

QUESTION PAPER CODE 430/4/2  
**EXPECTED ANSWER/VALUE POINTS**

**SECTION A**

Question numbers 1 to 20 carry 1 mark each.

Choose the correct option in question numbers 1 to 10.

1. The second term from the end of the A.P. 5, 8, 11, ..., 47 is

(A) 50                                      (B) 45                                      (C) 44                                      (D) 41

Sol. (C) 44

1

2. Number of zeroes of the polynomial  $p(x)$  shown in Figure-1, are

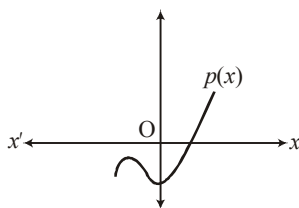


Figure 1

(A) 3                                      (B) 2                                      (C) 1                                      (D) 0

Sol. (C) 1

1

3. If  $\sin A = \cos A$ ,  $0 \leq A \leq 90^\circ$ , then the angle  $A$  is equal to

(A)  $30^\circ$                                       (B)  $60^\circ$                                       (C)  $0^\circ$                                       (D)  $45^\circ$

Sol. (D)  $45^\circ$

1

4. Total surface area of a solid hemisphere is

(A)  $3\pi r^2$                                       (B)  $2\pi r^2$                                       (C)  $4\pi r^2$                                       (D)  $\frac{2}{3}\pi r^3$

Sol. (A)  $3\pi r^2$

1

5. Given that  $\text{HCF}(156, 78) = 78$ ,  $\text{LCM}(156, 78)$  is

(A) 156                                      (B) 78                                      (C)  $156 \times 78$                                       (D)  $156 \times 2$

Sol. (A) 156

1

6. Areas of two similar triangles are in the ratio 16 : 81. Therefore, corresponding sides of these triangles are in the ratio

(A) 9 : 4                                      (B) 4 : 9                                      (C) 2 : 3                                      (D) 16 : 81

Sol. (B) 4 : 9

1

7. The distance between the points  $(-1, -3)$  and  $(5, -2)$  is

- (A)  $\sqrt{61}$  units                      (B)  $\sqrt{37}$  units                      (C) 5 units                      (D)  $\sqrt{17}$  units

Sol. (B)  $\sqrt{37}$  units 1

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

- (A)  $-8$                       (B) 10                      (C) 8                      (D)  $2\sqrt{2}$

Sol. (A)  $-8$  1

OR

Roots of the quadratic equation  $2x^2 - 4x + 3 = 0$  are

- (A) real and equal                      (B) real and distinct                      (C) not real                      (D) real

Sol. (C) Not Real 1

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9. The value of  $k$  for which the equations  $3x - y + 8 = 0$  and  $6x + ky = -16$  represent coincident lines, is

- (A)  $-\frac{1}{2}$                       (B)  $\frac{1}{2}$                       (C) 2                      (D)  $-2$

Sol. (D)  $-2$  1

---

10. A dice is thrown once. The probability of getting an odd number is

- (A) 1                      (B)  $\frac{1}{2}$                       (C)  $\frac{4}{6}$                       (D)  $\frac{2}{6}$

Sol. (B)  $\frac{1}{2}$  1

---

Fill in the blanks in question numbers 11 to 15.

11. For a given distribution with 100 observations, the 'less than' ogive and 'more than' ogive intersect at  $(58, 50)$ . The median of the distribution is \_\_\_\_\_.

Sol. 58 1

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12. In a quadratic polynomial  $x^2 - 6x$ , product of the zeroes is \_\_\_\_\_.

Sol. 0 (zero). 1

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13. The roots of the equation,  $x^2 + bx + c = 0$  are equal if \_\_\_\_\_.

Sol.  $b^2 = 4c$  1

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14. The lengths of the tangents drawn from an external point to a circle are \_\_\_\_\_.

Sol. Equal 1

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15. The mid-point of the line segment joining the points  $(-3, -3)$  and  $(-3, 3)$  is \_\_\_\_\_.

Sol.  $(-3, 0)$  1

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16. If  $\operatorname{cosec} \theta = \frac{5}{4}$ , find the value of  $\cot \theta$ .

