Solution

MATHEMATICS

Class 10 - Mathematics

Section A

1. **(a)** an irrational number

   Explanation:

   Let a be rational and $\sqrt{b}$ is irrational.
   If possible let $a+\sqrt{b}$ be rational.
   Then $a+\sqrt{b}$ is rational and a is rational.
   $\Rightarrow \left[\left(a+\sqrt{b}\right)-a\right]$ is rational [Difference of two rationals is rational]
   $\Rightarrow \sqrt{b}$ is rational.
   This contradicts the fact that $\sqrt{b}$ is irrational.
   The contradiction arises by assuming that $a+\sqrt{b}$ is rational.
   Therefore, $a+\sqrt{b}$ is irrational.

2. **(a)** 2

   Explanation:

   2
   The number of zeroes is 2 as the graph does cut the x-axis 2 times.

3. **(a)** coincident

   Explanation:

   Given: a_1 = 5, a_2 = -10, b_1 = -3, b_2 = 6, c_1 = 11 and c_2 =-22

   a_1 = 5, a_2 = -10, b_1 = -3, b_2 = 6, c_1 = 11 and c_2 = -22

   Here, $\frac{a_1}{a_2}=\frac{5}{-10}=-\frac{1}{2}, \frac{b_1}{b_2}=\frac{-3}{6}=-\frac{1}{2}, \frac{c_1}{c_2}=\frac{11}{-22}=-\frac{1}{2}$
   $\because \frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$
   Therefore, the pair of given linear equations is coincident.

4.

   (d) 2 or -2

   Explanation:

   Since the roots are equal, we have D = 0.

   $\therefore$ 36k^2 - 4 $\times$ 9 $\times$ 4 = 0 $\Rightarrow$ 36k^2 = 144 $\Rightarrow$ k^2 = 4 $\Rightarrow$ k = 2 or -2.

5.

   (d) 3

   Explanation:

   3

6.

   (c) -1

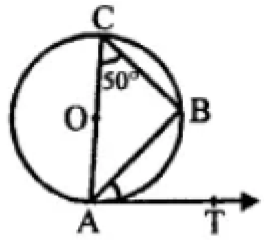
   Explanation:

   A(2, 3) and B(-4, 1) are the given points.
   Let C(0.y) be the points are y-axis
   AC = $\sqrt{(0-2)^2+(y-3)^2}$
   $\Rightarrow$ AC = $\sqrt{4+y^2+9-6y}$
   $\Rightarrow$ AC = $\sqrt{y^2-6y+13}$
   BC = $\sqrt{(0+4)^2+(y-1)^2}$
   $\Rightarrow$ BC = $\sqrt{16+y^2+1-2y}$
   $\Rightarrow$ BC = $\sqrt{y^2-2y+17}$
   Since AC = BC

$AC^2 = BC^2$
$y^2 - 6y + 13 = y^2 - 2y + 17$
$\Rightarrow -6y + 2y = 17 - 13$
$\Rightarrow -4y = 4$
$\Rightarrow y = -1$
Therefore, the point on y-axis is (0, -1) and here ordinate is -1.

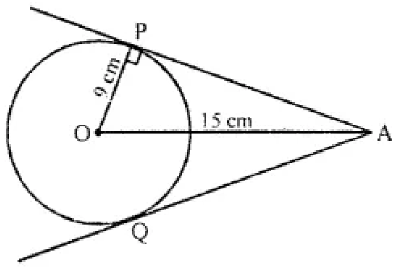
7.
(d) (0, 0)
Explanation:
As we know that, the perpendicular bisector of the any line segment divides the line segment into two equal parts i.e., the perpendicular bisector of the line segment always passes through the mid - point of the line segment.
As mid - point of any line segment which passes through the points
(x_1, y_1) and (x_2, y_2) is;
$= \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$
So mid - point of the line segment joining the points A (- 2, - 5) and B (2, 5) will be;
$= \left(\frac{-2+2}{2}, \frac{-5+5}{2}\right) = (0, 0)$
Hence, (0, 0) is the required point lies on the perpendicular bisector of the lines segment.

