QUESTION PAPER CODE 430/5/2
EXPECTED ANSWER/VALUE POINTS

SECTION A

1. For the following frequency distribution:

Class:	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25
Frequency	8	10	19	25	8

The upper limit of median class is

(A) 15 (B) 10 (C) 20 (D) 25

Sol. (A) 15 1

---

2. The probability of an impossible event is

(A) 1 (B) $\frac{1}{2}$ (C) not defined (D) 0

Sol. (D) 0 1

---

3. If (3, – 6) is the mid-point of the line segment joining (0, 0) and (x, y), then the point (x, y) is

(A) (– 3, 6) (B) (6, – 6) (C) (6, – 12) (D) $(\frac{3}{2}, -3)$

Sol. (C) (6, – 12) 1

---

4. The discriminant of the quadratic equation $4x^2 - 6x + 3 = 0$ is

(A) 12 (B) 84 (C) $2\sqrt{3}$ (D) – 12

Sol. (D) –12 1

---

5. In the given circle in Figure-1, number of tangents parallel to tangent PQ is

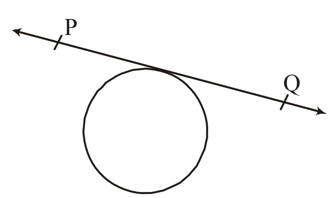


Fig. 1

(A) 0 (B) many (C) 2 (D) 1

Sol. (D) 1 1

---

6. $8 \cot^2 A - 8 \operatorname{cosec}^2 A$ is equal to

(A) 8 (B) $\frac{1}{8}$ (C) – 8 (D) $-\frac{1}{8}$

Sol. (C) –8 1

---

7. The point on x-axis which divides the line segment joining (2, 3) and (6, – 9) in the ratio 1 : 3 is

(A) (4, – 3) **(B) (6, 0)** **(C) (3, 0)** **(D) (0, 3)**

Sol. (C) (3, 0) 1

---

8. If a pair of linear equations is consistent, then the lines represented by them are

(A) parallel **(B) intersecting or coincident**

(C) always coincident **(D) always intersecting**

Sol. (B) Intersecting or coincident. 1

---

9. The total surface area of a frustum-shaped glass tumbler is ($r_1 > r_2$)

(A) $\pi r_1 l + \pi r_2 l$ **(B)** $\pi l (r_1 + r_2) + \pi r_2^2$

(C) $\frac{1}{3}\pi h(r_1^2 + r_2^2 + r_1 r_2)$ **(D)** $\sqrt{h^2 + (r_1 - r_2)^2}$

Sol. (B) $\pi l (r_1 + r_2) + \pi r_2^2$ 1

---

10. 120 can be expressed as a product of its prime factors as

(A) $5 \times 8 \times 3$ **(B)** 15×2^3 **(C)** $10 \times 2^2 \times 3$ **(D)** $5 \times 2^3 \times 3$

Sol. (D) $5 \times 2^3 \times 3$ 1

Fill the blank in question number 11 to 15.

11. Area of quadrilateral ABCD = Area of Δ ABC + Area of _______.

Sol. ΔACD 1

---

12. If the radii of two spheres are in the ratio 2 : 3, then the ratio of their respective volumers is _______.

Sol. 8/27 or 8 : 27 1

---

13. If 2 is a zero of the polynomial $ax^2 - 2x$, then the value of 'a' is _______.

Sol. 1 1

---

14. A line intersecting a circle in two points is called a _______.

Sol. Secant 1

---

15. All squares are _______ (congruent/similar).

Sol. Similar 1

Answer the following question number 16 to 20:

16. A dice is thrown once. If getting a six, is a success, then find the probability of a failure.

Sol. Total outcomes = 6 $\frac{1}{2}$

P(Failure) = $\frac{5}{6}$ $\frac{1}{2}$

---

17. Find the value of x so that – 6, x, 8 are in A.P.

Sol. $x + 6 = 8 - x$ $\frac{1}{2}$

$\boxed{x = 1}$ $\frac{1}{2}$

OR

Find the 11th term of the A.P. – 27, – 22, –17, –12, ...

Sol. $a = -27,\ d = 5$ $\frac{1}{2}$

$a_{11} = -27 + 50 = 23$ $\frac{1}{2}$

---

18. In Figure-2, the angle of elevation of the top of a tower AC from a point B on the ground is 60°. If the height of the tower is 20 m, find the distance of the point from the foot of the tower.

