Solution

MATHEMATICS

Class 10 - Mathematics

Section A

1.
(c) 45
Explanation:
We have,
135 = 3 $\times$ 45
= 3 $\times$ 3 $\times$ 15
= 3 $\times$ 3 $\times$ 3 $\times$ 5
= $3^3 \times 5$
Now, for 225 will be
225 = 3 $\times$ 75
= 3 $\times$ 3 $\times$ 5$\times$5
= $3^2 \times 5^2$
The HCF will be $3^2 \times 5$ = 45

2.
(c) 2
Explanation:
No. of zeros = no. of times the graph cuts the x-axis. Here the graph cuts the x-axis two times so no. of zero's = 2

3. **(a)** no solution
Explanation:
Since, we have y = 0 and y = -6 are two parallel lines.
therefore, no solution exists.

4.
(c) pq
Explanation:
Let the roots of given quadratic equation be α and β.
On comparing equation x^2 - (p - q) x + k = 0
with ax^2 + bx + c = 0, we have
a = 1, b = -(p + q), c = k
We know that
$\Rightarrow \alpha + \beta = \frac{-b}{a}$
Put the value a and b
$\Rightarrow \alpha + \beta = \frac{p+q}{1}$
$\Rightarrow \alpha + \beta$ = p + q ...(i)
Given α = p
Put the value of α in equation (i),
$\Rightarrow$ p + β = p + q
$\Rightarrow$ β = q
But we know that
$\alpha \cdot \beta = \frac{c}{a}$
Put the values
p.q. $= \frac{k}{1}$
Then, k = pq.

5.

(d) 10

Explanation:

AP can be written as

49, 46, 43...

a = 49, d = -3

n = 14

a_{14} = a + 13d

= 49 + 13(-3)

= 49 - 39

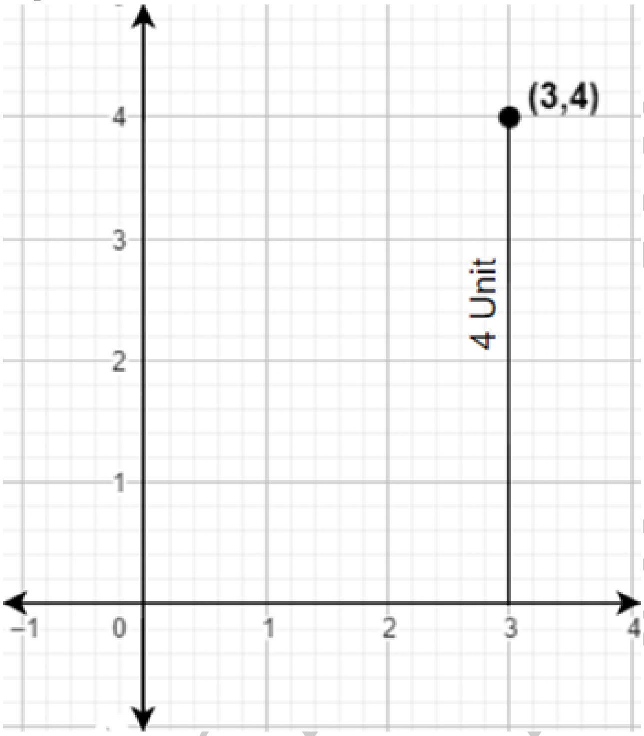
a_{14} = 10

14^{th} term from last = 10

6.

(c) 4 units

Explanation:



Distance is 4 units.

7.

(d) $\sqrt{41}$ units

Explanation:

OP = $\sqrt{(4-0)^2+(0-(-5))^2}$

$=\sqrt{(16+25)}$

= $\sqrt{41}$ units

8.

