Solution
MOCK EXAM - PAPER 1
Class 10 - Mathematics
Section A

1.
(d) 2
Explanation:
LCM (a, b, c) $= 2^3 \times 3^2 \times 5$ .... (I)
we have to find the value of n
Also we have
$a = 2^3 \times 3$
$b = 2 \times 3 \times 5$
$c = 3^n \times 5$
We know that the while evaluating LCM, we take greater exponent of the prime numbers in the factorisation of the number.
Therefore, by applying this rule and taking $n \geq 1$ we get the LCM as
LCM (a, b, c) = $2^3 \times 3^n \times 5$ ..... (II)
On comparing (I) and (II) sides, we get:
$2^3 \times 3^2 \times 5 = 2^3 \times 3^n \times 5$
n = 2

2.
(b) 3
Explanation:
The number of zeroes is 3 as the graph given in the question intersects the x-axis at 3 points.

3. **(a)** (4, 4)
Explanation:
(4, 4)

4. **(a)** 2
Explanation:
Here, $ax^2 + ax + 2 = 0$..... (1)
$x^2 + x + b = 0$..... (2)
Putting the value of x = 1 in equation (2) we get
$1^2 + 1 + b = 0$
2 + b = 0
b = −2
Now, putting the value of x = 1 in equation (1) we get
a + a + 2 = 0
2 a + 2 = 0
$a = \frac{-2}{2}$
= - 1
Then,
ab = (−1) × (−2) = 2

5.
(b) 100
Explanation:
Three-digit numbers divisible by 9 are 108, 117, 126,..., 999.
Let T_n = 999. Then, 108 + (n - 1) × 9 = 999.
∴ (n -1) × 9 = 891 ⇒ (n -1) = 99 ⇒ n = 100.

6.

(d) 3$\sqrt{2}$ units

Explanation:

3$\sqrt{2}$ units

7.

(d) (3, 5)

Explanation:

Point P divides the line segment joining the points A(1, 3) and B(4, 6) in the ratio 2: 1

Let coordinates of P be (x, y), then

$x = \frac{m_1x_2+m_2x_1}{m_1+m_2} = \frac{2\times4+1\times1}{2+1} = \frac{8+1}{3} = \frac{9}{3} = 3$

$y = \frac{m_1y_2+m_2y_1}{m_1+m_2} = \frac{2\times6+1\times3}{2+1} = \frac{12+3}{3} = \frac{15}{3} = 5$

$\therefore$ Coordinates of P are (3, 5)

8.

(b) 5 cm.

Explanation:

In triangles APB and CPD,

$\angle$APB = $\angle$CPD [Vertically opposite angles] $\angle$BAP = $\angle$ACD [Alternate angles as $AB||CD$]

$\therefore\Delta$APB $\sim$ ΔCPD [AA similarity]

$\therefore \frac{AB}{CD} = \frac{CP}{AP}$

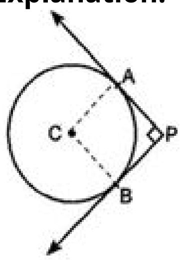
$\Rightarrow \frac{4}{6} = \frac{AP}{7.5}$

$\Rightarrow$ AP = $\frac{7.5\times4}{6}$ = 5 cm

9.

(d) 5 cm

Explanation:



Construction: Joined OA and OB.

Here OA$\perp$ AP

and OB$\perp$BP

and PA $\perp$PB

Also AP = PB

Therefore, APBO is a square.

$\Rightarrow$ AP = OA = OB = 5 cm

10.

(c) 70^o, 40^o

Explanation:

Since, PQL is a tangent and OQ is a radius, so $\angle$OQL = 90^o

$\therefore$ $\angle$OQS = 90^o - 50^o = 40^o

Now, OQ = OS ⇒ ∠OSQ = ∠OQS = 40^o

Similarly, ∠ORS = 90^o - 60^o = 30^o

And, OR = OS ⇒ ∠OSR = ∠ORS = 30^o

∴ ∠QSR = ∠OSQ + ∠OSR = 40^o + 30^o = 70^o

Now, ∠ROQ = 2∠QSR = 140^o

∠ROQ + ∠ORP + ∠OQP + ∠RPQ = 360^o (Angle sum property of quadrilateral QORP)

⇒140^o + 90^o + 90^o + ∠RPQ = 360^o

⇒ ∠RPQ = 40^o

11.