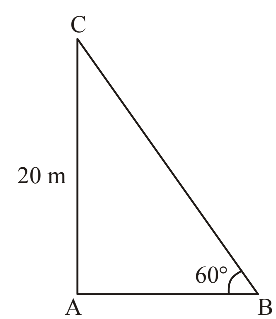


Fig. 2

Sol. $\frac{AC}{AB} = \tan 60°$ $\frac{1}{2}$

$\frac{20}{AB} = \sqrt{3}$ $\frac{1}{2}$

$AB = \frac{20\sqrt{3}}{3}$ or $AB = \frac{20}{\sqrt{3}}$

---

19. Evaluate:

tan 40° × tan 50°

Sol. $\tan 40° \times \cot 40°$ $\frac{1}{2}$

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

OR

If cos A = sin 42°, then find the value of A.

Sol. $\cos A = \sin(90° - 48°)$ $\frac{1}{2}$

$= \cos 48°$

$\Rightarrow \boxed{A = 48°}$ $\frac{1}{2}$

---

20. Find the height of a cone of radius 5 cm and slant height 13 cm.

Sol. $h = \sqrt{(13)^2 - (5)^2}$ $\frac{1}{2}$

$h = 12$ cm $\frac{1}{2}$

SECTION B

Question numbers 21 to 26 carry 2 mark each.

21. In Figure-3, ΔABC and ΔXYZ are shown. If AB = 3 cm BC = 6 cm, AC = $2\sqrt{3}$ cm, ∠A = 80°, ∠B = 60° XY = $4\sqrt{3}$ cm YZ = 12 cm and XZ = 6 cm, then find the value of ∠Y.

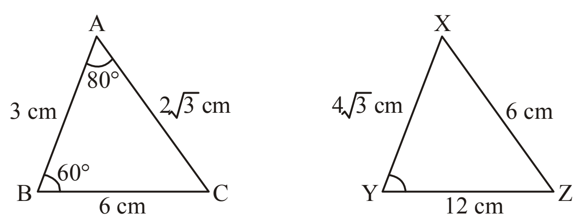


Figure 3

Sol. $\because \frac{AB}{XZ} = \frac{BC}{YZ} = \frac{AC}{XY} = \frac{1}{2}$ 1

$\therefore$ ΔABC ~ ΔXZY $\frac{1}{2}$

∠C = ∠Y = 40° $\frac{1}{2}$

---

22. Find the mean for the following distribution:

Classes:	**5 – 15**	**15 – 35**	**25 – 35**	**35 – 45**
Frequency:	**2**	**4**	**3**	**1**

Sol. Classes	**Freq.**	**Mid value = x**	**f × x**		
				Correct table	1
5-15	2	10	20	$\overline{x} = \frac{\Sigma fx}{\Sigma f}$	$\frac{1}{2}$
15-25	4	20	80	$= \frac{230}{10} = 23$	$\frac{1}{2}$
25-35	3	30	90		
35-45	1	40	40		
	$\Sigma f = 10$		$\Sigma fx = 230$		

OR

The following distribution shows the transport expenditure of 100 employees:

Expenditure (in ₹):	**200 – 400**	**400 – 600**	**600 – 800**	**800 – 1000**	**1000 – 1200**
Number of employees:	**21**	**25**	**19**	**23**	**12**

Find the mode of the distribution.

Sol. Modal class = 400 – 600 $\frac{1}{2}$

$$\text{Mode} = l + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h \qquad \frac{1}{2}$$

$$= 400 + \left[\frac{25-21}{50-21-19}\right] \times 200 \qquad \frac{1}{2}$$

$$= 400 + 80 = 480 \qquad \frac{1}{2}$$

---

23. **Solve for x:**

$$\mathbf{2x^2 + 5\sqrt{5}\,x - 15 = 0}$$

Sol. $D = \left(5\sqrt{5}\right)^2 - 4 \times 2 \times (-15)$

$= 245$ $\frac{1}{2}$

$$x = \frac{-b \pm \sqrt{D}}{2a} = \frac{-5\sqrt{5} \pm 7\sqrt{5}}{4} \qquad 1$$

$$x = \frac{\sqrt{5}}{2}, -3\sqrt{5} \qquad \frac{1}{2}$$

---

24. Check whether 6^n can end with the digit '0' (zero) for any natural number n.

Sol. $6^n = (2 \times 3)^n = 2^n \times 3^n$ 1

It is not in form of $2^n \times 5^m$ $\frac{1}{2}$

$\therefore$ 6^n can't end with digit '0' $\frac{1}{2}$

OR

Find the LCM of 150 and 200.

