Solution
MOCK EXAM - PAPER 2
Class 10 - Mathematics
Section A

1.
(c) ab
Explanation:
ab

2. **(a)** 1
Explanation:
The number of zeroes is 1 as the graph given in the question intersects the x-axis at one point only.

3.
(b) one or many solutions
Explanation:
A system of linear equations is said to be consistent if it has at least one solution or can have many solutions. If a consistent system has an infinite number of solutions, it is dependent. When you graph the equations, both equations represent the same line. If a system has no solution, it is said to be inconsistent. The graphs of the lines do not intersect, so the graphs are parallel and there is no solution.

4.
(b) -11
Explanation:
$3x^2 + (k-1)x + 9 = 0$
x = 3 is a solution of the equation means it satisfies the equation
Put x = 3, we get
$3(3)^2 + (k - 1) 3 + 9 = 0$
27 + 3 k - 3 + 9 = 0
27 + 3 k + 6 = 0
3 k = - 33
k = - 11

5.
(c) 50
Explanation:
Here a = 3 and d = 5.
$\therefore (a_{30} - a_{20}) = (30 - 20)d = 10 \times 5 = 50$

6.
(c) abscissa
Explanation:
The distance of a point from the y-axis is the x (horizontal) coordinate of the point and is called abscissa.

7.
(c) IV
Explanation:
The point p is given by P $\left(\frac{2\times5+3\times2}{2+3}, \frac{2\times2-3\times5}{2+3}\right) = P\left(3, \frac{-11}{5}\right)$
so, p lies in IV quadrant.

$(-,+)$	$(+\infty)$ if
$(-,-)$	if $(+,-)$

8.

(d) x = 16, y = 8

Explanation:

In ΔCDB, PQ$\|$DB [Given]

$\therefore \frac{CP}{CD} = \frac{PQ}{BD}$ [Using Thales Theorem]

$\Rightarrow \frac{11}{22} = \frac{8}{x} \Rightarrow x = \frac{8 \times 22}{11}$ = 16

Again, In ΔABD, RS$\|$DB [Given]

$\therefore \frac{AR}{AD} = \frac{RS}{BD}$ [Using Thales Theorem]

$\Rightarrow \frac{3}{6} = \frac{y}{16}$

$\Rightarrow y = \frac{3 \times 16}{6}$ = 8

$\therefore$ x = 16, y = 8

9.

(c) 25 cm

Explanation:

In the given figure, PT is tangent to the circle with centre O and radius OT = 7 cm, PT = 24 cm

OT is the radius and PT is the tangent OT $\perp$ PT

Now, in right ΔOTP,

$OP^2 = OT^2 + PT^2$

$OP^2 = (7)^2 + (24)^2$

$OP^2 = 49 + 576 = 625 = (25)^2$

OP = 25 cm

10.

(c) 50^o

Explanation:

In $\triangle$APB,

AP = BP [$\because$ tangents are equal from an external point to the circle]

$\therefore \angle PAB = \angle PBA$ [$\because$ Angles opp. to equal sides of a triangle are equal]

And

$\angle A + \angle PAB + \angle PBA = 180^\circ$

$80^\circ + \angle PBA + \angle PBA = 180^\circ$

$2. \angle PBA = 180^\circ - 80^\circ$

$\angle PBA = \frac{100}{2}$

$\angle PBA = 50^\circ$

$\therefore \angle PAB = 50^\circ$

11.

(c) $\tan^4 A + \tan^2 A$

Explanation:

We have, $\sec^4A - \sec^2A = \sec^2A(\sec^2A - 1)$

$= (1 + \tan^2A)\tan^2A$

$= \tan^2A + \tan^4A$

$= \tan^4A + \tan^2A$

12.

(b) $sin60^{\circ}$

Explanation:

Given: $\frac{2\tan 30^{\circ}}{1+\tan^2 30^{\circ}}$

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

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

= $\frac{6}{4\sqrt{3}} = \frac{3}{2\sqrt{3}}$

= $\frac{\sqrt{3}}{2}$

= $\sin 60^{\circ}$

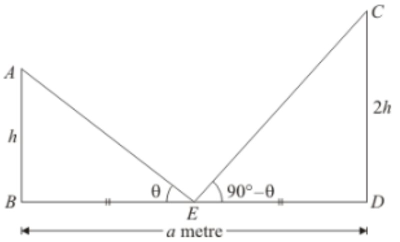
13. **(a)** $\frac{a}{2\sqrt{2}}$

Explanation:

Let AB and CD be the two persons such that AB < CD.