(b) $\sec^2\theta = 1 + \tan^2\theta$

Explanation:

$\sec^2\theta = 1 + \tan^2\theta$

12.

(d) $\frac{17}{4}$

Explanation:

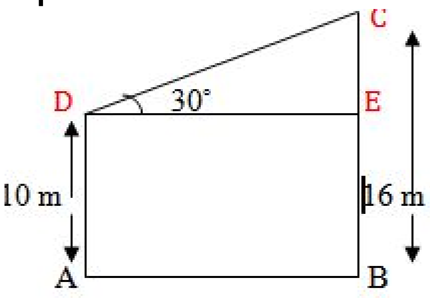
3 $\cos^2 60^o$ + 2$\cot^2 30^o$ - 5 $\sin^2 45^o$

$= 3 \times \left(\frac{1}{2}\right)^2 + 2 \times (\sqrt{3})^2 - 5 \times \left(\frac{1}{\sqrt{2}}\right)^2 = \frac{3}{4} + 6 - \frac{5}{2} = \frac{17}{4}$

13.

(d) 12 m

Explanation:



Given: Two poles BC = 16 m and AD = 10 m

And ∠CDE = 30°

To find: Length of wire CD = x

∴ In triangle CDE,

$\sin 30^\circ = \frac{CE}{CD}$

$\Rightarrow \frac{1}{2} = \frac{BC - BE}{CD}$

$\Rightarrow \frac{1}{2} = \frac{16-10}{x}$

$\Rightarrow \frac{1}{2} = \frac{6}{x}$

$\Rightarrow x = 12$ m

Therefore, the length of the wire is 12 m.

14.

(d) 15.6 cm^2

Explanation:

Perimeter of a sector of circle = $\frac{\theta}{360^{\circ}} \times 2\pi r$ + 2r

$\Rightarrow \left(\frac{\theta}{360^{\circ}} \times 2\pi \times 5.2\right)$ + (2 × 5.2) = 16.4

$\Rightarrow \frac{\theta}{360^{\circ}}\pi = \frac{16.4-10.4}{10.4} = \frac{6}{10.4}$

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

= $\frac{6}{10.4} \times (5.2)^2$ = 15.6 cm^2

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.

(c) $\frac{1}{13}$

Explanation:

Total number of cards = 52.

Number of 6 s = 4.

$\therefore$ P (getting a 6) = $\frac{4}{52} = \frac{1}{13}$

17.

(c) 10

Explanation:

Let the number of blue balls be x.

$\therefore$ Number of total outcomes = 5 + x

Now, P (getting the red ball) = $\frac{5}{5+x}$

$\therefore$ P (getting blue ball) = $2\left(\frac{5}{5+x}\right)$

Also P (getting the blue ball) = $\frac{x}{x+5}$

$\therefore 2\left(\frac{5}{x+5}\right) = \frac{x}{x+5}$

$\Rightarrow$ x = 10

18.

(c) mode

Explanation:

The most frequent value in the data is known as the Mode. e.g let us consider the following data set: 3,5,7,5,9,5,8,4 the mode is 5 since it occurs most often in data set.

19. **(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.

20. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation:
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Section B

21. Let $\frac{1}{\sqrt{5}}$ be a rational number.
$\therefore \frac{1}{\sqrt{5}} = \frac{p}{q}$, where $q \neq 0$ and let $p \& q$ be the co-primes.
$5p^2 = q^2 \Rightarrow q^2$ is divisible by 5.
$\Rightarrow q$ is divisible by 5. ...(i)
let $q = 5a$, where 'a' is some integer.
$25a^2 = 5p^2 \Rightarrow p^2 = 5a^2 \Rightarrow p^2$ is divisible by 5.
$\Rightarrow p$ is divisible by 5 ...(ii)
(i) and (ii) leads to contradiction as p and q are coprimes.
$\therefore \frac{1}{\sqrt{5}}$ is an irrational number

OR

The prime factorization of 90 and 140 are as follows
$90 = 2 \times 3 \times 3 \times 5 = 2 \times 3^2 \times 5$
$144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 = 2^4 \times 3^2$
Hence HCF (90,144) = 2 $\times$ 3^2 = 18
and LCM (90,144) = $2^4 \times 3^2 \times 5$ = 720

22. It is given that, AB = 8 cm, AC = 24 cm, BD = 6 cm and BC = 24 cm
We have to check whether AD is the bisector of $\angle A$
First, we will check the proportional ratio between sides.
Now, DC = BC - BD
DC = 24 - 6
= 18
So, $\frac{AB}{AC} = \frac{BD}{DC}$
$\Rightarrow \frac{8}{24} = \frac{6}{18}$
$\Rightarrow \frac{1}{3} = \frac{1}{3}$
Therefore the sides are proportional.
Hence, AD is bisector of $\angle A$

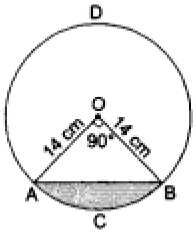
23. $NQ = MQ = 19$
$\therefore RN = 30 - 19 = 11\ cm$
$\therefore RT = 11\ cm$
$\therefore TS = 21 - 11 = 10\ cm$
Since SLOT is a square
Therefore radius of the circle $= TS = 10\ cm$

24. $4\left(\sin^4 30^\circ + \cos^4 60^\circ\right) - \frac{2}{3}\left(\sin^2 60^\circ - \cos^2 45^\circ\right) + \frac{1}{2}\tan^2 60^\circ$
$= 4\left[\left(\frac{1}{2}\right)^4 + \left(\frac{1}{2}\right)^4\right] - \frac{2}{3}\left[\left(\frac{\sqrt{3}}{2}\right)^2 - \left(\frac{1}{\sqrt{2}}\right)^2\right] + \frac{1}{2}\left(\sqrt{3}\right)^2$
$= 4\left[\frac{1}{16} + \frac{1}{16}\right] - \frac{2}{3}\left[\frac{3}{4} - \frac{1}{2}\right] + \frac{1}{2} \times 3$
$= 4 \times \frac{2}{16} - \frac{2}{3}\left[\frac{3-2}{4}\right] + \frac{3}{2}$

$= \frac{1}{2} - \frac{2}{3} \times \frac{1}{4} + \frac{3}{2}$
$= \frac{1}{2} - \frac{1}{6} + \frac{3}{2}$
$= \frac{3-1+9}{6} = \frac{11}{6}$

OR

$\tan A = \sqrt{3} = \tan 60^\circ$
$\Rightarrow A = 60^\circ$
$\frac{\sin^2 A}{1+\cos^2 A} = \frac{\sin^2 60^\circ}{1+\cos^2 60^\circ}$
$= \frac{\left(\frac{\sqrt{3}}{2}\right)^2}{1+\left(\frac{1}{2}\right)^2}$
$= \frac{3}{5}$

25. 

Let AB be the chord of a circle of centre O and radius = 14 cm
such that $\angle AOB$= 90°.
∴ area of the sector OACBO = $\frac{\pi r^2 \theta}{360} \mathrm{cm}^2$
$= \left(\frac{22}{7} \times 14 \times 14 \times \frac{90}{360}\right) \mathrm{cm}^2$
= 154 cm$^{2.}$
Area of $\triangle OAB = \frac{1}{2} r^2 \sin\theta$
$= \left(\frac{1}{2} \times 14 \times 14 \times \sin 90^\circ\right) \mathrm{cm}^2$
= 98 cm^2
Area of the minor segment ACBA
= (area of the sector OACBO) - (are of the $\triangle OAB$)
= (154 - 98) cm^2
= 56 cm^2
Area of the major segment BDAB
= (area of the circle) - (area of the minor segment)
$= \left[\left(\frac{22}{7} \times 14 \times 14\right) - 56\right] \mathrm{cm}^2$
= (616 - 56) cm^2
= 560 cm^2