Sol. $150 = 2 \times 3 \times 5^2$ $\frac{1}{2}$

$200 = 2^3 \times 5^2$ $\frac{1}{2}$

$\text{LCM} = 2^3 \times 5^2 \times 3$ $\frac{1}{2}$

$= 600$ $\frac{1}{2}$

---

25. If 5 tan θ = 4, show that $\frac{5\sin\theta - 3\cos\theta}{5\sin\theta + 3\cos\theta} = \frac{1}{7}$.

Sol. $\tan\theta = \frac{4}{5}$ $\frac{1}{2}$

$\text{LHS} = \frac{5\tan\theta - 3}{5\tan\theta + 3}$ 1

$\Rightarrow \frac{5 \times \frac{4}{5} - 3}{5 \times \frac{4}{5} + 3} = \frac{1}{7}$ $\frac{1}{2}$

---

26. 14 defective bulbs are accidentally mixed with 98 good ones. It is not possible to just look at the bulb and tell whether it is defective or not. One bulb is taken out at random from this lot. Determine the probability that the bulb taken out is a good one.

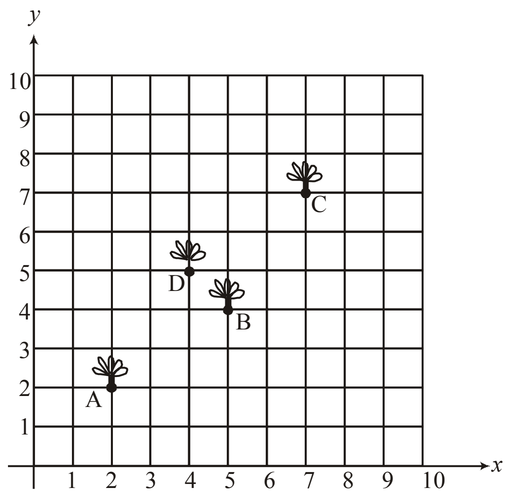
Sol. Total outcomes = 14 + 98 = 112 1

P(good bulb) = $\frac{98}{112}$ or $\frac{7}{8}$ 1

SECTION C

Question number 27 to 34 carry 3 marks each.

27. Krishna has an apple orchard which has a 10 m × 10 m sized kitchen garden attached to it. She divides it into a 10 × 10 grid and puts soil and manure into it. She grows a lemon plant at A, a coriander plant at B, an onion plant at C and a tomato plant at D. Her husband Ram praised her kitchen garden and points out that on joining A, B, C and D they may form a parallelogram. Look at the below figure carefully and answer the following questions:



(i) Write the coordinates of the points A, B, C and D, using the 10 × 10 grid as coordinate axes.

(ii) Find whether ABCD is a parallelogram or not.

Sol. (i) Coordinates are A(2, 2), B(5, 4), C(7, 7), D(4, 5) $4\times\frac{1}{2}=2$

(ii) $AB = \sqrt{(5-2)^2+(4-2)^2} = \sqrt{13}$

$BC = \sqrt{13}$

$CD = \sqrt{13}$

$DA = \sqrt{13}$ $\left[\begin{array}{l}\because AB = BC = CD = DA \\ \therefore \text{ABCD is a parallelogram}\end{array}\right]$ 1

---

28. Prove that $\sqrt{3}$ is an irrational number.

Sol. Let $\sqrt{3}$ is rational

$\sqrt{3} = \frac{a}{b}$ (where a & b are +ve integers & co-prime, b ≠ 0) $\frac{1}{2}$

$a^2 = 3b^2$ ...(i)

3 divides a^2

$\therefore$ 3 divides a also 1

Let a = 3c & put in (i)

$(3c)^2 = 3(b)^2$

$3c^2 = b^2$

$\Rightarrow$ 3 divides b^2

$\therefore$ 3 divides b also 1

$\therefore$ 3 divides a and b both

This contradicts our assumption

Therefore, $\sqrt{3}$ is irrational no. $\frac{1}{2}$

---

29. Prove that:

$$\frac{\tan\theta}{1-\cot\theta}+\frac{\cot\theta}{1-\tan\theta} = 1 + \sec\theta\ \text{cosec}\ \theta$$

Sol. $\text{LHS} = \dfrac{\frac{\sin\theta}{\cos\theta}}{1-\frac{\cos\theta}{\sin\theta}}+\dfrac{\frac{\cos\theta}{\sin\theta}}{1-\frac{\sin\theta}{\cos\theta}}$ 1