Then, let AB = h so that CD = 2h

Now, the given information can be represented as,



Here, E is the midpoint of BD.

We have to find height of the shorter person.

So we use trigonometric ratios.

In triangle ECD,

$\tan\angle CED = \frac{CD}{ED}$

$\Rightarrow \tan(90^{\circ} - \theta) = \frac{2h}{\left(\frac{a}{2}\right)}$

$\Rightarrow \cot\theta = \frac{4h}{a}$ ...(1)

Again in triangle ABE,

$\Rightarrow \tan\angle AEB = \frac{AB}{BE}$

$\Rightarrow \tan\theta = \frac{h}{\left(\frac{a}{2}\right)}$

$\Rightarrow \frac{1}{\cot\theta} = \frac{2h}{a}$

$\Rightarrow \frac{a}{4h} = \frac{2h}{a}$

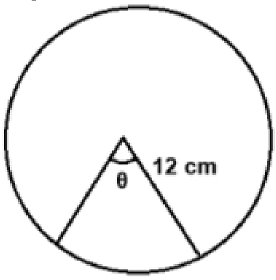
$\Rightarrow a^2 = 8h^2$

$\Rightarrow h = \frac{a}{2\sqrt{2}}$

14.

(b) 150^{o}

Explanation:



area of sector = 60 π cm^2

Let centre angle = θ

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

$\frac{60 \times 360^\circ}{12 \times 12} = \theta$

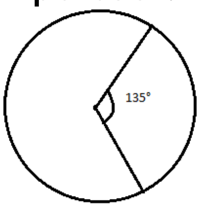
= 150° = θ

Central angle = 150°

15.

(c) 24π cm^2

Explanation:



It is given that the radius of circle = 8 cm

and angle, θ = 135°

Therefore, area of sector $= \frac{\theta}{360^\circ} \times \pi r^2$

$= \frac{135^\circ}{360^\circ} \times \pi \times 8 \times 8$

$= \frac{135^\circ}{360^\circ} \times \pi \times 64$

$= 24\pi$ cm^2

16.

(b) $\frac{1}{52}$

Explanation:

One card is drawn at random from a deck of well shuffled deck of 52 cards

$\therefore$ Possible outcomes = 52

Probability of a card being a 4 of hearts = $\frac{1}{52}$

17.

(c) $\frac{17}{16}$

Explanation:

Since, probability of an event always lies between 0 and 1.

Probability of any event cannot be more than 1 or negative as $\frac{17}{16} > 1$

18.

(d) 18

Explanation:

18

19.

(c) A is true but R is false.

Explanation:

A is true but R is false.

20. **(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.

Section B

21. Let us assume that $4+\sqrt{2}$ is rational. Then, there exist positive co-primes a and b such that

$4+\sqrt{2}=\frac{a}{b}$

$\sqrt{2}=\frac{a}{b}-4$

$\sqrt{2}=\frac{a-4b}{b}$

As a - 4b and b are integers.

So, $\frac{a-4b}{b}$ is a rational number .

But $\sqrt{2}$ is not rational number .

Since a rational number cannot be equal to an irrational number . Our assumption that $4+\sqrt{2}$ is a rational number is wrong .

Hence, $4+\sqrt{2}$ is irrational.

OR

Let us assume that 6 + √2 is a rational number.

So we can write this number as

6 + √2 = a/b

Here a and b are two co-prime numbers and b is not equal to 0

Subtract 6 both side we get

√2 = a/b – 6

√2 = (a-6b)/b

Here a and b are integers so (a-6b)/b is a rational number. So √2 should be a rational number. But √2 is an irrational number. It is a contradiction.