8. **(a)** 15 cm.
Explanation:
Since $DE||BC$, then using Thales theorem,
$\Rightarrow \frac{AB}{DB} = \frac{AC}{EC}$
$\Rightarrow \frac{15}{6} = \frac{25}{EC}$
$\Rightarrow EC = 10$ cm
Now, AE = AC – EC = 25 – 10 = 15 cm

9.
(d) 50°
Explanation:


We have to find the measure of $\angle BAT$
AB is chord and AT is the tangent
$\angle ACB = \angle BAT$ (Angles in the alternate segment)
= 50°

10.
(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

11. **(a)** 2 cosecθ

Explanation:

We have, $\frac{\tan\theta}{\sec\theta-1}+\frac{\tan\theta}{\sec\theta+1}$

$=\tan\theta\left(\frac{1}{\sec\theta-1}+\frac{1}{\sec\theta+1}\right)$

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

$=\frac{\tan\theta\times2\sec\theta}{\sec^2\theta-1}=\frac{2\tan\theta\sec\theta}{\tan^2\theta}$

$=\frac{2\sec\theta}{\tan\theta}=\frac{2\times\cos\theta}{\cos\theta\times\sin\theta}=\frac{2}{\sin\theta}$

$=2cosec\theta$

12.

(d) -1

Explanation:

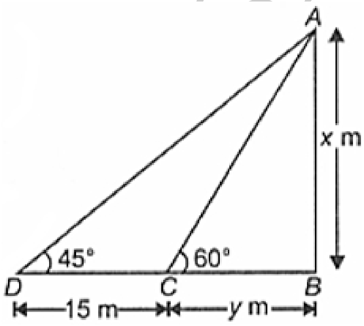
-1

13.

(d) 35.49 m

Explanation:

Let the length of the tower AB be x m



Let the length of shadow of tower be y m

Now, in $\triangle$ABC, $\frac{AB}{BC}$ = tan60^o $\Rightarrow$ $\frac{x}{y}$ = $\sqrt{3}$

$\Rightarrow$ y = $\frac{x}{\sqrt{3}}$ ...(i)

In $\triangle$ABC, $\frac{AB}{BC}$ = tan45^0

$\Rightarrow$ $\frac{x}{15+y}$ = 1 $\Rightarrow$ x = 15 + y ...(ii)

Putting the value of y in (ii),

we get

x = 15 + $\frac{x}{\sqrt{3}}$ ⇒ x = $\frac{15\sqrt{3}(\sqrt{3}+1)}{2}$ ⇒ x = 35.49 m

14. **(a)** 72°

Explanation:

Area of the sector $= \frac{\theta}{360^{\circ}} \times \pi r^2$

$5\pi = \frac{\theta}{360^{\circ}} \times \pi \times 5 \times 5$

$\Rightarrow \theta = \frac{5\pi}{\pi} \times \frac{360^{\circ}}{5 \times 5}$

$\Rightarrow \theta$ = 72°

Hence, sector angle = 72°

15.

(d) 8 cm

Explanation:

We have given length of the arc and area of the sector bounded by that arc and we are asked to find the radius of the circle.

We know that area of the sector $= \frac{\theta}{360} \times \pi r^2$.

Length of the arc $= \frac{\theta}{360} \times 2\pi r$

Now we will substitute the values.

Area of the sector $= \frac{\theta}{360} \times \pi r^2$

$20\pi = \frac{\theta}{360} \times \pi r^2$ ……..(1)

Length of the arc $= \frac{\theta}{360} \times 2\pi r$

$5\pi = \frac{\theta}{360} \times 2\pi r$ ……..(2)

$\frac{20\pi}{5\pi} = \frac{\frac{\theta}{360} \times \pi r^2}{\frac{\theta}{360} \times 2\pi r}$

$\frac{20}{5} = \frac{r^2}{2r}$

$\therefore 4 = \frac{r}{2}$

$\therefore$ r = 8

Therefore, radius of the circle is 8 cm.

16.

(b) $\frac{8}{75}$

Explanation:

Number of possible outcomes = {1, 4, 9, 16, 25, 36, 49, 64} = 8

Number of Total outcomes = 75

$\therefore$ Probability (of getting a perfect square) = $\frac{8}{75}$

17.