(d) 8 cm

Explanation:

As PQ || AC by using proportionality theorem

$\Rightarrow \frac{BP}{PA}=\frac{BQ}{QC}$

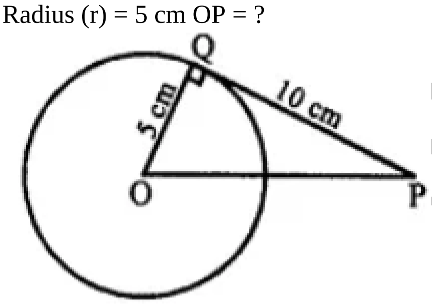
$\Rightarrow \frac{4}{2.4}=\frac{5}{QC}$

$\Rightarrow \mathrm{QC}=\frac{5\times2.4}{4}$ = 5 × 0.6

$\Rightarrow$ QC = 3 cm
$\therefore$ BC = BQ + QC
= 5 + 3
= 8 cm

9.
(c) 25^{o}
Explanation:
PA = PB (tangents from same point)
PAB is an isosceles triangle
angle PAB = angle PBA = x
In triangle PBA
50° + x + x = 180°
2x = 130°
x = 65°
Now
$\angle$PAO = 90°
x + $\angle$OAB = 90°
$\angle$ OAB = 90° - 65°
$\angle$OAB = 25°

10.
(b) $\sqrt{125}$
Explanation:
Length of a tangent to the circle from an external point = 10 cm
Radius (r) = 5 cm OP = ?



OQ is radius and QP is tangent
OQ $\perp$ QP
In right $\triangle$OPQ,
$OP^2 = OQ^2 + QP^2$ (Pythagoras Theorem) = $(5)^2 + (10)^2$ = 25 + 100 = 125
OP = $\sqrt{125}$ cm

11.
(c) $\tan^2 A$
Explanation:
$\frac{1+\tan^2 A}{1+\cot^2 A} = \frac{1+\tan^2 A}{1+\frac{1}{\tan^2 A}}$
$= \frac{1+\tan^2 A}{\frac{\tan^2 A+1}{\tan^2 A}}$
$= (1+\tan^2 A)\left(\frac{\tan^2 A}{\tan^2 A+1}\right) = \tan^2 A$
Hence, the correct choice is $\tan^2 A$.

12. **(a)** 9
Explanation:

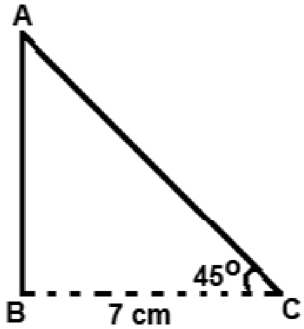
$2 \sin^2 30^o + 3 \tan^2 60^o - \cos^2 45^o$

$= 2 \times \left(\frac{1}{4}\right) + 3 \times 3 - \frac{1}{2} = 9$

13.

(c) 7 m

Explanation:



height of tree = AB

$\tan 45^\circ = \frac{AB}{BC}$

$1 = \frac{AB}{7}$

AB = 7 m

14.

(d) 126°

Explanation:

We have given that area of the sector is $\frac{7}{20}$ of the area of the circle.

Therefore, area of the sector $= \frac{7}{20} \times$ area of the circle

$\therefore \frac{\theta}{360} \times \pi r^2 = \frac{7}{20} \times \pi r^2$

Now we will simplify the equation as below,

$\frac{\theta}{360} = \frac{7}{20}$

Now we will multiply both sides of the equation by 360,

$\therefore \theta = \frac{7}{20} \times 360$

$\therefore \theta = 126$

Therefore, sector angle is 126°.

15.

(c) $\frac{60}{\pi}$ cm

Explanation:

Given: Length of arc = 20 cm

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

$\Rightarrow \frac{60^\circ}{360^\circ} \times 2\pi$r= 20

$\Rightarrow \frac{\pi r}{3}$ = 20

$\Rightarrow r\left(\frac{\pi}{3}\right)$ = 20

$\Rightarrow r\left(\frac{\pi}{3}\right)$ = 20

$\Rightarrow$ r = $\frac{60}{\pi}$ cm

16.

(c) $\frac{1}{6}$

Explanation:

When two dice are thrown,

The sample space S = {(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6)

(2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6),

(3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6),

(4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6),
(5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6),
(6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)

$\therefore$ n(S) = 36

Let A: Event of getting the numbers whose difference is 3.