Hence result is 6 + √2 is a irrational number

22. According to question it is given that BM= x, AM = y, CM = z also,

$\triangle \mathrm{AMD} \sim \triangle \mathrm{CMD}$ (using AA Similarity)

$\therefore \frac{\mathrm{AM}}{\mathrm{CM}}=\frac{\mathrm{BM}}{\mathrm{DM}}$

$\frac{y}{z}=\frac{x}{\mathrm{MD}}$

$\Rightarrow MD=\frac{xz}{y}$

$\therefore$ MD $=\frac{xz}{y}$

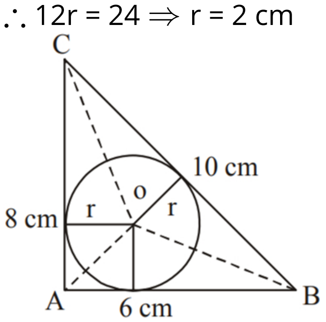
23. CA = $\sqrt{(10)^2-(6)^2}$

= 8 cm

Area $\triangle$ABC = $\frac{8\times 6}{2}$ = 24 cm^2

ar $\triangle$AOC + ar $\triangle$AOB + ar $\triangle$BOC = 4r + 3r + 5r = 12r

$\therefore$ 12r = 24 $\Rightarrow$ r = 2 cm



24. Taking L.H.S

$\frac{\cos A-\sin A+1}{\cos A+\sin A-1}$

Dividing Numerator and Denominator by sin A

$= \frac{\frac{\cos A-\sin A+1}{\sin A}}{\frac{\cos A+\sin A-1}{\sin A}}$

$= \frac{\frac{\cos A}{\sin A}-\frac{\sin A}{\sin A}+\frac{1}{\sin A}}{\frac{\cos A}{\sin A}+\frac{\sin A}{\sin A}-\frac{1}{\sin A}}$

Using the formula $\cot\theta = \frac{\cos\theta}{\sin\theta} = \frac{\cot A-1+cosecA}{\cot A+1-cosecA}$

Using the identity cosec^2A = 1 + cot^2A

$= \frac{\cot A-\left(cosec^2A-\cot^2A\right)+cosecA}{\cot A+1-cosecA}$

$= \frac{(\cot A+cosecA)-\left(cosec^2A-\cot^2A\right)}{\cot A+1-cosecA}$

$= \frac{(\cot A+cosecA)(1-cosecA+\cot A)}{\cot A+1-cosecA}$

= cot A + cosec A

= R.H.S

OR

LHS$= \sqrt{\frac{1+\cos\theta}{1-\cos\theta}}+\sqrt{\frac{1-\cos\theta}{1+\cos\theta}}$

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

$= \sqrt{\frac{(1+\cos\theta)^2}{1-cos^2\theta}}+\sqrt{\frac{(1-\cos\theta)^2}{1-\cos^2\theta}}$

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

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

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

$= \frac{2}{\sin\theta}$

$= 2\cos ec\theta\ \left[\because \frac{1}{\sin\theta} = \cos ec\theta\right]$

= RHS

Hence proved.

25. We have, OA = R = 21 m and OC = r = 14 m

∴Area of the flower bed = Area of a quadrant of a circle of radius R - Area of a quadrant of a circle of radius r

$= \frac{1}{4}\pi R^2 - \frac{1}{4}\pi r^2$

$= \frac{\pi}{4}\left(R^2 - r^2\right)$

$= \frac{1}{4} \times \frac{22}{7}\left(21^2 - 14^2\right)\text{cm}^2$

$= \left\{\frac{1}{4} \times \frac{22}{7} \times (21+14)(21-14)\right\}m^2$

$= \left\{\frac{1}{4} \times \frac{22}{7} \times 35 \times 7\right\}\text{m}^2$

= 192.5 m^2

Section C

26. **Given:** Number of goats for trip = 105

Number of donkey for trip = 140

Number of cows for trip = 175

Therefore, The largest number of animals in one trip = HCF of 105. 140 and 175.