(b) $\frac{1}{25}$

Explanation:

n(S) = 100

E = {1, 8, 27, 64}

n(E) = 4

the probability of drawing a number on the card that is a cube is

P(E) = $\frac{4}{100}$ = $\frac{1}{25}$

18.

(d) $\frac{n+1}{2}$

Explanation:

According to question,

Arithmetic Mean = $\frac{1+2+3+...+n}{n}$

$= \frac{\frac{n(n+1)}{2}}{n}$

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

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:

We have,

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

$a_{21} - a_7 = \{a + (21 - 1)d\} - \{a + (7 - 1)d\} = 84$

a + 20d - a - 6d = 84

14d = 84

d = $\frac{18}{14}$ = 6

d = 6

So, A is false but R is true.

Section B

21. 510 and 92

510= 2 × 3 × 5× 17

92 = 2 × 2 × 23

HCF = 2

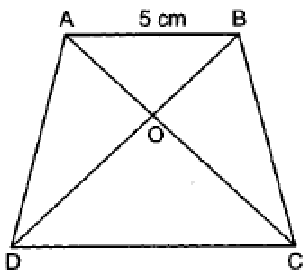
LCM = 2 × 2 × 3 × 5 × 17 × 23 = 23460

Product of two numbers 510 and 92 = 510 × 92 = 46920

HCF × LCM = 2 × 23460 = 46920

Hence, product of two numbers = HCF × LCM

22. According to question InΔAOB and ΔCOD, we have



$\angle$AOB = $\angle$COD [Vertically opposite angles]

$\frac{AO}{OC} = \frac{OB}{OD}$ [Given]

Therefore, by SAS-criterion of similarity, we have

$\Delta AOB \sim \Delta COD$

$\Rightarrow \quad \frac{AO}{OC} = \frac{BO}{OD} = \frac{AB}{DC}$

$\Rightarrow \quad \frac{1}{2} = \frac{5}{DC}$ [$\because$ AB = 5 cm]

$\Rightarrow$ DC = 10 cm

Thus, the value of DC is 10 cm

23. We know that the lengths of tangents drawn from an external point to a circle are equal.

AQ = AR, ...(i) [tangents from A]

BP = BQ ...(ii) [tangents from B]

CP = CR ... (iii) [tangents from C]

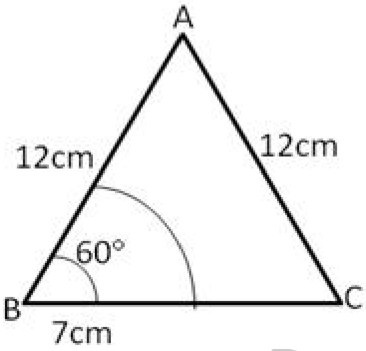
Perimeter of $\triangle ABC$

= AB + BC + AC
= AB + BP + CP + AC
= AB + BQ + CR + AC [using (ii) and (iii)]
= AQ + AR
= 2AQ [using (i)
$\therefore \quad AQ=\frac{1}{2}($ perimeter of $\triangle ABC)$

24. We have to prove that $(\sqrt{3}+1)(3-\cot 30^{\circ})=\tan^{3} 60^{\circ}-2 \sin 60^{\circ}$
Here, L.H.S. $=(\sqrt{3}+1)(3-\cot 30^{\circ})$
$=3\sqrt{3}-\sqrt{3}\cot 30^{\circ}+3-\cot 30^{\circ}$
$=3\sqrt{3}-\sqrt{3}\times\sqrt{3}+3-\sqrt{3}$
$=3\sqrt{3}-3+3-\sqrt{3}$
$=3\sqrt{3}-\sqrt{3}$
$=2\sqrt{3}$
R.H.S. $=\tan^{3} 60^{\circ}-2\sin 60^{\circ}$
$=(\sqrt{3})^{3}-2\times\frac{\sqrt{3}}{2}$
$=3\sqrt{3}-\sqrt{3}$
$=2\sqrt{3}$
Hence, L.H.S. = R.H.S.

