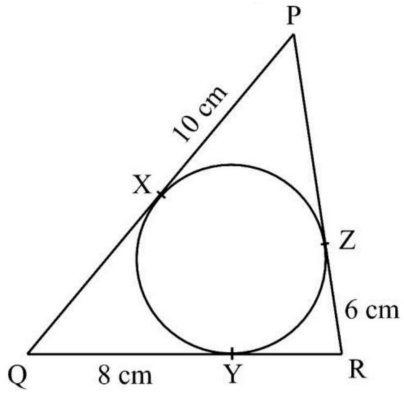
Salary (In thousand ₹)	**No. of Persons**
5 - 10	49
10 - 15	133
15 - 20	63
20- 25	15
25 - 30	6
30 - 35	7
35 - 40	4
40 - 45	2
45 - 50	1

Calculate the median salary of the data.

31. Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that $\angle PTQ = 2\angle OPQ$. **[3]**

OR

In the given figure, $\triangle PQR$ circumscribes the circle. If $PX = 10\ cm, QY = 8\ cm$ and $RZ = 6\ cm$, then find the perimeter of $\triangle PQR$.



Section D

32. A straight highway leads to the foot of a tower. A man standing on the top of the 75 m high tower observes two cars at angles of depression of 30° and 60°, which are approaching the foot of the tower. If one car is exactly behind the other on the same side of the tower, find the distance between the two cars. (use $\sqrt{3}$ = 1.73) **[5]**

33. Find 'mean' and 'mode' marks of the following data : **[5]**

Marks	$0-5$	$5-10$	$10-15$	$15-20$	$20-25$	$25-30$
Number of students	2	3	8	15	14	8

34. A train travels at a certain average speed for a distance of 54 km and then travels a distance of 63 km at an average speed of 6 km/h more than the first speed. If it takes 3 hours to complete the total journey, what was its first average speed? **[5]**

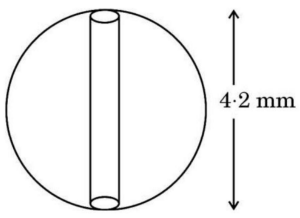
OR

The product of two consecutive positive integers is 306. Find the integers.

35. A spherical glass vessel has a cylindrical neck which is 7 cm long and 2 cm in diameter. The diameter of the spherical part is 14 cm. Find the capacity of the entire glass vessel. (Use $\pi = \frac{22}{7}$) **[5]**

OR

A necklace is made up of wooden beads. Each bead is in the form of a sphere of diameter 4.2 mm. A cylinder is hollowed out from each bead. If the radius of the cylinder is 1 mm, find the volume of wood left in each bead.



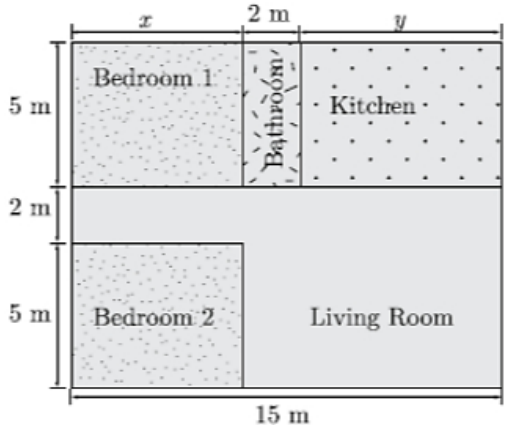
Section E

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

Architect : An architect is a skilled professional who plans and designs buildings and generally plays a key role in their construction. Architects are highly trained in the

art and science of building design. Since they bear responsibility for the safety of their buildings' occupants, architects must be professionally licensed.