Section C

26. Since, the three persons start walking together.
∴ The minimum distance covered by each of them in complete steps = LCM of the measures of their steps
$40 = 8 \times 5 = 2^3 \times 5$
$42 = 6 \times 7 = 2 \times 3 \times 7$
$45 = 9 \times 5 = 3^2 \times 5$
Hence LCM (40, 42, 45)
$= 2^3 \times 3^2 \times 5 \times 7 = 8 \times 9 \times 5 \times 7 = 2520$
∴ The minimum distance each should walk so that each can cover the same distance
= 2520 cm = 25.20 meters.

27. Let p(x) = x^2 - 2x - 8
By the method of splitting the middle term,
$x^2 - 2x - 8 = x^2 - 4x + 2x - 8$

$= x(x-4)+2(x-4) = (x-4)(x+2)$
For zeroes of p(x),
p(x) = 0
$\Rightarrow (x-4)(x+2) = 0$
$\Rightarrow x-4=0$ or $x+2=0$
$\Rightarrow x=4$ or $x=-2$
$\Rightarrow x = 4, -2$
So, the zeroes of p(x) are 4 and -2.
We observe that, Sum of its zeroes
= 4 + (-2) = 2
$= \frac{-(-2)}{1} = \frac{-\text{(Coefficient of } x)}{\text{Coefficient of } x^2}$
Product of its zeroes
$= 4x(-2) = -8 = \frac{-8}{1} = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$
Hence, relation between zeroes and coefficients is verified.

28. Mode Age = $24 \therefore$ Modal class = 23-28
$l = 23, f_1 = 170, f_2 = x, f_0 = 160,\ h = 5$
Mode $= l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$
$24 = 23 + \left(\frac{170-160}{340-160-x}\right) \times 5$
$24 = 23 + \frac{10\times5}{180-x}$
$x = 130$

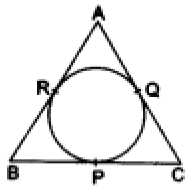
29. Given pair of linear equation is $ax + by - a + b = 0$ .....(i)
and $bx - ay - a - b = 0$ .... (ii)
Multiplying $ax + by - a + b = 0$ by a and $bx - ay - a - b = 0$ by b, and adding them, we get
$a^2x + aby - a^2 + ab = 0$ and $b^2x - aby - ab - b^2 = 0$
$(a^2x + aby - a^2 + ab) + (b^2x - aby - ab - b^2) = 0$
$a^2x + aby - a^2 + ab + b^2x - aby - ab - b^2 = 0$
$a^2x + b^2x - a^2 - b^2 = 0$
$\Rightarrow (a^2+b^2)x = (a^2+b^2)$
$\Rightarrow x = \frac{(a^2+b^2)}{(a^2+b^2)} = 1$
On putting x =1 in first equation, we get
$ax + by - a + b = 0$
$a + by = a - b$
$\Rightarrow y = -\frac{b}{b} = -1$
Hence, x=1 and y=-1, which is the required unique solution.

OR

Let the fare from station A to B be Rs. x and that from station A to C be Rs. y.
Then, according to the question,
2x + 3y = 795...................(1)
3x + 5y = 1300...................(2)
From equation(1), 3y = 795 - 2x
$\Rightarrow \quad y = \frac{795-2x}{3}$ ....(3)
Substitute this value of y in equation(2), we get
$3x + 5\left(\frac{795-2x}{3}\right) = 1300$
$\Rightarrow$ 9x + 3975 - 10x = 3900
$\Rightarrow$ - x + 3975 = 3900
$\Rightarrow$ - x = 3900 - 3975

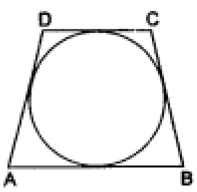
$\Rightarrow$ -x = -75
$\Rightarrow$ x = 75
Substituting the value of x in equation (3), we get
$y=\frac{795-2(75)}{3}=\frac{795-150}{3}=\frac{645}{3}=215$
Hence, the fare from station A to B is Rs. 75 and that from station A to C is Rs. 215.
Verification: Substituting x = 75, y = 215, we find that both the equations (1) and (2) arfe satisfied as shown below:
2x + 3y = 2(75) + 3(215) = 150 + 645 = 795
3x + 5y = 3(75) + 5(215) = 225 + 1075 = 1300
This verifies the solution.