$\therefore$ A = (1, 4), (2, 5), (3, 6), (4, 1), (5, 2), (6, 3)}

n(A) = 6

$\therefore$ Required probability = $\frac{n(A)}{n(S)}$

$= \frac{6}{36}$

$= \frac{1}{6}$

17.

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

Explanation:

A card is drawn at random from a pack of well shuffled 52 playing cards. 'S' is the sample space.

$\therefore$ n(S) = 52

Event A: The card drawn is an ace of spade

$\therefore$n(A) = 1

$\therefore$ P(A) = $\frac{n(A)}{n(S)}$

= $\frac{1}{52}$

18.

(d) 24.5

Explanation:

Median = 26

Mode = 29

Mode = 3Median - 2Mean

Hence, $Mean = \frac{\text{3Median - Mode}}{2}$

$= \frac{3(26)-29}{2}$

$= \frac{78-29}{2}$

$= \frac{49}{2}$

= 24.5

19.

(d) A is false but R is true.

Explanation:

A is false but R is true.

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. We have to find the greatest number which divides 85 and 72 leaving remainder 1 and 2 respectively.

Let assume that x be the greatest number which divides 85 and 72 leaving remainder 1 and 2 respectively.

So, it means

x divides 85 - 1 = 84

and

x divides 72 - 2 = 70

So, from this we concluded that

= x divides 84 and 70

= x = HCF (84, 70)

Now, to find HCF(84, 70), we use method of prime factorization.

Prime factors of 84 = $2 \times 2 \times 3 \times 7$

Prime factors of 70 = $2 \times 5 \times 7$

So,

= HCF (84, 70) = 2×7 = 14

= x = 14

Hence, 14 is the greatest number which divides 85 and 72 leaving remainder 1 and 2 respectively.

22. Since G is the mid-point of PQ, then,

PG = GQ. According to the question, GH $\|$ QR.Therefore by basic theorm of proportionality,we have,

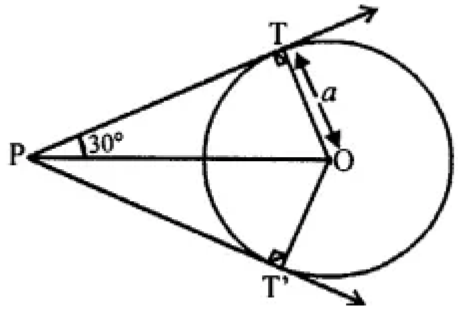
$\frac{PG}{GQ} = \frac{PH}{HR}$

$1 = \frac{PH}{HR}$ [as PG = GQ]

PH = HR

Hence,H is the mid-point of PR.

23. Since, tangents drawn from an external point are equally inclined to the line joining centre to that point.



$\therefore \angle \mathrm{TPT} = 60^{\circ} \quad \Rightarrow \angle \mathrm{TPO} = 30^{\circ}$

Also, OT $\perp$ TP

Now, in $\triangle$TPO $\sin 30^{\circ} = \frac{\mathrm{OT}}{\mathrm{OP}}$

$\Rightarrow \frac{1}{2} = \frac{a}{\mathrm{OP}} \quad \Rightarrow \mathrm{OP} = 2a$

24. We have,

LHS = $\tan^2$A - $\tan^2$B

$\Rightarrow \quad \mathrm{LHS} = \frac{\sin^2 A}{\cos^2 A} - \frac{\sin^2 B}{\cos^2 B}$

$\Rightarrow \quad \mathrm{LHS} = \frac{\sin^2 A \cos^2 B - \cos^2 A \sin^2 B}{\cos^2 A \cos^2 B}$

$\Rightarrow \quad \mathrm{LHS} = \frac{(1-\cos^2 A)\cos^2 B - \cos^2 A(1-\cos^2 B)}{\cos^2 A \cos^2 B}$

$\Rightarrow \quad \mathrm{LHS} = \frac{\cos^2 B - \cos^2 A \cos^2 B - \cos^2 A + \cos^2 A \cos^2 B}{\cos^2 A \cos^2 B}$