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

$$= \frac{\sin^3\theta-\cos^3\theta}{\sin\theta\cdot\cos\theta(\sin\theta-\cos\theta)}$$ 1

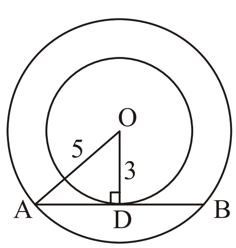
$$= \frac{1+\sin\theta\cdot\cos\theta}{\sin\theta\cos\theta}=\frac{1}{\sin\theta}\times\frac{1}{\cos\theta}+1$$

$= \text{cosec}\ \theta\cdot\sec\ \theta + 1 = \text{RHS}$ 1

---

30. Two concentric circles are of radii 5 cm and 3 cm. Find the length of chord of the larger circle which touches the smaller circle.

Sol.



Correct figure 1

In ΔAOB, $OA^2 = AD^2 + OD^2$

$(5)^2 = AD^2 + (3)^2$ 1

$\therefore AD^2 = 16$

$AD = 4$ $\frac{1}{2}$

$\therefore$ Length of chord i.e. $AB = 4 \times 2 = 8$ cm $\frac{1}{2}$

31. The difference between two numbers is 26 and the larger number exceeds thrice of the smaller number by 4. Find the numbers.

Sol. Let larger No. = x

Let smaller No = y

$x - y = 26$ ...(i) 1

$x - 3y = 4$ ...(ii) 1

By solving (i) & (ii), we get

$\therefore \quad x = 37$ $\frac{1}{2}$

$y = 11$ $\frac{1}{2}$

OR

Solve for x and y:

$$\frac{2}{x} + \frac{3}{y} = 13 \text{ and } \frac{5}{x} - \frac{4}{y} = -2$$

Sol. Let $\frac{1}{x} = p$ & $\frac{1}{y} = q$

$2p + 3q = 13$ ...(i) $\frac{1}{2}$

$5p - 3q = -2$ ...(ii) $\frac{1}{2}$

By solving (i) & (ii), we get

$\therefore \quad p = 2, \ q = 3$ 1

$\therefore \quad \frac{1}{x} = 2, \quad \frac{1}{y} = 3$

$\boxed{x = \frac{1}{2}}$ $\boxed{y = \frac{1}{3}}$ 1

32. **In Figure-4, AB and CD are two diameters of a circle (with centre O) perpendicular to each other and OD is the diameter of the smaller circle.**

If OA = 7 cm, then find the area of the shaded region.

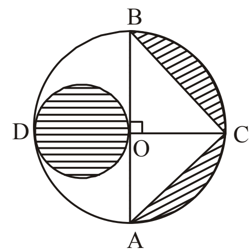


Fig. 4

Sol. Area of smaller circle = $\pi r^2 = \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} = \frac{77}{2} = 38.5\ \text{cm}^2$ 1

Area of Big semi-circle = $\frac{1}{2} \times \frac{22}{7} \times 7 \times 7 = 77\ \text{cm}^2$ $\frac{1}{2}$

Area of ΔABC = $\frac{1}{2} \times 14 \times 7 = 49\ \text{cm}^2$ $\frac{1}{2}$

Area of shaded portion = ar. of smaller circle + ar. of big semicircle – ar. of ΔABC

$= 38.5 + 77 - 49 = 66.5\ \text{cm}^2$ 1

OR

In Figure-5, ABCD is a square with side 7 cm. A circle is drawn circumscribing the square. Find the area of the shaded region.

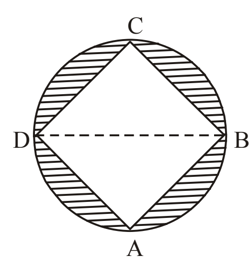


Fig. 5

Sol. Area of sqaure ABCD = $a^2 = 7^2 = 49\ \text{cm}^2$ $\frac{1}{2}$

Diagonal of square = $\sqrt{2}a = 7\sqrt{2}$ cm 1

$\therefore$ Radius of circle = $\frac{7\sqrt{2}}{2}$ cm $\frac{1}{2}$

Area of circle = $\frac{22}{7}\times\left(\frac{7\sqrt{2}}{2}\right)^2 = 77\ cm^2$ $\frac{1}{2}$

Area of shaded, portion = 77 – 49 = 28 cm^2 $\frac{1}{2}$

---

33. Construct a triangle with its sides 4 cm, 5 cm and 6 cm. Then construct a triangle similar to it whose sides are $\frac{2}{3}$ of the corresponding sides of the first triangle.