Sol.  $\cot^2 \theta = \frac{25}{16} - 1 = \frac{9}{16}$  1

$\cot \theta = \frac{3}{4}$  1

**OR**

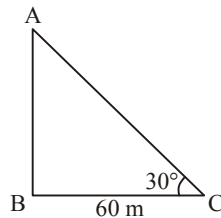
Find the value of  $\sin 42^\circ - \cos 48^\circ$ .

Sol.  $\sin 42^\circ = \cos (90^\circ - 42^\circ) = \cos 48^\circ$  1

$\therefore \sin 42^\circ - \cos 48^\circ = 0$  1

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17. The angle of elevation of the top of the tower AB from a point C on the ground, which is 60 m away from the foot of the tower, is  $30^\circ$ , as shown in Figure-2. Find the height of the tower.



**Figure 2**

Sol.  $\tan 30^\circ = \frac{AB}{60}$  1

$\Rightarrow AB = \frac{60}{\sqrt{3}}$  or  $20\sqrt{3}$  m 1

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18. In Figure-3, find the length of the tangent PQ drawn from the point P to a circle with centre at O, given that OP = 12 cm and OQ = 5 cm.

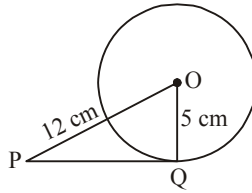


Figure 3

Sol.  $PQ^2 = 144 - 25 = 119$   $\frac{1}{2}$

$\therefore PQ = \sqrt{119}$  units  $\frac{1}{2}$

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19. Write the 31<sup>st</sup> term of the A.P.  $-50, -47, -44, \dots$

Sol.  $a_{31} = (-50) + 30 \times 3$   $\frac{1}{2}$

$= 40$   $\frac{1}{2}$

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20. Find the coordinates of the point on x-axis which divides the line segment joining the points (2, 3) and (5, -6) in the ratio 1 : 2.

Sol. Let the point on x-axis be (x, 0)  $\frac{1}{2}$

$\therefore$  Required point is (3, 0)  $\frac{1}{2}$

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### SECTION B

Question numbers 21 to 26 carry 2 marks each.

21. If  $\sec 2A = \operatorname{cosec} (A - 30^\circ)$ ,  $0^\circ < 2A < 90^\circ$ , then find the value of  $\angle A$ .

Sol.  $\sec 2A = \operatorname{cosec} (A - 30^\circ)$   
 $\Rightarrow \operatorname{cosec} (90^\circ - 2A) = A - 30^\circ$  1

$\Rightarrow 90^\circ - 2A = A - 30^\circ$   $\frac{1}{2}$

$\Rightarrow \angle A = 40^\circ$   $\frac{1}{2}$

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22. Using Euclid's Division Lemma, find HCF of 54 and 90.

Sol. Using Euclid's division lemma

$$90 = 54 \times 1 + 36$$

 $\frac{1}{2}$ 

$$54 = 36 \times 1 + 18$$

 $\frac{1}{2}$ 

$$36 = 18 \times 2 + 0$$

 $\frac{1}{2}$ 

$\therefore$  HCF of 54 and 90 is 18.

 $\frac{1}{2}$ 

23. The following table shows the ages of the patients admitted in a hospital during a year:

Age (in years):	5 – 15	15 – 25	25 – 35	35 – 45	45 – 55	55 – 65
Number of patients:	60	110	210	230	150	50

Find the mode of the distribution

Sol. Modal class is 35 – 45

 $\frac{1}{2}$ 

$$\therefore \text{Mode} = 35 + \frac{230 - 210}{460 - 210 - 150} \times 10$$

1

$$= 37$$

 $\frac{1}{2}$ 

24. How many two-digit numbers are divisible by 6?

Sol. Two digit numbers divisible by 6 are 12, 18, 24,...96

1

$$96 = 12 + (n - 1) \times 6$$

 $\frac{1}{2}$ 

$$\Rightarrow n = 15$$

 $\frac{1}{2}$ 

OR

In an A.P. it is given that common difference is 5 and sum of its first ten terms is 75. Find the first term of the A.P.

Sol.  $S_{10} = 75$  and  $n = 10$

 $\frac{1}{2}$ 

$$\frac{10}{2}(2a + 9 \times 5) = 75$$

1

$$\Rightarrow a = -15$$

 $\frac{1}{2}$

25. The diameter of a solid metallic sphere is 16 cm. The sphere is melted and recast into solid spherical balls of radius 2 cm. Determine the number of balls.