30. LHS $=\tan^2 A+\frac{1}{\sec^2 A}$
$=\tan^2 A+\cos^2 A$
RHS $=\frac{1}{\cos^2 A}-\sin^2 A$
$=\sec^2 A-\sin^2 A$
$=\tan^2 A+1-\sin^2 A$
$=\tan^2 A+\cos^2 A$
$\therefore$ LHS $=$ RHS

31. 

We know that the lengths of tangents from an exterior point to a circle are equal.
$\therefore$ AR = AQ, ... (i) [tangents from A]
BP = BR, ... (ii) [tangents from B]
CQ = CP .... (iii) [tangents from C]
$\therefore$ (AR + BP + CQ) = (AQ + BR + CP) = k (say).
Perimeter of $\triangle ABC$ = (AB + BC + CA)
= (AR + BR) + (BP + CP) + (CQ+AQ)
= (AR + BP + CQ) + (AQ + BR + CP)
= (k + k) = 2k
$\Rightarrow \quad k=\frac{1}{2}($ perimeter of $\triangle ABC)$.
$\therefore$ (AR + BP +CQ) = (AQ + BR + CP)
$=\frac{1}{2}($ perimeter of $\triangle ABC)$.

OR



In the given figure, a circle touches all the four sides of a quadrilateral ABCD whose three sides are AB = 6 cm, BC = 7 cm and CD = 4 cm.We have to find AD.
Here,
AP = AS [Tangent drawn from an external point to a circle are equal in length]
Let, AP = AS = x
Similarly, BP = BQ
CQ = CR
RD = DS
Since, AP = x

$\Rightarrow$ BP = AB - AP = 6 - x
Now, BP = BQ = 6 - x
$\Rightarrow$ CQ = BC - BQ = 7 - (6 - x)
= 7 - 6 + x
= 1 + x
Now, CQ = CR = 1 + x
$\Rightarrow$ RD = CD - CR = 4 - (1 + x)
= 4 - 1 - x = 3 - x
Now, RD = DS = 3 - x
AD = AS + SD
= x + 3 - x = 3
$\Rightarrow$ AD = 3cm.

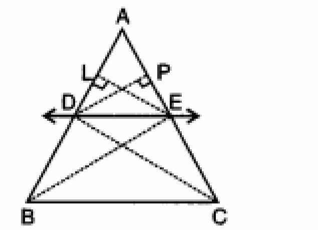
Section D

32. Calculation of median:

Class interval	**Frequency(f_i)**	**Cumulative frequency**
5 - 10	5	5
10- 15	6	11
15 - 20	15	26
20 - 25	10	36
25 - 30	5	41
30 - 35	4	45
35 - 40	2	47
40 - 45	2	49

Now,N = 49 $\Rightarrow \frac{N}{2}$ = 24.5.
Thus, the median class is 15 - 20.
$\therefore$ l = 15, h = 5, f = 15, c.f. = 11
Median, M = l + $\left\{h \times \frac{\left(\frac{N}{2}-cf\right)}{f}\right\}$
= 15 + $\left(5 \times \frac{(24.5-11)}{15}\right)$
= 15 + $\left(5 \times \frac{13.5}{15}\right)$
= 15 + 4.5 = 19.5
Hence, the median of frequency distribution is 19.5

33. Given : A triangle ABC, DE || BC, intersecting AB at D and AC at E.
To Prove: $\frac{\mathrm{AD}}{\mathrm{DB}} = \frac{\mathrm{AE}}{\mathrm{EC}}$
Construction: Join BE, CD and draw EL $\perp$ AD and DP $\perp$ AE.