First consider 105 and 140
By applying Euclid's division lemma, we get
140 = 105 $\times$ 1 + 35
105 = 35 $\times$ 3 + 0
Therefore, HCF of 105 and 140 = 35
Now consider 35 and 175
Again applying Euclid's division lemma, we get
175 = 35 $\times$ 5 +0
HCF of 105, 140 and 175 is 35.
So 35 animals of same kind can go for trip in a single trip and number of trip is 105/35 +140/35 + 175/35 = 12

27. Required polynomial is $x^2 - 5x - 6$
For zeroes; $x^2 - 5x - 6 = (x-6)(x+1)$
Zeroes are $x = 6, -1$

28.

Class Interval	**Frequency(f_i)**	**Mid value x_i**	$u_i = \frac{x_i - A}{h} = \frac{x_i - 29.5}{10}$	**($f_i \times u_i$)**
4.5 - 14.5	6	9.5	-2	-12
14.5 - 24.5	11	19.5	-1	-11
24.5 - 34.5	21	29.5 = A	0	0
34.5 - 44.5	23	39.5	1	23
44.5 - 54.5	14	49.5	2	28
54.5 - 64.5	5	59.5	3	15
	$\Sigma f_i = 80$			$\Sigma(f_i \times u_i)$ = 43

Thus, A = 29.5, h = 10 $\sum f_i = 80$ and $\sum f_i u_i = 43$
Mean = $A + \left\{h \times \frac{\sum f_i u_i}{\sum f_i}\right\}$
$= 29.5 + \left(\frac{43}{80} \times 10\right)$
= 29.5 + 5.37
= 34.87 years
Hence, the mean of the frequency distribution is 34.87 years.

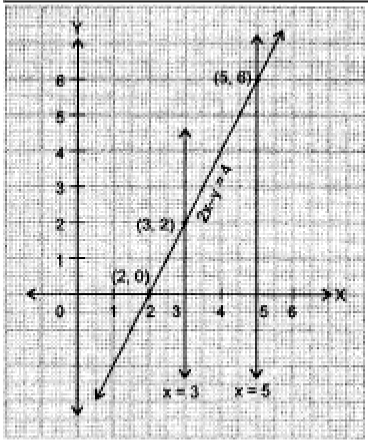
29. 0.2 x + 0.3 y = 1.3 ; 0.4 x + 0.5 y = 2.3
The given system of linear equations is:
0.2 x + 0.3 y = 1.3.............(1)
0.4 x + 0.5 y = 2.3..................(2)
From equation (1),
0.3 y = 1.3 - 0.2 x
$\Rightarrow \quad y = \frac{1.3 - 0.2x}{0.3}$ ....(3)
Substituting this value of y in equation(2), we get
$0.4x + 0.5\left(\frac{1.3 - 0.2x}{0.3}\right) = 2.3$
$\Rightarrow$0.12 x + 0.65 - 0.1 x = 0.69
$\Rightarrow$0.12 x - 0.1 x = 0.69 - 0.65
$\Rightarrow$0.02 x = 0.04
$\Rightarrow \mathrm{x} = \frac{0.04}{0.02} = 2$
Substituting this value of x in equation(3), we get
$y = \frac{1.3 - 0.2(2)}{0.3} = \frac{1.3 - 0.4}{0.3} = \frac{0.9}{0.3} = 3$
Therefore, the solution is x = 2, y = 3, we find that both equation (1) and (2) are satisfied as shown below:
0.2 x + 0.3 y = (0.2)(2)+(0.3)(3) = 0.4 + 0.9 = 1.3

0.4 x + 0.5 y= (0.4)(2) + (0.5)(3) } = 0.8 + 1.5 = 2.3
This verifies the solution.

OR

$2x-y=4$

x	2	3	5
y	0	2	6

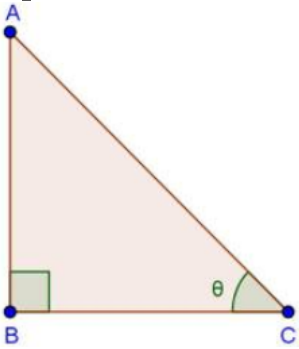


Quadrilateral is like trapezium whose parallel sides are $2\ units\ and\ 6\ units$. Distance between parallel sides is $2\ units.$

So, area of trapezium = $\frac{1}{2}\times$ (sum of parallel sides) $\times$ (Distance between parallel sides)

=$\frac{1}{2}(2+6)\times 2 = 8 sq.\ units$

30.