Sol.  $r = 8$  cm.  $\frac{1}{2}$

$$\therefore \frac{4}{3}\pi \times 8 \times 8 \times 8 = n \times \frac{4}{3}\pi \times 2 \times 2 \times 2$$

1

$$\Rightarrow n = 64$$

$\frac{1}{2}$

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26. In Figure-4,  $\triangle ABC$  and  $\triangle XYZ$  are shown. If  $AB = 3.8$  cm,  $AC = 3\sqrt{3}$  cm,  $BC = 6$  cm,  $XY = 6\sqrt{3}$  cm,  $XZ = 7.6$  cm,  $YZ = 12$  cm and  $\angle A = 65^\circ$ ,  $\angle B = 70^\circ$ , then find the value of  $\angle Y$ .

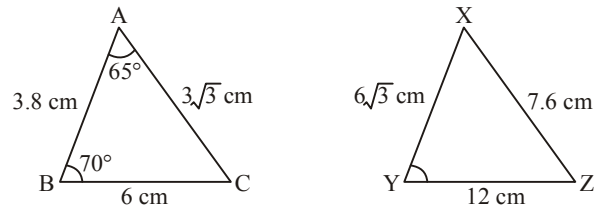


Figure 4

Sol.  $\triangle ABC \sim \triangle XZY$  1

$$\Rightarrow \angle Y = \angle C = 180^\circ - (\angle A + \angle B)$$

$\frac{1}{2}$

$$\Rightarrow \angle Y = 45^\circ$$

$\frac{1}{2}$

OR

If the areas of two similar triangles are equal, show that they are congruent.

Sol. Let  $\triangle ABC \sim \triangle PQR$

$$\therefore \frac{\text{ar}(ABC)}{\text{ar}(PQR)} = 1 = \frac{AB^2}{PQ^2} = \frac{BC^2}{QR^2} = \frac{AC^2}{PR^2}$$

1

$$\Rightarrow AB = PQ, BC = QR, AC = PR$$

$\frac{1}{2}$

$$\therefore \triangle ABC \cong \triangle PQR \text{ (SSS congruence rule)}$$

$\frac{1}{2}$

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## SECTION C

Question numbers 27 to 34 carry 3 marks each.

27. Prove that if  $x = a \sin \theta + b \cos \theta$  and  $y = a \cos \theta - b \sin \theta$ , then  $x^2 + y^2 = a^2 + b^2$ .

Sol. LHS =  $(a \sin \theta + b \cos \theta)^2 + (a \cos \theta - b \sin \theta)^2$   
 $= a^2(\sin^2 \theta + \cos^2 \theta) + b^2(\cos^2 \theta + \sin^2 \theta)$  2  
 $= a^2 + b^2 = \text{RHS.}$  1

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28. 5 pencils and 7 pens together cost ₹ 250 whereas 7 pencils and 5 pens together cost ₹ 302. Find the cost of one pencil and that of a pen.

Sol. Let the cost of 1 pencil be ₹ x and cost of 1 pen be ₹ y.  
 $5x + 7y = 250$  ...(i) 1  
 $7x + 5y = 302$  ...(ii) 1  
 Solving (i) and (ii)  
 $x = 36$  and  $y = 10$  1  
 Hence, cost of 1 pencil = ₹ 36  
 cost of 1 pen = ₹ 10

OR

Solve the following pair of equations using cross-multiplication method:

$$x - 3y - 7 = 0$$

$$3x - 5y - 15 = 0$$

Sol.  $\frac{x}{(-3)(-15) - (-5)(-7)} = \frac{y}{(-7)3 - (-15)} = \frac{1}{-5 - 3(-3)}$  1  $\frac{1}{2}$

$$\Rightarrow \frac{x}{10} = \frac{y}{-6} = \frac{1}{4}$$
 1  $\frac{1}{2}$ 

$$\Rightarrow x = \frac{5}{2}$$
 1  $\frac{1}{2}$ 

$$\Rightarrow y = \frac{-3}{2}$$
 1  $\frac{1}{2}$ 


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29. One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting

(i) a king of red colour.

(ii) the queen of diamonds.

(iii) an ace.

