# MOCK MANTRA
## (CBSE Class 10 MOCK Solutions)
## MOCK PAPER 1
## Mathematics

**Section A**

1.
**(b)** $2 \times 3^2 \times 7^2$
**Explanation:**

$$\begin{array}{c|l} 2 & 882 \\ \hline 3 & 441 \\ \hline 3 & 147 \\ \hline 7 & 49 \\ \hline 7 & 7 \\ \hline & 1 \end{array}$$

882 = $2 \times 3^2 \times 7^2$

2. **(a)** 3
**Explanation:**
The number of zeroes is 3 as the graph intersects the x-axis at three points.

3.
**(d)** 0
**Explanation:**
The number of solutions of two linear equations representing parallel lines is 0 because two linear equations representing parallel lines has no solution and they are inconsistent.

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 = $(-1) \times (-2) = 2$

5.
**(d)** 2, 4, 8, 16, ...
**Explanation:**
In 2, 4, 8, 16, ...
d = $a_2 - a_1$ = 4 - 2 = 2
And d = $a_3 - a_2$ = 8 - 4 = 4
Also d = $a_4 - a_3$ = 16 - 8 = 8
Here, the common difference is not the same for all terms, therefore, it is not an AP.

6. **(a)** isosceles triangle
**Explanation:**
$AB^2 = (4 + 4)^2 + (0 - 0)^2 = 8^2 + 0^2 = 64 + 0 = 64$
$\Rightarrow$ AB=$\sqrt{64}$= 8 units
$BC^2 = (0-4)^2 + (3-0)^2 = (-4)^2 + 3^2 = 16 + 9 = 25$
$\Rightarrow$ BC = $\sqrt{25}$ = 5 units.
$AC^2 = (0 + 4)^2 + (3 - 0)^2 = 4^2 + 3^2 = 16 + 9 = 25$
$\Rightarrow$ A C = $\sqrt{25}$ = 5 units.
$\therefore \triangle$ABC is isosceles.

7.
**(c)** (4, 0)
**Explanation:**
Centriod is G $\left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right) = G\left(\frac{-1+5+8}{3}, \frac{0-2+2}{3}\right) = (4, 0)$

8. **(a)** $20^o$, $30^o$.
**Explanation:**
In triangle ABC, $\angle \mathrm{A} + \angle \mathrm{B} + \angle \mathrm{C} = 180^\circ$
$\Rightarrow \angle \mathrm{A} + 30^\circ + 20^\circ = 180^\circ$
$\Rightarrow \angle \mathrm{A} = 130^\circ$
In triangle ABC and QRP, $\frac{AB}{QR} = \frac{AC}{PQ}$
$\Rightarrow \frac{45}{5} = \frac{63}{7}$ => $\frac{9}{1} = \frac{9}{1}$
Since sides of triangles ABC and QRP are proportional, and included angles are equal, therefore by SAS similarity criteria ,
$\Delta \mathrm{ABC} \sim \Delta \mathrm{QRP}$
$\angle \mathrm{A} = \angle \mathrm{Q}, \angle \mathrm{B} = \angle \mathrm{R}, \angle \mathrm{C} = \angle \mathrm{P}$
$\Rightarrow \angle \mathrm{P} = 20^\circ, \angle \mathrm{R} = 30^\circ$

9.
**(d)** 35°
**Explanation:**
Here, $\angle$AOB = 180° - 70° = 110°
Now, in triangle AOB$\angle$AOB + $\angle$OAB + $\angle$OBA = 180°
$\Rightarrow$110° + $\angle$OAB + $\angle$OBA = 180° $\Rightarrow$2$\angle$OBA = 70°
[Angles opposite to radii] $\Rightarrow\angle$OBA = 35°

10.
**(b)** $50^o$
**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. **(a)** tan$\theta$
**Explanation:**

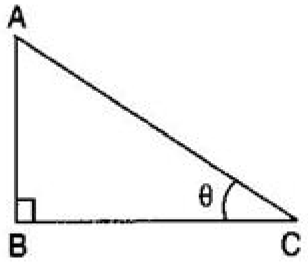
Here $\sqrt{(1-\cos^2\theta)\sec^2\theta}$
$=\sqrt{\sin^2\theta \times \frac{1}{\cos^2\theta}}$
[$\because$ 1 - $\cos^2\theta$ = $\sin^2\theta$ and $\sec^2\theta$ = $\frac{1}{cos^2\theta}$
$= \sqrt{\frac{\sin^2\theta}{\cos^2\theta}}$
$= \sqrt{\tan^2\theta}$
= $\tan\theta$

12.