Let θ is $\angle C$. Given $\sin\theta=\frac{12}{13}=\frac{AB}{AC}$ ......(1)

Let AB = 12K and AC = 13K ,where K is positive integer.

In ΔABC, By using Pythagoras theorem :-

$AB^2 + BC^2 = AC^2$

Or, $(12K)^2 + BC^2 = (13K)^2$

Or, $144K^2 + BC^2 = 169K^2$

Or, $BC^2 = 169K^2 - 144K^2$

Or, $BC^2 = 25K^2$

$\therefore BC=\sqrt{25K^2}=5K$

Now,

$\cos\theta=\frac{BC}{AC}=\frac{5K}{13K}=\frac{5}{13}$ ....(2)

$\tan\theta=\frac{AB}{BC}=\frac{12K}{5K}=\frac{12}{5}$ ....(3)

Now,

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

$=\frac{\left(\frac{12}{13}\right)^2-\left(\frac{5}{13}\right)^2}{2\times\frac{12}{13}\times\frac{5}{13}}\times\frac{1}{\left(\frac{12}{5}\right)^2}$ [from (1),(2) & (3)]

$= \frac{\frac{144}{169} - \frac{25}{169}}{\frac{120}{169}} \times \frac{1}{\frac{144}{25}}$

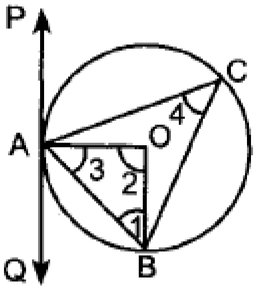
$= \frac{\frac{144-25}{169}}{\frac{120}{169}} \times \frac{25}{144}$

$= \frac{119}{169} \times \frac{169}{120} \times \frac{25}{144}$

$= \frac{595}{3456}$

31. Given:

PAQ is a tangent to the circle with centre O at a point A as shown in figure $\angle OBA = 35^{\circ}$.



$OA = OB$[Radii of the same circle]

$\Rightarrow \angle 3 = 35^{\circ}$ [Angles opposite to equal sides of a triangle are equal]

But, $\angle$1 + $\angle$2 + $\angle 3 = 180^{\circ}$

$\Rightarrow 35^{\circ} + 35^{\circ} + \angle 2 = 180^{\circ}$

$\Rightarrow \angle 2 = 180^{\circ} - 70^{\circ} = 110^{\circ}$

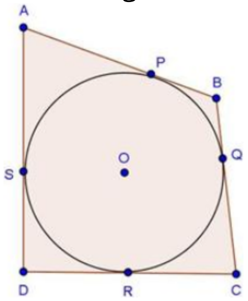
$\angle 4 = \frac{1}{2}\angle 2 = \frac{1}{2} \times 110^{\circ} = 55^{\circ}$

$\Rightarrow \angle ACB = 55^{\circ}$ [Degree measure theorem]

$\angle BAQ = \angle ACB = 55^{\circ}$[Angles in the same segment]

OR

Since tangents drawn from an exterior point to a circle are equal in length.



$\therefore$ AP = AS [From A] ...(i)

BP = BQ [From B] ...(ii)

CR = CQ [From C] ...(iii)

and, DR = DS [From D] ...(iv)

adding (i), (ii), (iii) and (vi), we get

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

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

$\Rightarrow$ AB + CD = AD + BC

Hence, AB + CD = BC + DA

Section D

32.

Lifeline (in hours)	Frequency	cf
1500 – 2000	10	10
2000 – 2500	35	45
2500 – 3000	52	97
3000 – 3500	61	158
3500 – 4000	38	196