Sol. For correct construction of Δ 1

For construction of similar Δ 2

OR

Draw a circle of radius 2.5 cm. Take a point P at a distance of 8 cm from its centre. Construct a pair of tangents from the point P to the circle.

Sol. For draw the correct circle & exterior pt. 1

For construction of the pair of tangents 2

---

34. If the sum of first 7 terms of an A.P. is 49 and that of 17 terms is 289, then find the sum of first n terms.

Sol. $\because \frac{7}{2}[2a+6d]=49$

$a + 3d = 7$ ...(i) 1

$\frac{17}{2}[2a+16d]=289$

$a + 8d = 17$ ...(ii) $\frac{1}{2}$

By solving the eq. (i) & (ii)

$a = 1,\ d = 2$ $\frac{1}{2}$

$\therefore\ S_n = \frac{n}{2}[2+(n-1)\times 2]$

$= \frac{n}{2}\times 2n = n^2$ 1

SECTION D

Question number 35 to 40 carry 4 marks each.

35. Two water taps together can fill a tank in $9\frac{3}{8}$ hours. The tap of larger diameter takes 10 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank.

Sol. Let smaller diameter tap takes x hours to fill the tank

Then, time taken by larger diameter tap to fill the tank = (x – 10) hr $\frac{1}{2}$

ATQ

$$\frac{1}{x} + \frac{1}{x-10} = \frac{8}{75} \qquad 1\frac{1}{2}$$

$$8x^2 - 230x + 750 = 0 \qquad \frac{1}{2}$$

$$(8x - 30)(x - 25) = 0 \qquad \frac{1}{2}$$

$$x = \frac{15}{4} \text{ and } x = 25 \qquad \frac{1}{2}$$

Rejected $x = \frac{15}{4}$,

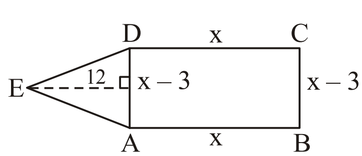
Hence, time taken by smaller diameter tap = 25 hrs

Time taken by larger diameter tap = 25 – 10 = 15 hrs $\frac{1}{2}$

OR

A rectangular park is to be designed whose breadth is 3 m less than its length. Its area is to be 4 square metres more than the area of a park that has already been made in the shape of an isosceles triangle with its base as the breadth of the Rectangular park and of altitude 12 m. Find the length and breadth of the park.

Sol.



Correct figure $\frac{1}{2}$

Let length of rectangle = x

$\therefore$ Breadth = x – 3

ar. of reactangle = x(x – 3)

$= x^2 - 3x$ 1

Area of Isosceles ΔADE

$= \frac{1}{2}(x-3)\times 12$

$= 6x - 18$ $\frac{1}{2}$

ATQ

$x^2 - 3x = 6x - 18 + 4$ 1

$x^2 - 9x + 14 = 0$

$(x - 7)(x - 2) = 0$

$x = 7, x = 2$ Rejected $\frac{1}{2}$

$\therefore$ Length of rectangle = 7 cm

Breadth of rectangle = 4 cm $\frac{1}{2}$

---

36. Find the curved surface area of frustum of a cone of height 12 cm and radii of circular ends are 9 cm and 4 cm.

Sol. $l = \sqrt{(r_1 - r_2)^2 + h^2} = \sqrt{(5)^2 + (12)^2} = 13\text{ cm}$ $1\frac{1}{2}$

$\therefore$ C.S.A of frustom of cone = $\pi l(r_1 + r_2)$

$= \pi \times 13(9 + 4)$ $1\frac{1}{2}$

$= 169\pi$ or $531.14\ cm^2$ 1

---

37. Draw a 'less than' ogive for the following frequency distribution:

Classes:	**0 – 10**	**10 – 20**	**20 – 30**	**30 – 40**	**40 – 50**	**50 – 60**	**60 – 70**	**70 – 80**
Frequency:	**7**	**14**	**13**	**12**	**20**	**11**	**15**	**8**

Sol.

getting the pts (10, 7), (20, 21)

(30, 34), (40, 46), (50, 66)

(60, 77), (70, 92), (80, 100) 2

Plotting and Joining the points to get the correct ogive 2

38. **If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, prove that the other two sides are divided in the same ratio.**

Sol. For correct given, To prove, Construction, Figure $4\times\frac{1}{2}=2$

For correct proof 2

OR

If Figure-6, in an equilateral triangle ABC, AD $\perp$ BC, BE $\perp$ AC and CF $\perp$ AB. Prove that $4(AD^2 + BE^2 + CF^2) = 9\,AB^2$.