**(c)** $\sec^2$ A
**Explanation:**
$\frac{\operatorname{cosec}^2 A-\cot^2 A}{1-\sin^2 A}$
$\frac{1}{\cos^2 A}=\sec^2 A$

13.

**(d)** $60^\circ$
**Explanation:**
Given: distance from a point to the foot of the tower = 75 m and the height of the tower = $75\sqrt{3}$ m
$\therefore \tan\theta=\frac{\mathrm{AB}}{\mathrm{BC}}$
$\Rightarrow \tan\theta=\frac{75\sqrt{3}}{75}$
$\Rightarrow \tan\theta=\sqrt{3}$
$\Rightarrow \tan\theta=\tan 60^\circ$
$\Rightarrow \theta=60^\circ$




14.

**(b)** $\frac{\pi r^2\theta}{360}$
**Explanation:**
The area of a sector of a circle with sector angle $\theta$ is given by $\frac{\pi r^2\theta}{360^\circ}$, where r = radius of the circle

15. **(a)** $45^o$
**Explanation:**
Given
$\frac{\text{area of sector}}{\text{area of circle}}=\frac{1}{8}$
$\frac{\frac{\theta}{360^\circ}\times\pi r^2}{\pi r^2}=\frac{1}{8}$
$\frac{\theta}{360^\circ}=\frac{1}{8}$
$\theta=\frac{360^\circ}{8}$
$\theta=45^\circ$

16.

**(b)** $\frac{1}{3}$
**Explanation:**
Number of multiple of 3 on a dice = {3, 6}, = 2
Number of possible outcomes = 2

Number of Total outcomes = 6

$\therefore$ Required Probability = $\frac{2}{6} = \frac{1}{3}$

17.

**(c)** 0

**Explanation:**

Elementary events are

(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)

$\therefore$ Number of Total outcomes = 36

And Number of possible outcomes (sum of numbers appearing on die is 13) = 0

$\therefore$ Required Probability = $\frac{0}{36} = 0$

18. **(a)** 80

**Explanation:**

In the given data, Maximum frequency is 15.

Therefore, the modal class is 80 - 90.

The lower limit of the modal class is 80.

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:**

A is false but R is true.

## Section B

21. Minimum number of rooms required means there should be maximum number of teachers in a room. We have to find HCF of 48, 80 and 144.

48 = $2^4 \times 3$

80 = $2^4 \times 5$

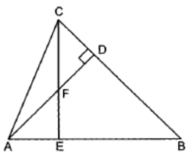
144 = $2^4 \times 3^2$

HCF (48, 80, 144) = $2^4$ = 16

Therefore, total number of rooms required $= \frac{48}{16} + \frac{80}{16} + \frac{144}{16} = 17$

22. Given Altitude AD and CE of $\triangle$ABC intersects each other at the point F.

To Prove: $\triangle FDC \sim \triangle BEC$




Proof: In $\triangle$'s FDC and BEC, we have

$\angle$FDC = $\angle$BEC = $90^o$ [$\because AD \perp BC$ and $CE \perp AB$ ]

$\angle$FCD = $\angle$ECB [Common angle]

Thus, by AA-criterion of similarity, we obtain $\triangle FDC \sim \triangle BEC$.

23. Construction : Draw $OC$

Proof : Line $AB$ is tangent to smaller circle at point $C$.

$\therefore$ segment $OC \perp AB$

$AB$ is chord to larger circle and

as perpendicular drawn from centre to chord bisects the chord.

$\therefore AC = CB$

24. Solution LHS = $\frac{\cot \mathrm{A} - \cos \mathrm{A}}{\cot A + \cos \mathrm{A}}$ = $\frac{\frac{\cos \mathrm{A}}{\sin \mathrm{A}} - \cos \mathrm{A}}{\frac{\cos \mathrm{A}}{\sin \mathrm{A}} + \cos \mathrm{A}}$

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

= $\frac{(1 - \sin \mathrm{A})(1 + \sin \mathrm{A})}{(1 + \sin \mathrm{A})(1 + \sin \mathrm{A})}$

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

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. 