Vishu is a licensed architect and design very innovative house. She has made a house layout for her client which is given below. In the layout, the design and measurements has been made such that area of two bedrooms and kitchen together is 95 sq. m.



i. Which pair of linear equations does describe this situation? (1)

ii. What is the length of the outer boundary of the layout? (1)

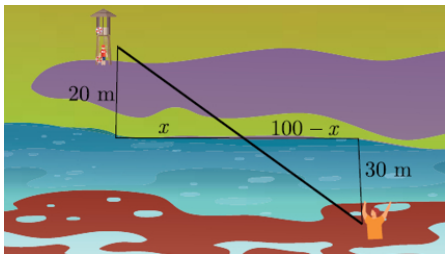
iii. What is the area of the bedroom 1? (2)

OR

What is the area of living room in the layout? (2)

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

Swimmer in Distress: A lifeguard located 20 metre from the water spots a swimmer in distress. The swimmer is 30 metre from shore and 100 metre east of the lifeguard. Suppose the lifeguard runs and then swims to the swimmer in a direct line, as shown in the figure.



i. How far east from his original position will he enter the water? (Hint: Find the value of x in the sketch.) (1)

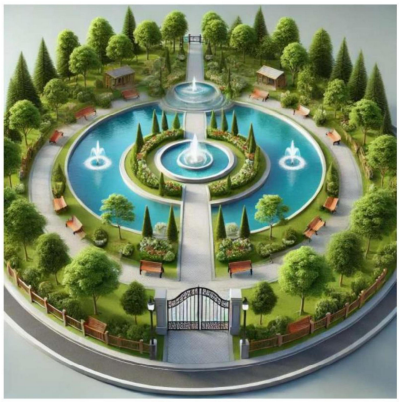
ii. Which similarity criterion of triangle is used? (1)

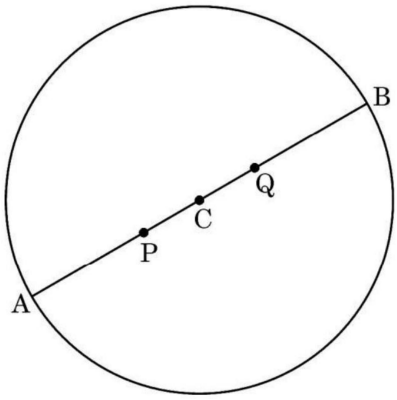
iii. What is the distance of swimmer from the shore? (2)

OR

What is the length of AD? (2)

38. In a society, there is a circular park having two gates. The gates are placed at points $A(10, 20)$ and $B(50, 50)$, as shown in the figure below. Two fountains are installed at points P and Q on AB such that $AP = PQ = QB$. **[4]**





Based on the above information, answer the following questions:

i. Find the coordinates of the centre C. **(1)**

ii. Find the radius of the circular park. **(1)**

iii. a. Find the coordinates of the point P. **(2)**

OR

b. Find the distance of the fountain at Q from gate A. **(2)**

Solution

Section A

1.

(b) 2100

Explanation:

As we know HCF × LCM = Product of the Numbers

Hence HCF × LCM (30,70) = 30 × 70 = 2100

2.

(b) 4

Explanation:

Number of zeros= number of times the graph touches x-axis.

Here the graph touches x-axis 4 times.

3. **(a)** (4, 4)

Explanation:

(4, 4)

4. **(a)** -5, 2

Explanation:

$p(x) = x^2 + 3x - 10$

$= x^2 + 5x - 2x - 10$

$= x(x + 5) - 2(x + 5)$

$= (x - 2)(x + 5)$

$p(x) = 0$

$x - 2 = 0$ or $x + 5 = 0$

$x = 2$ or $x = -5$

5. **(a)** 3

Explanation:

We have, n^{th} term is given by, $a_n = 3n + 7$.

To find the common difference of the A.P., we need two consecutive terms of the given A.P.

So, let us find the first and the second term of the given A.P.

First term (n = 1)

$a_1 = 3(1) + 7 = 3 + 7 = 10$

and Second term (n = 2)

$a_2 = 3(2) + 7$

$= 6 + 7$

$= 13$

Now, the common difference of the A.P. (d) = $a_2 - a_1$

$= 13 - 10$

$= 3$

Therefore, the common difference (d) = 3

6.