**Sol.** Total number of possible outcomes = 52

$$(i) \quad P(\text{Card is a king of Red colour}) = \frac{2}{52} \text{ or } \frac{1}{26} \quad 1$$

$$(ii) \quad P(\text{card is a queen of diamonds}) = \frac{1}{52} \quad 1$$

$$(iii) \quad P(\text{Card is an ace}) = \frac{4}{52} \text{ or } \frac{1}{13} \quad 1$$

**OR**

**A box contains 90 discs which are numbered from 1 to 90. If one disc is drawn at random from the box, find the probability that it bears**

(i) a two-digit number.

(ii) a perfect square number.

(iii) a prime, number less than 15.

**Sol.** Total number of possible outcomes = 90

$$(i) \quad P(\text{a two digit number}) = \frac{81}{90} \text{ or } \frac{9}{10} \quad 1$$

$$(ii) \quad P(\text{a perfect square number}) = \frac{9}{90} \text{ or } \frac{1}{10} \quad 1$$

$$(iii) \quad P(\text{a prime number less than 15}) = \frac{6}{90} \text{ or } \frac{1}{15} \quad 1$$


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30. In Figure-7, ABCD is a square of side 14 cm. From each corner of the square, a quadrant of a circle of radius 3.5 cm is cut and also a circle of radius 4 cm is cut as shown in the figure. Find the area of the remaining (shaded) portion of the square.

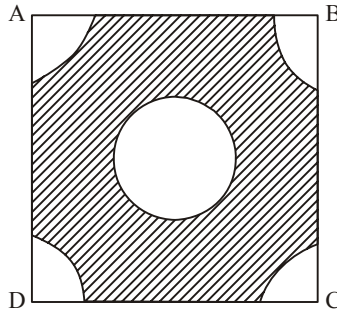


Figure 7

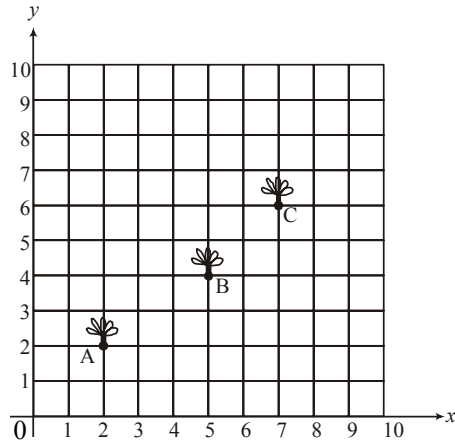
- Sol.** Area of the square =  $14 \times 14 = 196 \text{ cm}^2$   $\frac{1}{2}$
- Area of middle circle =  $\frac{22}{7} \times 4 \times 4 = 50.28 \text{ cm}^2$  1
- Area of four quadrants =  $4 \times \frac{1}{4} \times \frac{22}{7} \times 3.5 \times 3.5$
- $= 38.5 \text{ cm}^2$  1
- Hence, Area of Remaining part of square.
- $= 196 - (50.28 + 38.5)$
- $= 107.22 \text{ cm}^2$   $\frac{1}{2}$
- 

31. Construct an equilateral triangle of side length 5 cm each. Then construct another triangle, whose sides are  $\frac{2}{3}$  of the corresponding sides of the first triangle.

- Sol.** Correct construction of equilateral triangle. 1
- Correct construction of similar triangle. 2
-

32. Seema has a  $10\text{ m} \times 10\text{ m}$  kitchen garden attached to her kitchen. She divides it into a  $10 \times 10$  grid and wants to grow some vegetables and herbs used in the kitchen. She puts some soil and manure in that and sows a green chilly plant at A, a coriander plant at B and a tomato plant at C.

Her friend Kusum visited the garden and praised the plants grown there. She pointed out that they seem to be in a straight line. See the below diagram carefully and answer the following questions:



Figure

- (i) Write the coordinates of the points A, B and C taking the  $10 \times 10$  grid as coordinate axes.  
 (ii) By distance formula or some other formula, check whether the points are collinear.