Proof: $\triangle$BDE and $\triangle$CDE are on the same base DE and between the same parallel lines BC and DE,
Hence ar($\triangle$BDE) = ar($\triangle$CDE) ....(i)
Now, $\frac{\mathrm{ar}(\Delta\mathrm{ADE})}{\mathrm{ar}(\Delta\mathrm{BDE})} = \frac{\frac{1}{2}\cdot\mathrm{AD}\times\mathrm{EL}}{\frac{1}{2}\cdot\mathrm{BD}\times\mathrm{EL}} = \frac{\mathrm{AD}}{\mathrm{BD}}$ ....(ii)

Similarly, $\frac{\operatorname{ar}(\Delta \mathrm{ADE})}{\operatorname{ar}(\Delta \mathrm{CDE})}=\frac{\frac{1}{2} \mathrm{AE} \times \mathrm{DP}}{\frac{1}{2} \mathrm{EC} \times \mathrm{DP}}=\frac{\mathrm{AE}}{\mathrm{EC}}$ ....(iii)

From (i), eq (iii) becomes,

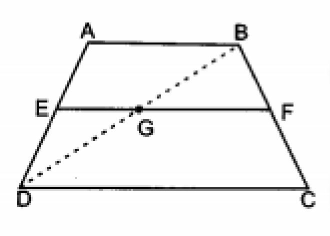
$\frac{\operatorname{ar}(\Delta \mathrm{ADE})}{\operatorname{ar}(\Delta \mathrm{BDE})}=\frac{\mathrm{AE}}{\mathrm{EC}} \ldots \ldots \ldots \ldots \ldots (iv)$

From (ii) and (iv) we get,

$\Rightarrow \quad \frac{\mathrm{AD}}{\mathrm{BD}}=\frac{\mathrm{AE}}{\mathrm{EC}}$

Hence proved

Consider the given trapezium ABCD. Join BD intersecting EF at G.



It is proved above that if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio. So,

In $\triangle$DAB, EG $\|$ AB,

$\therefore \quad \frac{\mathrm{AE}}{\mathrm{DE}}=\frac{\mathrm{BG}}{\mathrm{GD}}$ ....(v)

In $\triangle$BCD, GF $\|$ DC

$\therefore \quad \frac{\mathrm{BG}}{\mathrm{GD}}=\frac{\mathrm{BF}}{\mathrm{FC}}$ ....(vi)

From (v) and (vi) we get,

$\frac{\mathrm{AE}}{\mathrm{DE}}=\frac{\mathrm{BF}}{\mathrm{FC}}$

Hence proved

34. Let the present age of father be x years.
Son's present age = (45 - x) years.
Five years ago:
Father's age = (x - 5) years
Son's age = (45 - x - 5) years = (40 - x) years.
According to question,
$\therefore$ (x - 5) (40 - x) = 124
$\Rightarrow$ 40x - x^2 - 200 + 5x = 124
$\Rightarrow$ x^2 - 45x + 324 = 0
Spilting the middle term,
$\Rightarrow$ x^2 - 36x - 9 x + 324 = 0
$\Rightarrow$ x(x - 36) - 9(x - 36) = 0
$\Rightarrow$ (x - 9)(x - 36) = 0
$\Rightarrow$ x = 9, or 36
We can't take father age as 9 years
So, x = 36, we have
Father's present age = 36 years
Son's present age = 9 years
Hence, Father's present age = 36 years and Son's present age = 9 years.