(b) isosceles triangle

Explanation:

isosceles triangle

7. **(a)** 1 : 2
Explanation:
1 : 2

8. **(b)** 1 cm
Explanation:
In $\triangle$ABO and $\triangle$QPO
$\angle$BAO = $\angle$PQO (by alt. angle)
$\angle$AOB = $\angle$QOP (vert. oppo. angle)
$\therefore \triangle ABO \sim \triangle QPO$ (by AA Similarity)
$\therefore \frac{AB}{QP} = \frac{OB}{OP}$
$\frac{6}{2} = \frac{3}{OP}$
OP = 1cm

9. **(b)** 90°
Explanation:
Given, $\angle OPQ = x$, $\angle POQ = y$
$\angle OQP = 90^o$ ($\because$ Radius is perpendicular to the tangent at the point of contact.)
In $\triangle$OPQ,
$\angle OPQ + \angle POQ + \angle OQP = 180^o$ (angle sum property)
$\Rightarrow x + y + 90^o = 180^o$
$\Rightarrow x + y = 180^o - 90^o = 90^o$

10. **(a)** 180°
Explanation:
180°

11. **(a)** 9
Explanation:
9 ($\sec^2$ A - $\tan^2$ A)
= 9 $\times$ 1... ($\sec^2$ A - $\tan^2$ A=1)
= 9

12. **(c)** -1
Explanation:
$\frac{1}{\cot^2\theta} - \frac{1}{\cos^2\theta}$
$= \text{Tan}^2\,\theta - \sec^2\theta$
= -1

13. **(a)** $7 \cdot 5\ m$
Explanation:
7.5 cm

14. **(b)** 22 cm
Explanation:

Arc length =$\frac{2\pi r\theta}{360} = \left(2 \times \frac{22}{7} \times 21 \times \frac{60}{360}\right)$ cm $= 22$cm

15.

(d) 25 cm
Explanation:
25 cm

16. **(a)** -3
Explanation:
We know that
$P(E) + P(\bar{E}) = 1$
here q = 1
q^2 - 4 = 1 - 4 = -3

17.

(c) $\frac{5}{6}$
Explanation:
$\frac{5}{6}$

18.

(d) x + y = 19
Explanation:
Mean of 6, 7, x, 8, y, 14 is 9
$\Rightarrow \frac{6+7+x+8+y+14}{6}$ = 9 ...(n = 6)
$\Rightarrow \frac{35+x+y}{6}$ = 9
$\Rightarrow$ 35 + x + y = 54
$\Rightarrow$ x + y = 54 - 35 = 19

19.

(c) A is true but R is false.
Explanation:
A is true but R is false.

20.

(d) A is false but R is true.
Explanation:
Assertion (A): "Sum ... is 220 " $\rightarrow$ False (it's -51).
Reason (R): Formula $S_n = \frac{n}{2}[2a + (n-1)d] \rightarrow$ True (this is the correct formula for an A.P.).

Section B

21. Given,a $\triangle PQR$ in which $\angle Q = 90^o$, QR = 3 cm and PR - PQ = 1 ...(i)
On applying Pythagoras theorem In $\triangle PQR$,
$H^2 = P^2 + B^2$ (By Pythagoras theorem)
$PR^2 = PQ^2 + QR^2$
$\Rightarrow QR^2 = PR^2 - PQ^2$
$\Rightarrow (3)^2 = PR^2 - PQ^2$
$\Rightarrow PR^2 - PQ^2 = 9$
$\Rightarrow (PR + PQ)(PR - PQ) = 9$ [$\because a^2 - b^2 = (a+b)(a-b)$]

$\Rightarrow (PR + PQ)(1) = 9$ [From Eq(i)]

$\Rightarrow PR + PQ = 9$ ...(ii)

On adding Eq(i) and Eq(ii), we get

PR - PQ + PR + PQ = 1 + 9 $\Rightarrow 2PR = 10 \Rightarrow PR = 5\ cm$

On substituting PR = 5 cm in Eq(i), we get

$5 - PQ = 1 \Rightarrow PQ = 4\ cm$

$\therefore PR = 5\ and\ PQ = 4$

So the perpendicular is PQ = 4 cm

Base is QR = 3cm and hypotenuse is PR = 5cm

Now, $\sin R = \frac{P}{H} = \frac{PQ}{PR} = \frac{4}{5}$,

$\cos R = \frac{B}{H} = \frac{QR}{PR} = \frac{3}{5}$ and $\tan R = \frac{P}{B} = \frac{PQ}{QR} = \frac{4}{3}$