Sol. (i) Coordinates of A, B and C are

$$(2, 2), (5, 4), (7, 6)$$

$$\frac{1}{2} + \frac{1}{2} + \frac{1}{2}$$

$$(ii) \text{ Area of triangle} = \frac{1}{2} [2(4-6) + 5(6-2) + 7(2-4)]$$

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

$$= 1 \neq 0$$

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

$\therefore$  Points are not collinear

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

33. Prove that  $\sqrt{5}$  is an irrational number.

Sol. Let  $\sqrt{5}$  be a rational number.

$$\sqrt{5} = \frac{p}{q} \text{ where } p \text{ and } q \neq 0 \text{ are integers and coprime.}$$

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

$$\Rightarrow p^2 = 5q^2 \Rightarrow p^2 \text{ is divisible by } 5.$$

$$\Rightarrow p \text{ is divisible by } 5$$

...(i)

1

Let  $p = 5m$ ,  $m$  is a positive integer.

$\therefore 25m^2 = 5q^2 \Rightarrow q^2$  is divisible by 5.

$\Rightarrow q$  is divisible by 5.

...(ii)

1

Using (i) and (ii),  $p$  and  $q$  are not coprime.

Which is contradiction.

Thus  $\sqrt{5}$  is an irrational number.

$\frac{1}{2}$

34. In Figure-5, a circle is inscribed in a  $\triangle ABC$  touching  $BC$ ,  $CA$  and  $AB$  at  $P$ ,  $Q$  and  $R$  respectively. If  $AB = 10$  cm,  $AQ = 7$  cm,  $CQ = 5$  cm, find the length of  $BC$ .

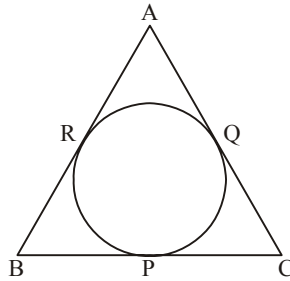


Figure 5

**Sol.**  $AR = AQ = 7$  cm

1

$BR = AB - AR = 10 - 7 = 3$  cm

$\frac{1}{2}$

$BC = BP + PC$

$= BR + CQ$

1

$= 3 + 5 = 8$  cm

$\frac{1}{2}$

OR

In Figure-6, two tangents  $TP$  and  $TQ$  are drawn to a circle with centre  $O$  from an external point  $T$ . Prove that  $\angle PTQ = 2 \angle OPQ$ .

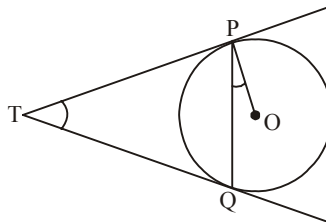


Figure 6

**Sol.** Let  $\angle PTQ = \theta$

$$\therefore TP = TQ$$

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

$$= 90^\circ - \frac{1}{2}\theta \quad \frac{1}{2}$$

$$\therefore \angle TPO = 90^\circ$$

$$\therefore \angle OPQ = 90^\circ - \left(90^\circ - \frac{1}{2}\theta\right) \quad 1$$

$$= \frac{1}{2}\theta = \frac{1}{2}\angle PTQ$$

$$\Rightarrow \angle PTQ = 2 \angle OPQ \quad \frac{1}{2}$$

### SECTION D

Questions numbers 35 to 40 carry 4 marks each.

35. A bucket is in the form of a frustum of a cone of height 30 cm with the radii of its lower and upper circular ends as 10 cm and 20 cm respectively. Find the capacity of the bucket. (Use  $\pi = 3.14$ )

**Sol.** Capacity of bucket =  $\frac{1}{3}\pi h(r_1^2 + r_2^2 + r_1r_2)$

$$= \frac{1}{3} \times 3.14 \times 30(100 + 400 + 200) \quad 2$$

$$= 21980 \text{ cm}^3 \quad 2$$

**OR**

Water in a canal 6 m wide and 1.5 m deep, is flowing with a speed of 10 km/hr. How much area will it irrigate in 30 minutes if 4 cm of standing water is needed?

**Sol.** Length of canal covered by water in 30 min. = 5000 m 1

Volume of water flown in 30 min. =  $6 \times 1.5 \times 5000 \text{ m}^3$  1

Hence,  $6 \times 1.5 \times 5000 = (\text{Area of field}) \times \frac{4}{100}$  1

$\therefore$  Area of field =  $1125000 \text{ m}^2$  1

36. Draw a 'more than' ogive for the following distribution:

Weight (in kg):	40 – 44	44 – 48	48 – 52	52 – 56	56 – 60	60 – 64	64 – 68
Number of Students:	4	10	30	24	18	12	2

**Sol.** Points to be plotted for more than type ogive

(40, 100), (44, 96), (48, 86), (52, 56), (56, 32), (60, 14), (64, 2) 2

For drawing correct ogive 2

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37. A train travels 360 km at a uniform speed. If the speed had been 5 km/hr more, it would have taken 1 hour less for the same journey. Find the original speed of the train.