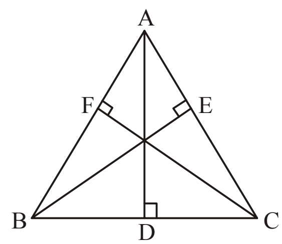


Figure 6

Sol. **Proof**

In ΔABD, $AD^2 = AB^2 - BD^2$ ...(i)

In ΔBCE $BE^2 = BC^2 - CE^2$ ...(ii)

In ΔACF $CF^2 = AC^2 - AF^2$ ...(iii)

$3\times\frac{1}{2}=1\frac{1}{2}$

$AD^2 + BE^2 + CF^2 = AB^2 + BC^2 + AC^2 - BD^2 - CE^2 - AF^2$ 1

$$= 3AB^2 - \left(\frac{BC}{2}\right)^2 - \left(\frac{AC}{2}\right)^2 - \left(\frac{AB}{2}\right)^2$$

$$= 3AB^2 - \frac{3}{4}AB^2$$

$$= \frac{9}{4}AB^2$$

$4(AD^2 + BE^2 + CF^2) = 9AB^2$ $1\frac{1}{2}$

---

39. **Find other zeroes of the polynomial**
$p(x) = 3x^4 - 4x^3 - 10x^2 + 8x + 8$,
if two of its zeroes are $\sqrt{2}$ and $-\sqrt{2}$.

Sol. $\left(x-\sqrt{2}\right)$ & $\left(x+\sqrt{2}\right)$ are two factors

i.e. $x^2 - 2$ is a factor 1

$$
\begin{array}{r|l}
 & 3x^2 - 4x - 4 \\
\hline
x^2 - 2 & 3x^4 - 4x^3 - 10x^2 + 8x + 8 \\
 & 3x^4 \qquad\quad - 6x^2 \\
 & - \qquad\qquad + \\
\hline
 & -4x^3 - 4x^2 + 8x + 8 \\
 & -4x^3 \qquad\quad + 8x \\
 & + \qquad\qquad - \\
\hline
 & -4x^2 + 8 \\
 & -4x^2 + 8 \\
 & + \qquad - \\
\hline
 & 0
\end{array}
$$

2

$3x^2 - 4x - 4 = (3x + 2)(x - 2)$ $\frac{1}{2}$

$\therefore$ $-2/3$, 2 are other two zeroes. $\frac{1}{2}$

OR

Divide the polynomial $g(x) = x^3 - 3x^2 + x + 2$ by the polynomial $x^2 - 2x + 1$ and verify the division algorithm.

Sol.

$$
\begin{array}{r|l}
 & x - 1 \\
\hline
x^2 - 2x + 1 & x^3 - 3x^2 + x + 2 \\
 & x^3 - 2x^2 + x \\
 & - \quad + \qquad - \\
\hline
 & -x^2 + 2 \\
 & -x^2 - 1 + 2x \\
 & + \qquad + \quad - \\
\hline
 & -2x + 3
\end{array}
$$

2

Verify,

$P(x) = q(x) \times g(x) + r(x)$

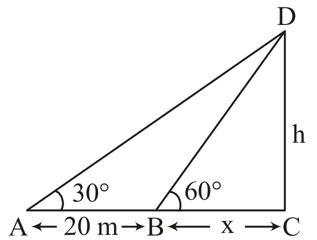
$= (x - 1)(x^2 - 2x + 1) + (-2x + 3)$ 1

$= x^3 - 3x^2 + 3x - 1 - 2x + 3$

$= x^3 - 3x^2 + x + 2$ 1

40. A TV tower stands vertically on the bank of a canal. From a point on the other bank directly opposite the tower, the angle of elevation of the top of the tower is 60°. From another point on the bank, which is 20 m away from this point, on the line joining this point to the foot of the tower, the angle of elevation of the top of the tower is 30°. Find the width of the canal.

Sol.



Correct figure 1

In ΔBCD, $\frac{h}{x} = \sqrt{3}$

$\therefore$ $h = \sqrt{3}x$ 1

In ΔACD, $\frac{h}{x+20} = \frac{1}{\sqrt{3}}$ 1

$\sqrt{3}h = x + 20$

By putting $h = \sqrt{3}x$

$\Rightarrow 3x = x + 20$

$\therefore$ $x = 10$

$\therefore$ width of canal = 10 m 1