OR

A + 2B = 60° and A + 4B = 90°

Solving to get B = 15° and A = 30°

22. $26 = 2 \times 13$

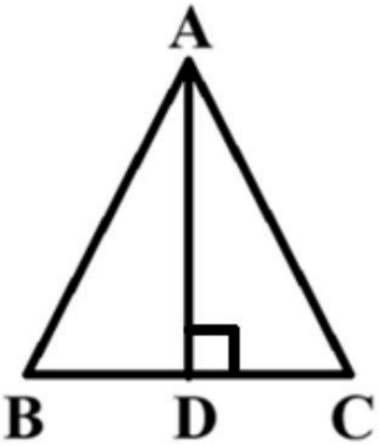
$65 = 5 \times 13$

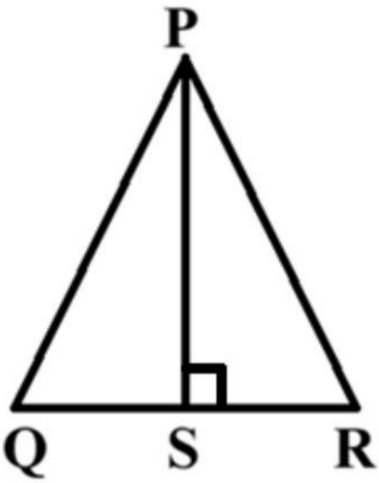
$117 = 3 \times 3 \times 13$

$\therefore$ HCF of 26, 65 and 117 = 13

and LCM of 26, 65 and 117 = $13 \times 3 \times 3 \times 2 \times 5 = 1170$

23.





$\Delta ABD \sim \Delta PQS$

$\Rightarrow \angle B = \angle Q$ ...(i)

$\Delta ACD \sim \Delta PRS$

$\Rightarrow \angle C = \angle R$ ...(ii)

From (1) & (2), we get

$\triangle ABC \sim \triangle PQR$

24. Side of square $= 14\ cm$

Area of shaded region = area of square - area of 4 quadrants

$= 14^2 - 4 \times \frac{22}{7} \times 7^2 \times \frac{90}{360}$

$= (196 - 154) = 42$

Hence, area of shaded region $= 42\ cm^2$

OR

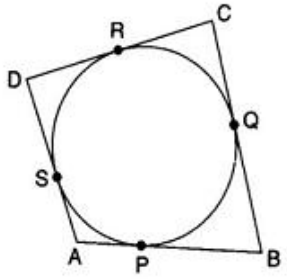
Area of quadrant = $\frac{1}{4}\pi(7)^2 = \frac{49}{4}\pi$ cm^2

Area of triangle = $\frac{1}{2} \times 7 \times 3 = \frac{21}{2}$ cm^2

Area of shaded region = $\frac{49}{4}\pi - \frac{21}{2}$

= $\frac{7}{2}\left(\frac{7}{2}\pi - 3\right)$ cm^2 or 28 cm^2

25. We know that the tangent segments from an external point to a circle are equal



$\therefore$ AP = AS .....(1)

BP = BQ .....(2)

CR = CQ .....(3)

DR = DS .....(4)

Adding (1), (2), (3) and (4), we get

(AP + BP) + (CR + DR) = (AS + BQ + CQ + DS)

$\Rightarrow$ AB + CD = (AS + DS) + (BQ + CQ)

$\Rightarrow$ AB + CD = AD + BC

Section C

26. Prime factorisation of 404 and 96 is:

404 = $2 \times 2 \times 101$

or 404 = $2^2 \times 101$

96 = $2 \times 2 \times 2 \times 2 \times 2 \times 3$

or 96 = $2^5 \times 3$

$\therefore$ HCF(404,96)= 2^2 = 4

LCM(404, 96) = $101 \times 2^5 \times 3$

LCM(404, 96) = 9696

Now we have to verify that,

HCF(404, 96) $\times$LCM(404, 96) = 404$\times$96

Hence, LHS = HCF $\times$ LC M = $4 \times 9696 = 38784$

RHS = Product of numbers = $404 \times 96 = 38784$

Since, LHS = RHS

$\therefore$ HCF $\times$ LCM = Product of 404 and 96.

Hence verified.