4000 – 4500	29	225

$\frac{N}{2}=\frac{225}{2}=112\cdot 5$

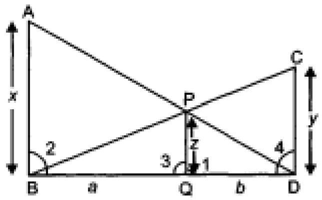
I = 3000, c.f. = 97, f = 61, h = 500

Median $=I+\frac{\left(\frac{N}{2}-cf\right)}{f}\times \mathrm{h}$

$=3000+\frac{(112\cdot 5-97)}{61}\times 500$

$=3000+\frac{7750}{61}=3127\cdot 05$

33. Let BQ = a units, DQ = b units



$\because$ PQ $\parallel$ AB $\therefore \angle 1=\angle 2$,

and $\angle ADB=\angle PDQ$

$\therefore$ $\triangle \mathrm{ADB}\sim\triangle \mathrm{PDQ}$

Similarly $\triangle BCD\sim\triangle BPQ$

$\because$ $\triangle ADB\sim\triangle PDQ$

$\therefore$ $\frac{\mathrm{AB}}{\mathrm{PQ}}=\frac{\mathrm{BD}}{\mathrm{DQ}}$

$\frac{x}{z}=\frac{a+b}{b}$

$\frac{x}{z}=\frac{a}{b}+1\Rightarrow\frac{x}{z}-1=\frac{a}{b}$ ..(i)

Also, $\triangle BCD\sim\triangle BPQ$

$\therefore$ $\frac{\mathrm{BD}}{\mathrm{BQ}}=\frac{\mathrm{CD}}{\mathrm{PQ}}\Rightarrow\frac{a+b}{a}=\frac{y}{z}$

$1+\frac{b}{a}=\frac{y}{z}\Rightarrow\frac{b}{a}=\frac{y}{z}-1$

$\Rightarrow$ $\frac{b}{a}=\frac{y-z}{z}\Rightarrow\frac{a}{b}=\frac{z}{y-z}$ ..(ii)

From (i) and (ii)

$\frac{x}{z}-1=\frac{z}{y-z}\Rightarrow\frac{x}{z}=\frac{z}{y-z}+1$

$\frac{x}{z}=\frac{z+y-z}{y-z}$

$\frac{x}{z}=\frac{y}{y-z}\Rightarrow\frac{z}{x}=\frac{y-z}{y}$

$\frac{z}{x}=1-\frac{z}{y}$

$z\left(\frac{1}{x}\right)=z\left(\frac{1}{z}-\frac{1}{y}\right)\Rightarrow\frac{1}{x}=\frac{1}{z}-\frac{1}{y}$

$\Rightarrow$ $\frac{1}{x}+\frac{1}{y}=\frac{1}{z}$ (Hence proved)

34. Let the original speed of the aircraft be x km/hr.

Distance covered = 2800 km.

We know that, time taken to cover 'd' km with speed 's' km/hr is $\frac{d}{s}hr$

So, Time taken to cover 2800 km = $\frac{2800}{x}$ hours.

Reduced speed = (x - 100) km/hr.

Time taken to cover 2800 km at this speed = $\frac{2800}{(x-100)}$ hours.

Given time taken with reduced speed is 30 minutes i.e. $\frac{30}{60}hr$

$\therefore$ $\frac{2800}{(x-100)}-\frac{2800}{x}=\frac{30}{60}$

$\Rightarrow$ $\frac{1}{(x-100)}-\frac{1}{x}=\frac{1}{2\times 2800}\Rightarrow\frac{x-(x-100)}{(x-100)x}=\frac{1}{5600}$

$\Rightarrow$ $\frac{100}{(x^2-100x)}=\frac{1}{5600}\Rightarrow$ x^2 - 100x - 560000 = 0

$\Rightarrow$ x^2 - 800x + 700x - 560000 = 0

$\Rightarrow$ x(x-800) + 700(x - 800) = 0
$\Rightarrow$ (x - 800)(x + 700) = 0
$\Rightarrow$ x - 800 = 0 or x + 700 = 0
$\Rightarrow$ x = 800 or x = -700
$\Rightarrow$ x = 800 [$\because$ speed cannot be negative]
original speed of the aircraft = 800 km/hr
original duration of the flight = $\frac{2800}{800}$ hours.=3.5 hrs
= 3 hours 30 minutes.