Given Radius = r = $5\sqrt{2}$cm

= OA = OB

Length of chord AB = 10 cm

In $\triangle OAB$, OA = OB = $= 5\sqrt{2}$

AB = 10cm

OA$^2$ + OB$^2$ = $= (5\sqrt{2})^2 + (5\sqrt{2})^2$

= 50 + 50 = 100 = (AB)$^2$

Pythagoras theorem is satisfied OAB is right triangle

= angle subtended by chord = $\angle AOB = 90^\circ$

Area of segment (minor) = shaded region

= area of sector - area of $\triangle OAB$

$= \frac{\theta}{360} \times \pi r^2 - \frac{1}{2} \times OA \times OB$

$= \frac{90}{360} \times \frac{22}{7}(5\sqrt{2})^2 - \frac{1}{2} \times 5\sqrt{2} \times 5\sqrt{2}$

$= \frac{275}{7} - 25 = \frac{100}{7}\mathrm{cm}^2$

Area of major segment = (area of circle) - (area of minor segment)

$= \pi r^2 - \frac{100}{7}$

$= \frac{22}{7} \times (5\sqrt{2})^2 - \frac{100}{7}$

$= \frac{1100}{7} - \frac{100}{7}$

$= \frac{1000}{7}\mathrm{cm}^2$

OR

Given 3 horses are tethered with 7 m long ropes at three corners of $\triangle$ABC

Here radius of sectors, r = 7 m

Given sides of $\triangle$ABC are AB = 20 cm, BC = 30 m, CA = 40 m

Area of the plot which can be grazed = $\frac{x^\circ}{360^\circ} \times \pi r^2 + \frac{y^\circ}{360^\circ} \times \pi r^2 + \frac{z^\circ}{360^\circ} \times \pi r^2$

= $\frac{\pi r^2}{360}$[x + y + z]

= $\frac{\pi r^2}{360} \times 180$ [$\therefore$ x + y + z = 180]

= $\frac{1}{2}\pi r^2$

= $\frac{1}{2} \times \frac{22}{7} \times 7 \times 7$ = 77 sq. m.

**Section C**

26. The required greatest capacity is the HCF of 120, 180 and 240.

$240 = 180 \times 1 + 60$

$180 = 60 \times 3 + 0$

HCF is 60.

Now HCF of 60, 120

$120 = 60 \times 2 + 0$

$\therefore$ HCF of 120, 180 and 240 is 60.

$\therefore$ The required capacity is 60 litres.

27. Consider general quadratic polynomial $p(x) = ax^2 + bx + c,\ a \neq 0$

b = 0 (given)

Let $\alpha$, β be the zeroes of p(x)

$\therefore$ Sum of zeroes = $\alpha + \beta = -\frac{b}{a} = \frac{0}{a} = 0$

$\Rightarrow \alpha + \beta = 0$

$\Rightarrow \alpha = -\beta$

In other words $\beta = -\alpha$

$\therefore$ The zeroes are $\alpha$, - $\alpha$.

Hence, the zeroes are equal in magnitude but opposite in sign.

28. x + y = 5 ...(1)

2x + 2y = 10 ...(2)

Here, $a_1 = 1$, $b_1 = 1$, $c_1 = -5$

$a_2 = 2$, $b_2 = 2$, $c_2 = -10$

We see that $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

Hence, the lines represented by the equations (1) and (2) are coincident.

Therefore, equations (1) and (2) have infinitely many common solutions, i.e., the given pair of linear equations is consistent.

Graphical Representation, we draw the graphs of the equations (1) and (2) by finding two solutions for each if the equations.

These two solutions of the equations (1) and (2) are given below in table 1 and table 2 respectively.

For equation (1) x + y = 5 $\Rightarrow$ y = 5 - x

Table 1 of solutions

| | | |
|---|---|---|
| x | 0 | 5 |
| y | 5 | 0 |

For equations (2) x + 2y = 10

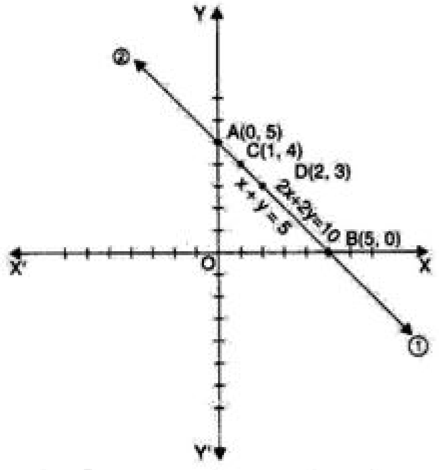
$\Rightarrow$ 2y = 10 - 2x

$\Rightarrow y = \frac{10-2x}{2} \Rightarrow$ y = 5 - x

Table 2 of solutions

| | | |
|---|---|---|
| x | 1 | 2 |
| y | 4 | 3 |

We plot the points A(0, 5) and B(5, 0) on a graph paper and join these points to form the line AB representing the equation (1) as shown in the figure, Also, we plot the points C(1, 4) and D (2, 3) on the same graph paper and join these points to form the line CD representing the equation (2) as shown in the same figure.