27. $\alpha + \beta = \frac{1}{a}, \alpha\beta = \frac{c}{a}$

Sum of zeroes of required polynomial $= \alpha + \beta - 6$

$= \frac{1}{a} - 6$ or $\frac{1-6a}{a}$

Product of zeroes of required polynomial $= \alpha\beta - 3(\alpha + \beta) + 9$

$= \frac{c}{a} - \frac{3}{a} + 9$

$\therefore$ required polynomial is $x^2 - \left(\frac{1-6a}{a}\right)x + \frac{c-3+9a}{a}$

or $ax^2 - (1 - 6a)x + (c - 3 + 9a)$

28. We have to prove :-

$\sqrt{\sec^2\theta + cosec^2\theta}$ = tan θ + cot θ.

Now, take LHS $= \sqrt{\sec^2\theta + cosec^2\theta}$

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

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

= cosecθ secθ.....(1)

Now, take RHS = tanθ + cotθ

$= \frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta} = \frac{\sin^2\theta + \cos^2\theta}{\sin\theta\cos\theta}$

$= \frac{1}{\sin\theta \cdot \cos\theta}$

= cosec θ · sec θ .....(2)

Hence, from (1) & (2)

LHS=RHS , Proved.

29. The general term of an AP is given by a_n=a+(n-1)d

and in general the sum to n terms of an A.P is given by $S_n = \frac{n}{2}$[2a+(n-1)d].

Let the common difference of the AP be d.

Now, given that a=5

Since sum of first four terms is half the sum of the next four terms,therefore,

$S_4 = \frac{1}{2}(S_8 - S_4)$

$\Rightarrow \frac{4}{2}[2(5)+3d] = \frac{1}{2}[\frac{8}{2}[2(5)+7d] - \frac{4}{2}[2(5)+3d]]$

$\Rightarrow$4[10+3d]=[4(10+7d)-2(10+3d)]

$\Rightarrow$40+12d=40+28d-20-6d

$\Rightarrow$-10d=-20

$\Rightarrow$d=2

thus, the common difference is 2.

OR

Let a and d be the first term and common difference respectively of the given A.P. Then

a_n = a + (n - 1)d

$\frac{1}{n}$ = m^{th} term

$\Rightarrow \frac{1}{n}$ = a + (m - 1) d ...(i)

$\frac{1}{m}$ = nth term

$\Rightarrow \frac{1}{m}$ = a + (n - 1) d ...(ii)

On subtracting equation (ii) from equation (i), we get

$\frac{1}{n} - \frac{1}{m}$ = [a+ (m-1) d] -[a+ (n -1)d]

= a + md - d - a - nd + d

$= (m - n)d$

$\Rightarrow \frac{m-n}{mn} = (m - n)d$

$\Rightarrow d = \frac{1}{mn}$

Putting d = $\frac{1}{mn}$ in equation (i), we get

$\frac{1}{n} = a + \frac{(m-1)}{mn}$

$\Rightarrow \frac{1}{n} = a + \frac{1}{n} - \frac{1}{mn}$

$\Rightarrow a = \frac{1}{mn}$

$\therefore$ $(mn)^{th}$ term = a + (mn - 1) d

= $\frac{1}{mn} + (mn-1)\frac{1}{mn}$ $\left[\because a = \frac{1}{mn} = d\right]$

= $\frac{1}{mn} + \frac{mn}{mn} - \frac{1}{mn}$

= 1

30.

Salary (in thousand ₹)	**No. of persons (f)**	**cf**
5-10	49	49
10-15	133	182
15-20	63	245
20-25	15	260
25-30	6	266
30-35	7	273
35-40	4	277
40-45	2	279
45-50	1	N = 280

$\frac{N}{2} = \frac{280}{2} = 140$

140 lie in the interval 10-15

So, Median class is interval 10-15

Median = l + $\frac{h}{f}(\frac{N}{2}$ - C)

Here l = 10, h = 5, f = 133, c = 49

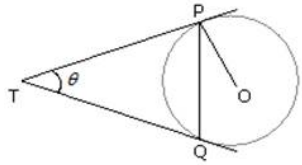
So, Median = 10 + $\frac{5}{133}$ (140 - 49)

= 10 + $\frac{5\times91}{133}$

= 10 + 3.421

= 13.421

Medium salary is ₹ 13.421 thousand, i.e., ₹ 13420

31. 

Given A circle with centre O and an external point T and two tangents TP and TQ to the circle, where P, Q are the points of contact.