**Sol.** Let original speed of the train be  $x$  km/h.

$$\therefore \frac{360}{x} - \frac{360}{x+5} = 1 \quad 2$$

$$\Rightarrow x^2 + 5x - 1800 = 0 \quad 1$$

$$\Rightarrow (x + 45)(x - 40) = 0$$

$$\Rightarrow x = 40$$

$\therefore$  Speed of the train is 40 km/h 1

**OR**

Sum of the areas of two squares is  $468 \text{ m}^2$ . If the difference of their parameters is 24 m, find the sides of the two squares.

**Sol.** Let the side of squares be  $x$  m,  $y$  m ( $x > y$ )

$$\therefore x^2 + y^2 = 468 \quad \dots(i) \quad 1$$

$$\text{and } 4(x - y) = 24 \quad \dots(ii) \quad 1$$

Simplify (i) and (ii) to get

$$x^2 - 6x - 216 = 0 \quad 1$$

$$\Rightarrow (x - 18)(x + 12) = 0$$

$$\Rightarrow x = 18 \quad \frac{1}{2}$$

$$\text{and } y = 12 \quad \frac{1}{2}$$

$\therefore$  Sides of square are 18 m and 12 m.

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38. Prove that the ratio of areas of two similar triangles is equal to the ratio of square of their corresponding sides.

Sol. Correct given, to prove, construction, figure

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

Correct proof

2

39. Divide polynomial  $-x^3 + 3x^2 - 3x + 5$  by the polynomial  $x^2 + x - 1$  and verify the division algorithm.

Sol. On dividing  $-x^3 + 3x^2 - 3x + 5$  by  $x^2 + x - 1$

We get quotient  $= -x + 4$

and Remainder  $= -8x + 9$

2

Verification

$$(x^2 + x - 1)(-x + 4) + (9 - 8x)$$

1

$$= -x^3 - x^2 + x + 4x^2 + 4x - 4 + 9 - 8x$$

$\frac{1}{2}$

$$= -x^3 + 3x^2 - 3x + 5$$

$\frac{1}{2}$

OR

Find other zeroes of the polynomial

$$p(x) = 2x^4 - 3x^3 - 3x^2 + 6x - 2$$

if two of its zeroes are  $\sqrt{2}$  and  $-\sqrt{2}$ .

Sol. Two factors of  $p(x)$  are  $(x - \sqrt{2})$  and  $(x + \sqrt{2})$

$\frac{1}{2}$

$$g(x) = (x + \sqrt{2})(x - \sqrt{2})$$

$$= x^2 - 2$$

$\frac{1}{2}$

$$\text{Now, } \frac{2x^4 - 3x^3 - 3x^2 + 6x - 2}{x^2 - 2} = 2x^2 - 3x + 1$$

2

$$\text{Also, } 2x^2 - 3x + 1 = (2x - 1)(x - 1)$$

$\frac{1}{2}$

Other zeroes are  $\frac{1}{2}, 1$

$\frac{1}{2}$

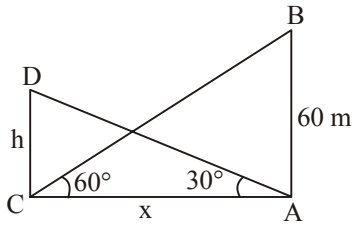
40. The angle of elevation of the top of a building from the foot of a tower is  $30^\circ$  and the angle of elevation of top of the tower from foot of the building is  $60^\circ$ . If the tower is 60 m high, then find the height of the building.

Sol.

Let AB be the tower and CD be the building.

Correct figure

1



$$\tan 60^\circ = \sqrt{3} = \frac{60}{x}$$

$$\Rightarrow x = \frac{60}{\sqrt{3}}$$

...(i)

1

$$\tan 30^\circ = \frac{1}{\sqrt{3}} = \frac{h}{x}$$

$$\Rightarrow h = \frac{x}{\sqrt{3}}$$

...(ii)

1

Solving (i) and (ii) to get  $h = 20$

Height of the building is 20 m.

1