OR

LHS $=\frac{\tan\theta-\cot\theta}{\sin\theta\cos\theta}=\frac{\frac{\sin\theta}{\cos\theta}-\frac{\cos\theta}{\sin\theta}}{\sin\theta\cos\theta}$
$=\frac{\sin^{2}\theta-\cos^{2}\theta}{\sin^{2}\theta\cos^{2}\theta}$
$=\frac{1}{\cos^{2}\theta}-\frac{1}{\sin^{2}\theta}$
$=\sec^{2}\theta-\operatorname{cosec}^{2}\theta=$ RHS

25. 

Area which cannot be grazed = (area of equilateral $\triangle ABC$ - (area of the sector with r = 7m,$\theta=60^{\circ}$)
$=\left[\frac{\sqrt{3}}{4}\times(12)^{2}-\frac{22}{7}\times(7)^{2}\times\frac{60}{360}\right]\mathrm{m}^{2}$
$=\left[(\sqrt{3}\times 12\times 3)-\frac{(22\times 7)}{6}\right]$
= 62.35 - 25.66 m^2
= 36.68 m^2

OR

Radius of circle (r) = OA = 7 cm.
Area of the semicircle = $\frac{1}{2}\times\pi r^{2}$
$=\frac{1}{2}\times\frac{22}{7}\times 7\times 7$
= 11 $\times$ 7
= 77 cm^2
Area of $\triangle$ABC = $\frac{1}{2}\times$ base $\times$ height
= $\frac{1}{2}\times 14\times 7$
= 49 cm^2
$\therefore$ Area of the shaded portion = Area of semicircle - Area of the $\triangle$ABC
= 77 - 49
= 28 cm^2

Section C

26. To distribute the fruits equally Renu has to take the H.C.F. of 45 and 20.

H.C.F. of 20 and 45 = 5

i.e. 5 fruits can be placed in 1 pack

$\therefore$ Total no. of packs = $\frac{Total\ available\ fruits}{no.\ of\ fruits\ in\ 1\ packs}$

$= \frac{45+20}{5}$

$= \frac{65}{5}$

= 13

Hence, maximum no. of packets required = 13

27. $y^2 + \frac{3}{2}\sqrt{5}y - 5 = \frac{1}{2}\left(2y^2 + 3\sqrt{5}y - 10\right)$

$= \frac{1}{2}\left(2y^2 + 4\sqrt{5}y - \sqrt{5}y - 10\right)$

$= \frac{1}{2}[2y(y + 2\sqrt{5}) - \sqrt{5}(y + 2\sqrt{5})]$

$= \frac{1}{2}(y + 2\sqrt{5})(2y - \sqrt{5})$

$\Rightarrow \quad y = -2\sqrt{5}, \frac{\sqrt{5}}{2}$ are zeroes of the polynomial.

If given polynomial is $y^2 + \frac{3}{2}\sqrt{5}y - 5$ then a = 1, b=$\frac{3}{2}\sqrt{5}$ and c = -5

Sum of zeroes = $-2\sqrt{5} + \frac{\sqrt{5}}{2} = \frac{-3\sqrt{5}}{2}$ .... (i)

Also, $\frac{-b}{a} = \frac{-3\sqrt{5}}{2}$ ------ (ii)

From (i) and (ii)

Sum of zeroes = $\frac{-b}{a}$

Product of zeroes = $-2\sqrt{5} \times \frac{\sqrt{5}}{2} = -5$ .... (iii)

Also, $\frac{c}{a} = \frac{-5}{1} = -5$ .... (iv)

From (iii) and (iv)

Product of zeroes = $\frac{c}{a}$

28. The given equations are

$6x + 5y = 7x + 3y + 1 = 2(x + 6y - 1)$

Therefore,we have

$6x + 5y = 2(x + 6y - 1)$

$6x + 5y = 2x + 12y - 2$

$6x - 2x + 5y - 12y = -2$

$4x - 7y = -2$ ......(i)

Also,

$7x + 3y + 1 = 2(x + 6y - 1)$

$7x + 3y + 1 = 2x + 12y - 2$

$7x - 2x + 3y - 12y = -2 - 1$

$5x - 9y = -3$ ....(ii)

Multiplying (i) by 9 and (ii) by 7, we get

$36x - 63y = -18$ ......(iii)

$35x - 63y = -21$ .....(iv)