OR

For real roots, $D \geq 0$

$[-2(p+1)]^2-4 p^2 \geq 0$

$\Rightarrow p \geq-\frac{1}{2}$

$\therefore$ smallest value of $p=-\frac{1}{2}$

At $p=-\frac{1}{2}$ given equation becomes

$x^2-2\left(\frac{-1}{2}+1\right)x+\left(\frac{-1}{2}\right)^2=0$

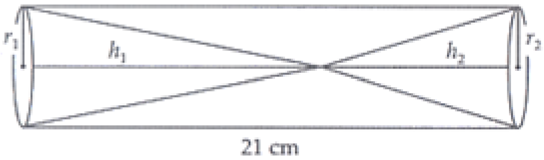
$x^2-x+\frac{1}{4}=0$ or $4x^2-4x+1=0$

$(2x-1)(2x-1)=0$

$\therefore$ roots are $\frac{1}{2},\frac{1}{2}$

35. Let height of the cone 1 be 'h' cm and the height of the cone 2 be (21 cm - h) .

As the ratio of volumes of cone c_1 and c_2 is 2 : 1, their radii are same equal to r = $\frac{6}{2}$cm = 3 cm.



$\therefore \frac{V_1}{V_2}=\frac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2}$

$\Rightarrow \frac{2}{1}=\frac{h}{21cm-h}$

or 42 cm - 2h = h

or, 3h = 42 cm

$\Rightarrow$ h = 42/3

$\Rightarrow$ h = 14 cm

Hence, height of cone 1 = 14 cm and height of cone 2 = 7 cm

Cone I	**Cone II**	**Cylinder**
$r_1=\frac{6}{3}$= 3 cm	r_2 = 3 cm	r = 3 cm
h_1 = 14 cm	h_2 = 7 cm	h = 21 cm

Volume of cone 1$=\frac{1}{3}\pi r_1^2 h_1=\frac{1}{3}\times\frac{22}{7}\times 3\times 3\times 14$ = 132 cm^3

Volume of cone 2$=\frac{1}{3}\pi r_2^2 h_2=\frac{1}{3}\times\frac{22}{7}\times 3\times 3\times 7$ = 22 $\times$ 3 = 66 cm^3

Volume of remaining portion of tube = Vol. of cylinder – Vol. of cone 1 – Vol. of cone 2

= πr^2h – 132 – 66

= $\frac{22}{7}\times 3\times 3\times 21$ – 198

= 22 $\times$ 27 – 198 = 594 – 198 = 396 cm^3

Hence, the required volume is 396 cm^3.

OR

We have;

A Cube,

Cube's $\frac{length}{Edge}$, a = 7 cm

A Cylinder:

Cylinder's Radius, r = 2.1 cm or r = $\frac{21}{10}$cm

Cylinder's Height, h = 7 cm

$\because$ A cylinder is scooped out from a cube,

$\therefore$ TSA of the resulting cuboid:

= TSA of whole Cube - 2 $\times$ (Area of upper circle or Area of lower circle) + CSA of the scooped out Cylinder

= $6a^2 + 2\pi rh - 2\times(\pi r^2)$

= $6\times(7)^2 + 2\times(22\div 7\times 2.1\times 7) - 2\times[22\div 7\times(2.1)^2]$

= 6 $\times$ 49 + (44 $\div$ 7 $\times$ 14.7) - (44 $\div$ 7 $\times$ 4.41)

= 294 + 92.4 - 27.72

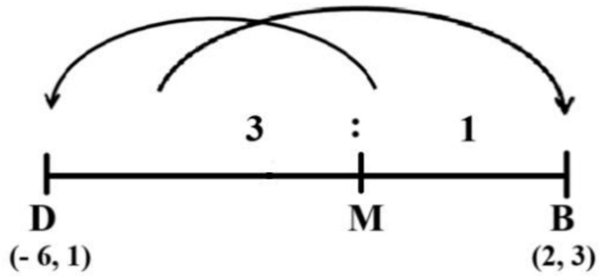
= 294 + 64.68

= 358.68 cm^2

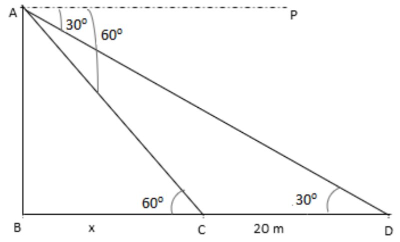
Hence, the total surface area of the remaining solid is 358.68 cm^2