$\Rightarrow \quad \mathrm{LHS} = \frac{\cos^2 B - \cos^2 A}{\cos^2 A \cos^2 B}$

$\Rightarrow \quad \mathrm{LHS} = \frac{(1-\sin^2 B) - (1-\sin^2 A)}{\cos^2 A \cos^2 B} = \frac{\sin^2 A - \sin^2 B}{\cos^2 A \cos^2 B}$ = RHS

OR

LHS = $\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta}$

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

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

= $\tan\theta\left(\frac{2\cos^2\theta-1}{2\cos^2\theta-1}\right)$

= $\tan\theta$ = RHS

25. 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

OR

Given that,
Radius of circle = 7 cm
Central angle = 90^o
Now, area of minor sector of circle
$= \frac{\pi r^2 \theta}{360^\circ}$
$= \frac{\pi (7)^2}{4}$
$= \frac{22 \times 7 \times 7}{7 \times 4}$
= 38.5 cm^2
Area of complete circle
= πr^2
= $\pi (7)^2$
= 154 cm^2
Now, area of major sector
= Area of complete circle - Area of minor sector
= 154 - 38.5
= 115.5 cm^2

Section C

26. Given numbers are 156, 208 and 260.
Here, 260 > 208> 156
Let us find the HCF of 260 and 208,
By using Euclid's division lemma for 260 and 208,
we get
260 = (208 × 1) + 52
Here , the remainder is 52, not zero.
On taking 208 as new dividend and 52 as new divisor and then apply Euclid's division lemma, we get
208 = (52 × 4) + 0
Here, the remainder is zero and the divisor is 52.
So, HCF of 208 and 260 is 52.
Now, 156 >52
Let us find the HCf of 52 and 156. By using Euclid's division lemma , we get
156 = (52 × 3) + 0
Here, the remiander is zero and the divisor is 52.
So, HCF of 52 amd 156 is 52.
Thus, HCf of 156, 208 and 260 is 52.
Hence, the minimum number of buses
$= \frac{156}{52} + \frac{208}{52} + \frac{260}{52} = \frac{156+208+260}{52} = \frac{624}{52} = 12$
The minimum number of buses is 12.
27. Let the given polynomial is p(x) = $4x^2 + 4x + 1$
Since, α, β are zeroes of p(x),
$\therefore \alpha + \beta$= sum of zeroes = $\frac{-4}{4}$
Also, $\alpha . \beta$= Product of zeroes = $\alpha . \beta = \frac{1}{4}$
Now a quadratic polynomial whose zeroes are 2α and 2β
x^2 - (sum of zeroes)x + Product of zeroes
$= x^2 - (2\alpha + 2\beta)x + 2\alpha \times 2\beta$
$= x^2 - 2(\alpha + \beta)x + 4(\alpha\beta)$
$= x^2 - 2 \times (-1)x + 4 \times \frac{1}{4}$
= $x^2 + 2x + 1$
The quadratic polynomial whose zeroes are 2α and 2β is $x^2 + 2x + 1$
28. Since each prize is Rs 20 less than its preceding prize,
therefore, the value of the seven successive cash prizes will form an AP.

Let the first prize be Rs a.
Then the winner prizes, in succession,
will be Rs (a - 20), Rs (a - 40), Rs (a - 60), etc.
Here, A = a
d = (a - 20) - a = -20
n = 7
$S_n = 700$
We know that
$S_n = \frac{n}{2}[2A(n-1)d]$
$\Rightarrow 700 = \frac{7}{2}[2a + (7-1)(-20)]$
$\Rightarrow 700 = \frac{7}{2}[2a - 120]$
$\Rightarrow 700 = 7(a - 60)$
$\Rightarrow a - 60 = \frac{700}{7}$
$\Rightarrow$ a - 60 = 100
$\Rightarrow$ a = 100 + 60
$\Rightarrow$ a = 160
$\Rightarrow$ Value of first prize = Rs 160
Value of second prize = Rs 160 - Rs 20 = Rs 140
Value of third prize = Rs 140 - Rs 20 = Rs 120
Value of fourth prize = Rs 120 - Rs 20 = Rs 100
Value of fifth prize = Rs 100 - Rs 20= Rs 80
Value of sixth prize = Rs 80 - Rs 20 = Rs 60
Value of seventh prize = Rs 60 - Rs 20= Rs 40