Subtracting (iii) and (iv),we get

$x = 3$

Substituting x = 3 in (i),we get

$\Rightarrow 4 \times 3 - 7y = -2$

$\Rightarrow -7y = -2 - 12$

$\Rightarrow -7y = -14$

$\Rightarrow$y = 2

$\therefore$ Solution is x = 3, y = 2

OR

Given equation is $2x + y = 6$

$\Rightarrow$ y = 6 - 2x.......(i)

If, $x = 0, y = 6 - 2(0) = 6$

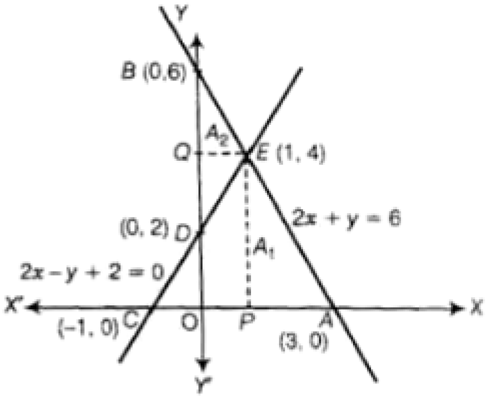
$x = 3, y = 6 - 2(3) = 0$

x	0	3
y	6	0
Points	B	A

Given equation is $2x - y + 2 = 0$
$\Rightarrow y = 2x + 2$ …(ii)
If, $x = 0, y = 2(0) + 2 = 0 + 2 = 2$
$x = -1, y = 2(-1) + 2 = 0$

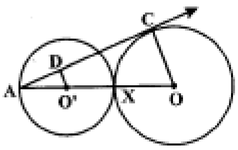
x	0	-1
y	2	0
Points	D	C

Plotting $2x + y = 6$ and $2x - y + 2 = 0$, as shown below, we obtain two lines AB and CD respectively intersecting at point, E (1, 4).



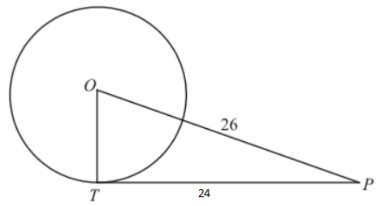
Now, A_1 = Area of ACE = $\frac{1}{2} \times AC \times PE$
$= \frac{1}{2} \times 4 \times 4 = 8$
And A_2 = Area of BDE = $\frac{1}{2} \times BD \times QE$
$= \frac{1}{2} \times 4 \times 1 = 2$
$\therefore A_1 : A_2$ = 8:2 = 4: 1

$\therefore$ Ratio of areas of two $\triangle s \quad = \frac{\text{Area } \Delta\text{ACE}}{\text{Area } \Delta\text{BDE}} = \frac{8}{2} = \frac{4}{1} = 4 : 1$

29. 

Let the radius of both the circles is r.
In the fig, O'D⊥AC and AC is tangent of circle (O,r)
So, OC ⊥ AC (as line joining center to tangent is ⊥ to the tangent)
Now in ΔAO'D and ΔAOC,
∠O'DA = ∠OCA = 90°
∠A = ∠A (common)
Therefore, ΔAO'D∼ΔAOC [by AA rule]
So, $\frac{DO'}{CO} = \frac{AO'}{AO}$-----------(1)
Now, AO= r + r + r = 3r
and O'A=r
Putting the value of AO and AO' in equation (1), we get
$\frac{DO'}{CO} = \frac{r}{3r} = \frac{1}{3}$
Therefore, DO':CO = 1:3

OR



Construction: Join OT

We know that the radius and tangent are perpendicular at their point of contact.

In right triangle OTP

According to Pythagoras theorem, we get

$OP^2 = TO^2 + TP^2$

$\Rightarrow 26^2 = TO^2 + 24^2$

$\Rightarrow 676 = TO^2 + 576$

$\Rightarrow TO^2 = 100$

$\Rightarrow$ TO = 10 cm

Therefore, the radius of the circle is equal to 10 cm.

30. LHS = $\frac{\cos^3\theta+\sin^3\theta}{\cos\theta+\sin\theta} + \frac{\cos^3\theta-\sin^3\theta}{\cos\theta-\sin\theta}$

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

= $(1 - sin\theta cos\theta) + (1 + sin\theta cos\theta)$

= $1 + 1 - sin\theta cos\theta + sin\theta cos\theta$

= 2 = RHS

31.