To Prove: $\angle PTQ = 2\angle OPQ$

Proof: Let $\angle PTQ = \theta$

Since TP, TQ are tangents drawn from point T to the circle.

TP = TQ

$\therefore$ TPQ is an isoscles triangle

$\therefore \angle TPQ = \angle TQP = \frac{1}{2}(180^o - \theta) = 90^o - \frac{\theta}{2}$

Since, TP is a tangent to the circle at point of contact P

$\therefore \angle OPT = 90^o$

$\therefore \angle OPQ = \angle OPT - \angle TPQ = 90^o - (90^o - \frac{1}{2}\theta) = \frac{\theta}{2} = \frac{1}{2}\angle PTQ$

Thus, $\angle PTQ = 2\angle OPQ$

OR

$RZ = RY \Rightarrow RY = 6\ cm$
$QX = QY \Rightarrow QX = 8\ cm$
$PZ = PX \Rightarrow PZ = 10\ cm$
} the length of tangents drawn from an external point to a circle are equal

$PQ = PX + QX = 18\ cm$

$QR = QY + YR = 14\ cm$

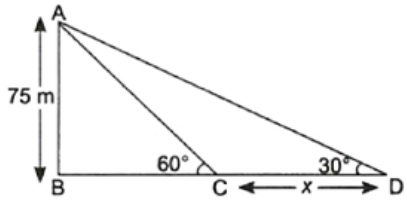
$PR = PZ + ZR = 16\ cm$

Perimeter of $\triangle PQR = PQ + QR + PR = 48\ cm$

Section D

32. Given, height of tower = AB = 75 m

Let distance between the cars = CD = x m



In $\triangle$ABC,

$\tan 60^o = \frac{AB}{BC}$

$\Rightarrow \sqrt{3} = \frac{75}{BC}$ ...($\because \tan 60^o = \sqrt{3}$)

$\Rightarrow$ BC = $\frac{75}{\sqrt{3}}$

$= \frac{75\sqrt{3}}{3}$

$= 25\sqrt{3}$ m

In $\triangle$ABD,

$\tan 30^o = \frac{AB}{BD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{75}{BC+CD}$ ...($\because \tan 30^o = \frac{1}{\sqrt{3}}$)

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{75}{25\sqrt{3}+CD}$

$\Rightarrow 25\sqrt{3}$ + CD = $75\sqrt{3}$

$\Rightarrow$ CD = $75\sqrt{3} - 25\sqrt{3}$

$= 50\sqrt{3}$

= 50×1.73

= 86.5 m

33.

Class	x_i	f_i	$u_i = \frac{x_i - 17.5}{5}$	$f_i u_i$
0-5	2.5	2	-3	-6
5-10	7.5	3	-2	-6
10-15	12.5	8	-1	-8
15-20	17.5	15	0	0
20-25	22.5	14	1	14
25-30	27.5	8	2	16
		$\sum f_i = 50$		$\sum f_i u_i = 10$

$\text{Mean} = 17.5 + 5 \times \frac{10}{50} = 18.5$

Modal class is 15-20

$\text{Mode } = 15 + 5 \times \frac{15-8}{30-8-14}$

$= 19.38$

34. Let the speed of the train be x km/hr for first 54 km and for next 63 km, speed is (x + 6) km/hr.
According to the question

$\frac{54}{x} + \frac{63}{x+6} = 3$

$\frac{54(x+6)+63x}{x(x+6)} = 3$

or, 54x + 324 + 63x = 3x(x + 6)

or, $117x + 324 = 3x^2 + 18x$

or, $3x^2 - 99x - 324 = 0$

or, $x^2 - 33x - 108 = 0$

or, $x^2 - 36x + 3x - 108 = 0$

or, x(x - 36) + 3(x - 36) = 0

(x - 36)(x + 3) = 0

x = 36

x = - 3 rejected.

(as speed is never negative)

Hence First speed of train = 36 km/h

OR

Let the two consecutive positive integers be x and (x + 1)

According to given condition,

x(x + 1) = 306

x^2 + x - 306 = 0

x^2 + 18x - 17x - 306 = 0

x(x + 18) - 17(x + 18) = 0

(x + 18) (x – 17) = 0

(x + 18) = 0 or (x – 17) = 0

x = - 18 or x = 17

but x = 17 (x is a positive integers)

x + 1 = 17 + 1 = 18

Thus the two consecutive positive integers are 17 and 18.