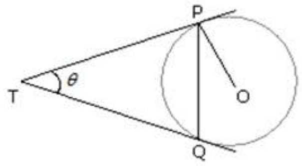
OR

The given AP is:
9,12, 15, 18.........
Here a = 9 and d = 12 - 9 = 3
Let n^{th} term of this A.P. is 39 more than 26^{th} term
$a_n = a_{36} + 39$
a + (n - 1)d = a + (36 - 1)d + 39
9 + (n - 1)$\times$ 3 = 9 + 35$\times$ 3 + 39
9 + 3n - 3 = 9 + 105 + 39
3n=9+144-9+3
3n=147
$n = \frac{147}{3} = 49$
Therefore, 49^{th} term of A.P. will be 39 more than its 36^{th} term.

29. According to question we are given that PQ = 10 cm, QR = 8 cm and PR = 12 cm.
We know that the lengths of the tangents drawn from an external point to a circle are equal.
Let PL = PN = x;
QL = QM = y;
RM = RN =z.
Now,PL + QL = PQ
$\Rightarrow$ x+y = 10, ...(i)
QM + RM = QR
$\Rightarrow$ y + z = 8, ...(ii)
Subtracting (ii) from (iii), we get
x - y = 4. ...(iv)
Solving (i) and (iv), we get
x = 7, y = 3.
Substituting y = 3 in (ii), we get z = 5
$\therefore$ QM = y = 3 cm,

RN = z = 5 cm,
PL = x = 7 cm.

OR



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 = θ
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

30. Given,
$\tan\theta + \sin\theta = m$......(1)
&, $\tan\theta - \sin\theta = n$ ......(2)
Now, LHS = $m^2 - n^2$
$= (\tan\theta + \sin\theta)^2 - (\tan\theta - \sin\theta)^2$ [from (1) & (2)]
$= \tan^2\theta + \sin^2\theta + 2\tan\theta\sin\theta - \tan^2\theta - \sin^2\theta + 2\tan\theta\sin\theta$
$= 4\tan\theta\sin\theta$
$= 4\sqrt{\tan^2\theta \cdot \sin^2\theta}$
$= 4\sqrt{\tan^2\theta(1-\cos^2\theta)}$
$= 4\sqrt{\tan^2\theta - \sin^2\theta}$
$= 4\sqrt{(\tan\theta+\sin\theta)(\tan\theta-\sin\theta)}$
$= 4\sqrt{mn}$ [from (1) & (2)]
= RHS. Hence, Proved.

31.

Class	**Mid-point (x_i)**	**f_i**	**$d_i = x_i - A$**	**f_id_i**
10-15	12.5	4	-10	-40
15-20	17.5	10	-5	-50
20-25	22.5=A	5	0	0
25-30	27.5	6	5	30
30-35	32.5	5	10	50
Total		$\sum f_i = 30$		$\sum f_id_i = 10$

Here, assumed mean, A = 22.5
Mean = $A + \frac{\sum f_id_i}{\sum f_i}$
$= 22.5 + \frac{-10}{30}$
= 22.5 - 0.33
= 22.17

Section D

32. Let the present age of Roohi be x years.
Then,

3 years ago, Roohi's age = (x - 3) years

5 years from now, Roohi's age = (x + 5) years

It is given that

$\frac{1}{x-3}+\frac{1}{x+5}=\frac{1}{3}$

$\Rightarrow \frac{x+5+x-3}{(x-3)(x+5)}=\frac{1}{3}$

$\Rightarrow \frac{2x+2}{x^2+2x-15}=\frac{1}{3}$

$\Rightarrow$ 6x + 6 = x^2 + 2x - 15

$\Rightarrow$ x^2 - 4x - 21 = 0

$\Rightarrow$ x^2 - 7x + 3x - 21 = 0

$\Rightarrow$ x(x - 7) + 3(x - 7) = 0

$\Rightarrow$ x - 7 = 0 or x + 3 = 0

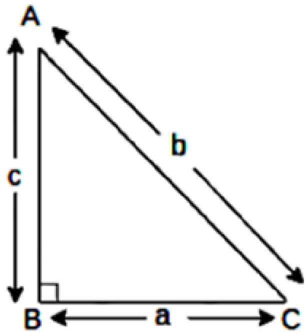
Since age cannot be negative, x $\neq$ -3