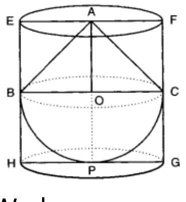
OR

The given equation is: $\frac{1}{x-2}+\frac{2}{x-1}=\frac{6}{x}$
$\Rightarrow \quad \frac{x-1+2x-4}{(x-2)(x-1)}=\frac{6}{x}$
$\Rightarrow \quad 3x^2-5x=6x^2-18x+12$
$\Rightarrow \quad 3x^2-13x+12=0$
$\Rightarrow 3x^2-4x-9x+12=0$
$\Rightarrow x(3x-4)-3(3x-4)=0$
$\Rightarrow$ (3x -4)(x -3) = 0
$\Rightarrow x=\frac{4}{3}$ and 3
Hence, $x=3,\frac{4}{3}$

35. Surface area to colour = surface area of hemisphere + curved surface area of cone
Diameter of hemisphere = 3.5 cm
So radius of hemispherical portion of the lattu = r = $\frac{3.5}{2}\mathrm{cm}$ = 1.75
r = Radius of the concial portion = $\frac{3.5}{2}$ = 1.75
Height of the conical portion = height of top - radius of hemisphere = 5 - 1.75 = 3.25 cm
Let I be the slant height of the conical part. Then,
$l^2=h^2+r^2$
$l^2=(3.25)^2+(1.75)^2$
$\Rightarrow l^2 = 10.5625+3.0625$
$\Rightarrow l^2=13.625$
$\Rightarrow l=\sqrt{13.625}$
$\Rightarrow l=3.69$
Let S be the total surface area of the top. Then,
$S=2\pi r^2+\pi rl$
$\Rightarrow \quad S=\pi r(2r+l)$
$\Rightarrow S=\frac{22}{7}\times 1.75(2\times 1.75+3.7)$
$= 5.5(3.5+3.7)$
$=5.5(7.2)$
$=39.6\ cm^2$

OR

Let BPC be the hemisphere and ABC be the cone mounted on the base of the hemisphere. Let EFGH be the right circular cylinder circumscribing the given toy.



We have,
Given radius of cone, cylinder and hemisphere (r) = $\frac{4}{2}$ = 2 cm
Height of cone (l) = 2 cm
Height of cylinder (h) = 4 cm

Now, Volume of the right circular cylinder = $\pi r^2 h = \pi \times 2^2 \times 4\text{cm}^3 = 16\pi\text{cm}^3$
Volume of the solid toy = $\left\{\frac{2}{3}\pi \times 2^3 + \frac{1}{3}\pi \times 2^2 \times 2\right\}\text{cm}^3 = 8\pi\text{cm}^3$
$\therefore$ Required space = Volume of the right circular cylinder - Volume of the toy
$= 16\pi\text{cm}^3 - 8\pi\text{cm}^3 = 8\pi\text{cm}^3.$
Hence, the right circular cylinder covers $8\pi\text{cm}^3$ more space than the solid toy.
So, remaining volume of cylinder when toy is inserted in it = 8π cm ^{3}

Section E

36. i. Number of bricks in the bottom row = 30. in the next row = 29, and so on.
Therefore, Number of bricks stacked in each row form a sequence 30, 29, 28, 27, ..., which is an AP with first term, a = 30 and common difference, d = 29 - 30 = -1
Suppose number of rows is n, then sum of number of bricks in n rows should be 360.
i.e. $S_n = 360$
$\Rightarrow \frac{n}{2}[2 \times 30 + (n-1)(-1)] = 360$ $\{S_n = \frac{n}{2}(2a + (n-1)d)$ }
$\Rightarrow 720 = n(60 - n + 1)$
$\Rightarrow 720 = 60n - n^2 + n$
$\Rightarrow n^2 - 61n + 720 = 0$
$\Rightarrow n^2 - 16n - 45n + 720 = 0$ [by factorization]
$\Rightarrow n(n-16) - 45(n-16) = 0$
$\Rightarrow (n-16)(n-45) = 0$
$\Rightarrow (n-16) = 0$ or $(n-45) = 0$
$\Rightarrow n = 16$ or $n = 45$
Hence, number of rows is either 45 or 16.
n = 45 not possible so n = 16
$a_{45} = 30 + (45-1)(-1)$ $\{a_n = a + (n-1)d$ }
$= 30 - 44 = -14$ [$\because$ The number of logs cannot be negative]
Hence the number of rows is 16.