Weight (in kg)	**No. of workers**	**$d_i = x_i - 63$**	**f_id_i**
60	5	-3	-15
61	8	-2	-16
62	14	-1	-14
63	16	0	0
64	10	1	10
65	7	2	14
	$N = \sum f_i = 60$		$\sum f_id_i = -21$

Let the assumed mean is 63.

from table,

N = 60 and $\sum f_id_i = -21$

$\therefore$ Mean = A + $\frac{\Sigma f_i d_i}{N}$

$\Rightarrow$ Mean = 63 + $\left(\frac{-21}{60}\right)$ = 63 - $\frac{7}{20}$ = 63 - 0.35 = 62.65

Section D

32. Let sides of two square x m and y m (x > y)

$x^2 + y^2 = 452$ …(i)

4x - 4y = 8 …(ii)

$\Rightarrow$ x - y = 2

By (i) & (ii)

$x^2 + (x - 2)^2 = 452$

$\Rightarrow x^2 - 2x - 224 = 0$

$x^2 - 16x + 14x - 224 = 0$

(x - 16) (x + 14) = 0

x = 16, x = -14 (rejected)

y = 14

Sides are 16 m and 14 m

OR

Let the original average speed of the train be x km/hr.

Time taken to cover 63 km $= \frac{63}{x}$ hours

Time taken to cover 72 km when the speed is increased by 6 km/hr $= \frac{72}{x+6}$ hours

By the question,we have,

$\frac{63}{x} + \frac{72}{x+6} = 3$

$\Rightarrow \frac{21}{x} + \frac{24}{x+6} = 1$

$\Rightarrow \frac{21x+126+24x}{x^2+6x} = 1$

$\Rightarrow$ 45x + 126 = x^2 + 6x

$\Rightarrow$ x^2 - 39x - 126 = 0

$\Rightarrow$ x^2 - 42x + 3x - 126 = 0

$\Rightarrow$ x(x - 42) + 3(x - 42) = 0

$\Rightarrow$ (x - 42)(x + 3) = 0

$\Rightarrow$ x - 42 = 0 or x + 3 = 0

$\Rightarrow$ x = 42 or x = -3

Since the speed cannot be negative, $x \neq -3$.

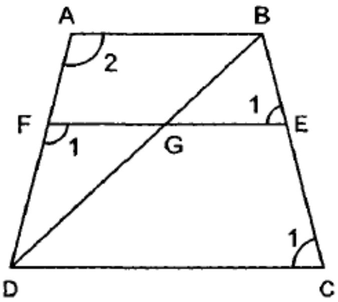
Thus, the original average speed of the train is 42 km/hr.

33. In ΔDFG and Δ DAB, we have

$\angle$1 = $\angle$2 [$\because AB \| DC \| EF \therefore \angle 1$ and $\angle$2 are corresponding angles]

$\angle$FDG = $\angle$ADB [Common]

Therefore, by AA-criterion of similarity, we have



$\therefore \quad \Delta DFG \sim \Delta DAB$

$\Rightarrow \quad \frac{DF}{DA} = \frac{FG}{AB}$ ....(i)

In trapezium ABCD, we have

$EF \| AB \| DC$

$\therefore \quad \frac{AF}{DF} = \frac{BE}{EC}$

$\Rightarrow \quad \frac{AF}{DF} = \frac{3}{4} \quad \left[\because \frac{BE}{EC} = \frac{3}{4}(\text{ given })\right]$

$\Rightarrow \quad \frac{AF}{DF} + 1 = \frac{3}{4} + 1$ [Adding 1 on both sides]

$\Rightarrow \quad \frac{AF+DF}{DF} = \frac{7}{4}$

$\Rightarrow \quad \frac{AD}{DF} = \frac{7}{4} \Rightarrow \frac{DF}{AD} = \frac{4}{7}$ ....(ii)

From (i) and (ii), we get

$\frac{FG}{AB} = \frac{4}{7} \Rightarrow FG = \frac{4}{7}AB$ ....(iii)