$\Rightarrow$ x = 7

Hence, Roohi's present age is 7 years.

OR

Let $\triangle$ABC be the right angle triangle, right angled at B, as shown in figure.



Also, let AB = c cm, BC = a cm and AC = b cm

Then, according to the given information, we have

b = 6 + 2a ...(i) (Let a be the shortest side)

and c = 3a - 6

We know that, $b^2 = c^2 + a^2$

$\Rightarrow$ $(6 + 2a)^2 = (3a - 6)^2 + a^2$ ...[Using (i) and (ii)]

$\Rightarrow$ 36 + $4a^2$ + 24a = $9a^2$ + 36 - 36a + a^2

$\Rightarrow$ 60a = $6a^2$

$\Rightarrow$ 6a=60 ...[$\because$ a cannot be zero]

$\Rightarrow$ a = 10 cm

Now, from equation (i),

b = 6 + 2 $\times$ 10 = 26

and from equation (ii),

c = 3 $\times$ 10 - 6 = 24

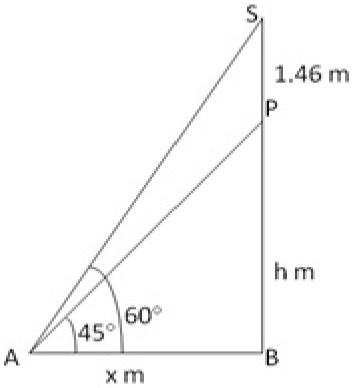
Thus, the dimensions of the triangle are 10 cm, 24 cm and 26 cm.

33. Height of the statue, SP = 1.46 m(given)

Suppose PB, the height of the pedestal = h metre

According to question angles of elevation of S and P are 60° and 45° respectively.

Further suppose AB = x m,



In right $\Delta \mathrm{ABS}$,

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

$\Rightarrow \frac{h+1.46}{x} = \sqrt{3}$ ....(i)

In right $\Delta \mathrm{PAB}$,

$\frac{PB}{AB} = \tan 45^{\circ} = 1$

$\therefore$ h = x ....(ii)

Putting x = h in (i), we get

$\frac{h+1.46}{h} = \sqrt{3} \Rightarrow h + 1.46 = \sqrt{3}h$

or h $(\sqrt{3} - 1)$ = 1.46 $\therefore h = \frac{1.46}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$

$\therefore h = \frac{1.46}{2} \times (\sqrt{3} + 1) = 0.73 \times 2.732$

= 2m (nearly)

Thus, height of the pedestal = 2m

34. According to question it is given that

Diameter of the base of the cone is = 7cm

Therefore radius = $\frac{7}{2}$ = 3.5cm

Total height of the toy = 14.5 cm

Height of the cone = 15.5 - 3.5 = 12 cm

Height of the hemisphere = 3.5 cm

According to question it is also given that

Volume of the toy = Volume of cone + Volume of hemisphere

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

$=\frac{1}{3}\pi r^2 (2r + h)$

$=\frac{1}{3} \times \frac{22}{7} \times (3.5)^2 [2 \times 3.5 + 12]$

$=\frac{1}{3} \times 22 \times 1.75 \times 19$

= 243.83 cm^3

OR

Clearly r = $\frac{1}{2}$, h = $\frac{1}{2}$

Volume of solid = Volume of Cone + Volume of Hemisphere

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

= $\frac{1}{3} \times 3.14 \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$ + $\frac{2}{3} \times 3.14 \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$

= $\frac{1}{3} \times 3.14 \times \frac{1}{2} \times \frac{1}{2} \times \left[\frac{1}{2} + 2\left(\frac{1}{2}\right)\right]$

= $\frac{1}{3} \times \frac{3.14}{4} \times \frac{3}{2}$

= $\frac{1.57}{4}$ = $\frac{157}{400}$ cm^3 or 0.3925 cm^3

35.