35. Radius of sphere $= R = 7\ cm$

Radius of cylinder $= r = 1\ cm$

Capacity of the entire glass vessel $= \pi r^2 h + \frac{4}{3}\pi R^3$

$= \frac{22}{7} \times 1 \times 1 \times 7 + \frac{4}{3} \times \frac{22}{7} \times 7 \times 7 \times 7$

$= \frac{4378}{3} cu.\ cm$ or $1459.33 cu.\ cm$

OR

Radius of a spherical bead $= R = 2.1\ mm$

radius of cylinder $= r = 1\ mm$

height of cylinder $= h = 4.2\ mm$

Volume of wood left in a bead

= Volume of sphere - Volume of cylinder

$= \frac{4}{3}\pi R^3 - \pi r^2\ h$

$= \frac{4}{3} \times \frac{22}{7} \times 2.1 \times 2.1 \times 2.1 - \frac{22}{7} \times 1 \times 1 \times 4.2$

$= 25.608 cu.\ mm$

Section E

36. i. $x + y + 2 = 15$

$x + y = 13$ ...(i)

Area of bedroom + Area of kitchen = 95

$5 \times x + 5 \times x + 5 \times y = 95$

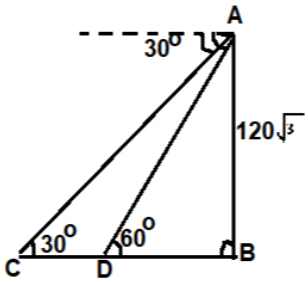
$2x + y = 19$ ...(ii)

In $\triangle ABD$

$\tan 60^o = \frac{120\sqrt{3}}{BD}$

$BD = \frac{120\sqrt{3}}{\sqrt{3}}$

BD = 120 m



In $\triangle ABC$

$\tan 30^o = \frac{AB}{BC}$

$\frac{1}{\sqrt{3}} = \frac{120\sqrt{3}}{BC}$

BC = 360 m

$\therefore$ CD = BC - BD

= 360 - 120

= 240 m

ii. Length of outer boundary

= 12 + 15 + 12 + 15

= 54 m

iii.

$$\begin{array}{r} x + y = 13 \\ 2x + y = 19 \\ - \quad - \quad - \\ \hline -x \quad = -6 \end{array}$$

x = 6

Area of bedroom 1 = $5 \times x$

= $5 \times 6 = 30\ m^2$

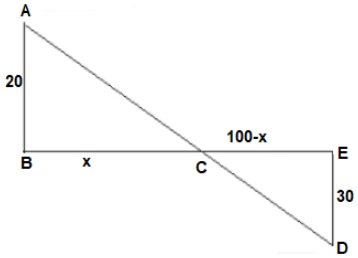
OR

Area of living room = $(5 \times 2) + (9 \times 7)$

= 10 + 63

= $73\ m^2$

37. i.



$\triangle ABC \sim \triangle DEC$

$\frac{20}{30} = \frac{x}{100-x}$

2000 - 20x = 30x

2000 = 50x

x = 40 m

ii. AA

iii. 60 metres

OR

AD = AC + CD

$= \sqrt{20^2 + 40^2} + \sqrt{60^2 + 30}^2$

$= \sqrt{400 + 1600} + \sqrt{3600 + 900}$

$= \sqrt{2000} + \sqrt{4500}$

$\Rightarrow 20\sqrt{5} + 30\sqrt{5}$

$\Rightarrow 50\sqrt{5}$ m

38. i. Co-ordinates of C are $\left(\frac{10+50}{2}, \frac{20+50}{2}\right) = C(30, 35)$

ii. Radius $= \sqrt{(30-10)^2 + (35-20)^2} = 25$

iii. a. P divides AB in the ratio $1 : 2$,

co-ordinates of P are $\left(\frac{1\times50+2\times10}{3}, \frac{1\times50+2\times20}{3}\right)$

i.e. $\left(\frac{70}{3}, 30\right)$

OR

b. Distance $AB = 2 \times 25 = 50$

$AQ = \frac{2}{3}AB = \frac{2}{3} \times 50$

$AQ = \frac{100}{3}$