Section E

36. i. Distance travel by the competitor to pick up each potato form an AP
10, 16, 22 ...
ii. $S_n = \frac{n}{2}\{2a + (n - 1)d\}$
$S_{10} = \frac{10}{2}\{2 \times 10 + 9 \times 6\}$
$S_{10} = 5\{20 + 54\}$
$S_{10} = 5 \times 74$
$S_{10} = 370$ m
i.e., The competitor has to run 370 m.
iii. $S_4 = \frac{4}{2}\{2 \times 10 + (4 - 1)6\}$
$= 2\{20 + 18\}$
$= 2 \times 38$
$S_4 = 76$
$\therefore$ Required distance = 370 - 76
= 294
OR
$t_n = a + (n - 1)d$
$t_5 = 10 + (5 - 1)6$
$t_5 = 10 + 24$
$t_5 = 34$ m

37. i. Observing the graph, coordinators of points are $A(-5,9)$ and $D(-6,1)$
$AD = \sqrt{(-6+5)^2 + (1-9)^2} = \sqrt{65}$
ii. a. Mid point of $AD = \left(\frac{-6-5}{2}, \frac{1+9}{2}\right)$ i.e. $\left(\frac{-11}{2}, 5\right)$
Student will sow another sapling at mid point of AB.
Point B is $(2,3)$
Mid point of $AB = \left(\frac{2-5}{2}, \frac{3+9}{2}\right)$ i.e. $\left(\frac{-3}{2}, 6\right)$
OR
b.


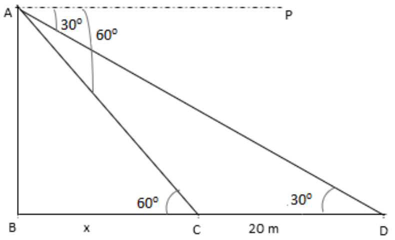
Coordinates of $M = \left(\frac{6-6}{4}, \frac{9+1}{4}\right)$
i.e. $\left(0, \frac{5}{2}\right)$
iii. Coordinates of C are $(1,-5)$

38. i. The above figure can be redrawn as shown below:


From the figure,
let AB = h and BC = x
In $\triangle$ABC,
tan 60 = $\frac{\text{AB}}{\text{BC}} = \frac{\text{h}}{x}$

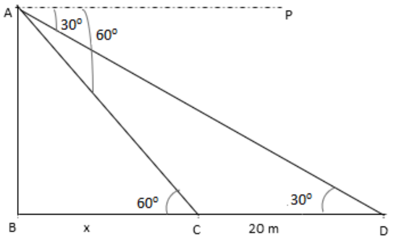
$\sqrt{3} = \frac{h}{x}$
h = $\sqrt{3}$x ...(i)
In △ABD,
tan 30 = $\frac{AB}{BD} = \frac{h}{x+20}$
$\frac{1}{\sqrt{3}} = \frac{\sqrt{3}x}{x+20}$ [using (i)]
x + 20 = 3x
x = 10 m

ii. The above figure can be redrawn as shown below:



Height of the building, h = $\sqrt{3}$x = 10$\sqrt{3}$ = 17.32 m

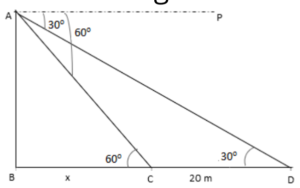
iii. The above figure can be redrawn as shown below:



Distance from top of the building to point D.
In △ABD
sin 30° = $\frac{AB}{AD}$
$\Rightarrow AD = \frac{AB}{\sin 30^0}$
$\Rightarrow AD = \frac{10\sqrt{3}}{\frac{1}{2}}$
⇒ AD = $20\sqrt{3}m$

OR

The above figure can be redrawn as shown below:



Distance from top of the building to point C is
In △ABC
sin 60° = $\frac{AB}{AC}$
$\Rightarrow AC = \frac{AB}{\sin 60^0}$
$\Rightarrow AC = \frac{10\sqrt{3}}{\frac{\sqrt{3}}{2}}$
⇒ AD = 20 m