C.I.	x_i	f	$u_i = \frac{x_i - a}{h}$	$f_i u_i$
10 - 25	17.5	2	-2	-4
25 - 40	32.5	3	-1	-3
40 - 55	47.5 a	7	0	0

55 - 70	62.5	6	1	6
70 - 85	77.5	6	2	12
85 - 100	92.5	6	3	18
		30		**29**

Mean = $47.5 + \frac{29}{30} \times 15$

= 47.5 + 14.5 = 62

Section E

36. i. x + y + 2 = 15

x + y = 13 ...(i)

Area of bedroom + Area of kitchen = 95

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

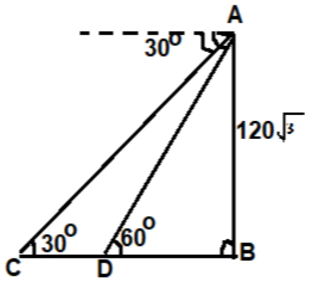
2x + y = 19 ...(ii)

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

x = 6

Area of bedroom 1 = $5 \times x$

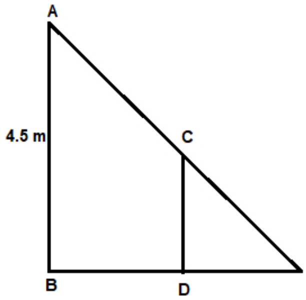
= 5×6 = 30 m^2

OR

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

= 10 + 63

= 73 m^2

37. i. 

Distance covered in 2 sec = 2 m

length of shadow = 1 m

Total distance from base = 2 + 1 = 3m

$\frac{1}{3} = \frac{\text{height of Rohan}}{4.5}$

height of Rohan = 1.5 m

= 150 cm

ii. When x > 1.5 m

distance walked = d m

$\Rightarrow \frac{x}{d+x} = \frac{1.5}{4.5}$

$\Rightarrow \frac{x}{d+x} = \frac{1}{3}$

2x = d

d > 3

hence, the time must be 3 sec

$\therefore$ minimum time after which his shadow become larger than his original height = 3 s

iii. 3 metres

OR

After 4 and distance = 4 m

Shadow length = y m

$\frac{y}{4+y} = \frac{1.5}{4.5}$

3y = 4 + y

y = 2 m

$\therefore$ After 4 sec, the shadow length will be 2 m

38. i. Since, PQRS is a square

$\therefore$ PQ = QR = RS = PS

Length of PQ = 200 - (-200) = 400

$\therefore$ The coordinates of R = (200, 400)

and coordinates of S = (-200, 400)

ii. Area of square PQRS = (side)^2

= (PQ)^2

= (400)^2

= 1,60,000 sq. units

iii. By Pythagoras theorem

(PR)^2 = (PQ)^2 + (QR)^2

= 1,60,000 + 1,60,000

= 3,20,000

$\Rightarrow$ PR = $\sqrt{3,20,000}$

= 400 $\times$ $\sqrt{2}$ units

OR

Since, point S divides CA in the ratio K : 1

$\therefore \left(\frac{Kx_2+x_1}{K+1}, \frac{Ky_2+y_1}{K+1}\right)$ = (-200, 400)

$\Rightarrow \left(\frac{K(200)+(-600)}{K+1}, \frac{K(800)+0}{K+1}\right)$ = (-200, 400)

$\Rightarrow \left(\frac{200K-600}{K+1}, \frac{800K}{K+1}\right)$ = (-200, 400)

$\therefore \frac{800K}{K+1}$ = 400

$\Rightarrow 800K = 400K + 400$
$\Rightarrow 400K = 400$
$\Rightarrow K = 1$