So far as the given figure is concerned , in ΔBEG and ΔBCD, we have

$\angle$BEG = $\angle$BCD [Corresponding angles]

$\angle$B = $\angle$B [Common]

$\therefore \quad \Delta BEG \sim \Delta BCD$ [By AA-criterion of similarity]

$\Rightarrow \quad \frac{BE}{BC} = \frac{EG}{CD}$

$\Rightarrow \quad \frac{3}{7} = \frac{EG}{CD} \quad \left[\because \frac{BE}{EC} = \frac{3}{4} \Rightarrow \frac{EC}{BE} = \frac{4}{3} \Rightarrow \frac{EC}{BE} + 1 = \frac{4}{3} + 1 \Rightarrow \frac{BC}{BE} = \frac{7}{3}\right]$

$\Rightarrow \quad EG = \frac{3}{7}$CD

$\Rightarrow \quad EG = \frac{3}{7} \times 2AB$ [$\because$ CD = 2 AB (given)]

$\Rightarrow \quad EG = \frac{6}{7}AB$ ....(iv)

Adding (iii) and (iv), we get

$FG + EG = \frac{4}{7}AB + \frac{6}{7}AB \Rightarrow EF = \frac{10}{7}AB \Rightarrow 7FE = 10AB$

34. We are Given that,

An iron pillar consists of a cylindrical portion and a cone mounted on it.

The height of the cylindrical portion of the pillar, H = 2.8 m = 280 cm.

The height of the conical portion of the pillar, h = 42 cm..

The diameter of the cylindrical portion of the pillar = diameter of the circular base of cone = D = 20 cm.

The radius of the circular base of cylinder/ cone r = $\frac{D}{2}$ = 10 cm.

Now, we have,

Volume of the pillar, (V) = Volume of the cylindrical portion of pillar + volume of the conical portion of the pillar.

$\Rightarrow$ V = $\pi r^2 H + \frac{1}{3}\pi r^2 h$

$\Rightarrow$ V = $\left(\frac{22}{7} \times 10^2 \times 280 + \frac{1}{3} \times \frac{22}{7} \times 10^2 \times 42\right)$ cm^3

$\Rightarrow$ V = (22 $\times$ 100 $\times$ 40 + 22 $\times$ 100 $\times$ 2) cm^3

$\Rightarrow$ V = (88000 + 4400) cm^3

$\Rightarrow$ V = 92400 cm^3

Hence, volume of iron pillar is 92400 cm^3

Given,

Weight of 1 cm^3 iron = 7.5 gm.

Hence, weight of 92400 cm^3 iron = 7.5 $\times$ 92400 gm.

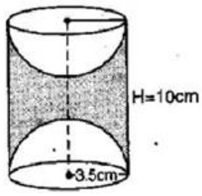
= 693000 gm.

= 693 Kg.

Since, 1Kg = 1000 gm.

Hence, the weight of iron piller is 693 Kg.

OR



TSA of the article = $2\pi rh + 2(2\pi r^2)$

= 2π (3.5)(10) + 2[2π $(3.5)^2$]

= $70\pi + 49\pi$

= 119π

= 119 $\times$ $\frac{22}{7}$

= 374 cm^2

35. Modal Class: 45 - 60

Mode = 55

55 = 45 + $\frac{15-a}{30-(a+10)} \times 15$

$\Rightarrow$ a = 5

6 + 7 + a + 15 + 10 + b = 51

$\Rightarrow$ a + b = 13

$\Rightarrow$ b = 13 - 5 = 8

Section E

36. i. Clearly, the amount of installment in the first month = ₹ 1000, which increases by ₹ 100 every month therefore, installment amount in second month = ₹ 1100, third month = ₹ 1200, fourth month = 1300 ..... which forms an AP, with first term, a = 1000 and common difference, d = 1100 - 1000 = 100