ii. Number of bricks in the bottom row = 30. in the next row = 29, and so on.
Therefore, Number of bricks stacked in each row form a sequence 30, 29, 28, 27,..., which is an AP with first term, a = 30 and common difference, d = 29 - 30 = -1
Suppose number of rows is n, then sum of number of bricks in n rows should be 360.
Number of bricks on top row are $n = 16$,
a_{16} = 30 + (16 - 1) (-1) {a_n = a + (n - 1)d}
= 30 - 15 = 15
Hence, and number of bricks in the top row is 15.

iii. Number of bricks in the bottom row = 30. in the next row = 29, and so on.
therefore, Number of bricks stacked in each row form a sequence 30, 29, 28, 27, ..., which is an AP with first term, a = 30 and common difference, d = 29 - 30 = -1.
Suppose number of rows is n, then sum of number of bricks in n rows should be 360
Number of bricks in 10th row a = 30, d = -1, n = 10
a_n = a + (n - 1)d
$\Rightarrow$ a_{10} = 30 + 9 $\times$ -1
$\Rightarrow$ a_{10} = 30 - 9 = 21
Therefore, number of bricks in 10th row are 21.

OR

Number of bricks in the bottom row = 30. in the next row = 29, and so on.
Therefore, Number of bricks stacked in each row form a sequence 30, 29, 28, 27,..., which is an AP with first term, a = 30 and common difference, d = 29 - 30 = -1.
Suppose number of rows is n, then sum of number of bricks in n rows should be 360.
a_n = 26, a = 30, d = -1
a_n = a + (n - 1)d

$\Rightarrow$ 26 = 30 + (n - 1) $\times$ -1

$\Rightarrow$ 26 - 30 = -n + 1

$\Rightarrow$ n = 5

Hence 26 bricks are in 5th row.

37. i. 

Middle point of QS = $\left(\frac{10+3}{2}, \frac{6+2}{2}\right)$

= (6.5, 4)

ii. Length = RS = $\sqrt{(10-3)^2+(2-2)^2}$

RS = $\sqrt{7^2+0}$

RS = 7 m

Breadth = RQ = $\sqrt{(10-10)^2+(2-6)^2}$

$=\sqrt{0+16}$

= 4 m

iii. Area of rectangle = l $\times$ b

= 7 $\times$ 4

= 28 m^2

OR

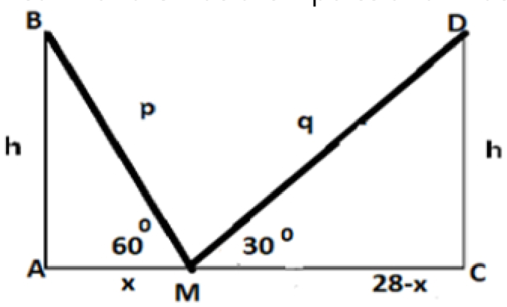
Diagonal = $\sqrt{l^2+b^2}$

$=\sqrt{7^2+4^2}$

$=\sqrt{49+16}$

$=\sqrt{65}$

38. i. Let AB and CD be the 2 poles and M be a point somewhere between their bases in the same line.



ii. tan 60° = $\frac{h}{x}$ $\Rightarrow$ h = x$\sqrt{3}$

tan 30° = $\frac{h}{28-x}$ $\Rightarrow$ h = $\frac{(28-x)}{\sqrt{3}}$

$\therefore$ h = $7\sqrt{3}$ m

iii. BM = p and DM = q

sin 60° = $\frac{h}{p}$ $\Rightarrow$ h = $\frac{p\sqrt{3}}{2}$

sin 30° = $\frac{h}{q}$ $\Rightarrow$ h = $\frac{q}{2}$

$\therefore$ $\frac{p\sqrt{3}}{2}$ = $\frac{q}{2}$ $\Rightarrow$ q = $\sqrt{3}$p

OR

tan 60° = $\frac{7\sqrt{3}}{x}$ $\Rightarrow$ x = 7m = AM

MC = 28 - x = 21m