Now, amount paid in the 30th installment,

a_{30} = 1000 + (30 - 1)100 = 3900 {$a_n = a + (n - 1)d$}

ii. Clearly, the amount of installment in the first month = ₹ 1000, which increases by ₹ 100 every month
therefore, installment amount in second month = ₹ 1100, third month = ₹ 1200, fourth month=1300 ..... which forms an AP, with first term, a = 1000 and common difference, d = 1100 - 1000 = 100
Amount paid in 30 instalments,
$S_{30} = \frac{30}{2}[2 \times 1000 + (30 - 1)100]$ = 73500
Hence, remaining amount of loan that he has to pay = 118000 - 73500 = ₹ 44500

iii. Clearly, the amount of installment in the first month = ₹ 1000, which increases by ₹ 100 every month
therefore, installment amount in second month = ₹ 1100, third month = ₹ 1200, fourth month = 1300 ..... which forms an AP, with first term, a = 1000 and common difference, d = 1100 - 1000 = 100
Amount paid in 100 instalments
$S_n = \frac{n}{2}[2a + (n - 1)d]$
$S_n = \frac{100}{2}[2 \times 1000 + (100 - 1)100]$
$\Rightarrow S_n$ = 100000 + 9900
$\Rightarrow$ 109900

OR

Clearly, the amount of installment in the first month = ₹ 1000, which increases by ₹ 100 every month
therefore, installment amount in second month = ₹ 1100, third month = ₹1200, fourth month = 1300 ..... which forms an AP, with first term, a = 1000 and common difference, d = 1100 - 1000 = 100
If he increases the instalment by ₹ 200 every month, amount would he pay in 40th instalment
Then a = 1000, d = 200 and n = 40
a_{40} = a + (n - 1)d
$\Rightarrow a_{40}$ = 1000 + (40 - 1)200
$\Rightarrow a_{40}$ = 880

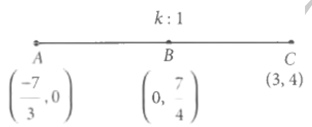
37. i. Here, CD = $\sqrt{(7-3)^2 + (7-4)^2}$
= $\sqrt{4^2 + 3^2}$ = 5 units
Also, it is given that CE = 10 units
Thus, DE = CE - CD = 10 - 5 = 5 units ($\because$ A, B, C, E are a line)

ii. Since, CD = DE = 5 units
$\therefore$ D is the midpoint of CE.
$\therefore \frac{x+3}{2}$ = 7 and $\frac{y+4}{2}$ = 7
$\Rightarrow$ x = 11 and y = 10 $\Rightarrow$ x + y = 21

iii. The points C, D and E are collinear.

OR

Let B divides AC in the ratio k : 1, then



$\frac{7}{4} = \frac{4k+0}{k+1}$
$\Rightarrow$ 7k + 7 = 16 k
$\Rightarrow$ 7 = 9k
$\Rightarrow$ k = $\frac{7}{9}$
Thus, the required ratio is 7 : 9.

38. i. In $\triangle$ ABC
tan 60^o = $\frac{AB}{BC}$
$\sqrt{3} = \frac{AB}{200}$
AB = $200\sqrt{3}$
Now, In $\triangle$ ABD
tan 45^o = $\frac{AB}{BD}$
1 = $\frac{200\sqrt{3}}{BD}$
BD = $200\sqrt{3}$

$\therefore$ CD = BD - BC

= $200\sqrt{3}$ - 200

= 200 ($\sqrt{3}$ - 1)

= 200 $\times$ (1.732 - 1)

= 200 $\times$ 0.732

= 146.4 m

speed = $\frac{distance}{time}$

= $\frac{146.4}{10}$

= 14.64 m/s

Now,

speed = 14.64 $\times$ $\frac{18}{5}$ km/hr

= 52.7

$\approx$ 53 km/hr

ii. In $\triangle$ ABD

tan 45^{o} = $\frac{AB}{BD}$

1 = $\frac{200\sqrt{3}}{BD}$

BD = $200\sqrt{3}$ m

$\therefore$ CD = $200\sqrt{3}$ - 200

= 200 ($\sqrt{3}$ - 1)

= 200 (1.732 - 1)

= 200 $\times$ 0.732

= 146.4

$\approx$ 147 m

$\therefore$ boat is at a distance of 147 m from its actual position.

iii. In $\triangle$ ABC

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

$\sqrt{3}$ = $\frac{AB}{200}$

AB = $200\sqrt{3}$ m

Hence, height of tower = $200\sqrt{3}$ m

OR

As boat moves away from the tower angle of depression decreases.