In the figure we observe that the two lines AB and CD coincide.

OR

Let the two numbers be x and y.

According to question

x + y = 16.....(i)

and,

$\frac{1}{x}+\frac{1}{y}=\frac{1}{3}$

$\Rightarrow \frac{x+y}{xy}=\frac{1}{3}$

⇒ 3x + 3y = xy.....(ii)

From equation (i), we get

x = 16 - y.....(iii)

Substitute the value of x in equation (ii), we get

3(16 - y) + 3y = (16 - y)y

$\Rightarrow$ 48 = 16y - $y^2$

$\Rightarrow$ $y^2$ - 16y + 48 = 0

$\Rightarrow$ $y^2$ - 12y - 4y + 48 = 0

$\Rightarrow$ y(y - 12) - 4(y - 12) = 0

$\Rightarrow$ (y - 4)(y - 12) = 0

$\Rightarrow$ y = 4 or y = 12

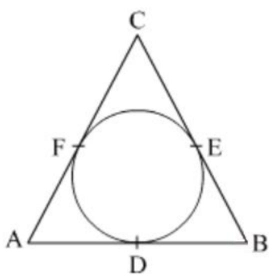
**Case 1.** When y = 4

x = 12 [from equation (iii)]

**Case 2.** When y = 12

x = 4 [from equation (iii)]

Thus, the possible values are 12 and 4.

29. 


Tangents drawn from an external point to a circle are equal.

$\Rightarrow$ AD = AF, BD = BE, CE = CF.

Let AD = AF = a

BD = BE = b

CE = CF = c

AB = AD + DB = a + b = 8 ........ (1)

BC = BE + EC = b + c = 10 ........ (2)

AC = AF + FC = a + c = 12 ........ (3)

Adding (1), (2) and (3), we get

2 (a + b + c) = 30

⇒ (a + b + c) = 15 ........ (4)

Subtracting (1) from (4), we get c = 7

Subtracting (2) from (4), we get a = 5

Subtracting (3) from (4), we get b = 3

Therefore, AD = a = 5 cm, BE = b = 3 cm, CF = c = 7 cm

OR

**<u>Construction:</u> Join OB**

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

$\because \angle OBP = \angle OAP = 90^\circ$

Now, In quadrilateral AOBP

$\angle AOB + \angle OBP + \angle APB + \angle OAP = 360^\circ$

$\Rightarrow 240^\circ + \angle AOB = 360^\circ$

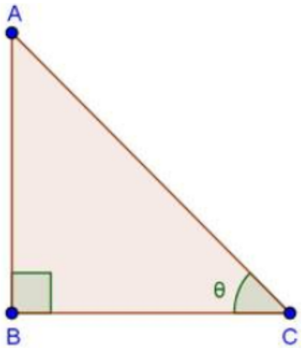
$\Rightarrow \angle AOB = 120^\circ$

Now, In isosceles triangle AOB

$\angle AOB + \angle OAB + \angle OBA = 180^\circ$

$\Rightarrow 120^\circ + 2\angle OAB = 180^\circ$

$\Rightarrow \angle OAB = 30^\circ$

30. 


Let $\theta$ 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 $\Delta ABC$, 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.

| Class interval | Frequency | Cumulative frequency |
|---|---|---|
| 85-100 | 10 | 10 |
| 100-115 | 4 | 14 |
| 115-130 | 7 | 21 |
| 130-145 | 9 | 30 |

Here, $\mathrm{N} = 30 \Rightarrow \frac{\mathrm{N}}{2} = 15$

The cumulative frequency just greater than 15 is 21.

Hence, median class is 115-130.

$\therefore$ l = 115, h = 15, f = 7, cf = cf of preceding class = 14

Now, Median $= 1 + \left\{h \times \frac{\left(\frac{N}{2} - cf\right)}{f}\right\}$

$= 115 + \left\{15 \times \frac{(15-14)}{7}\right\}$

$= 115 + \left\{15 \times \frac{1}{7}\right\}$

= 115 + 2.1

= 117.1

Thus, the median bowling speed is 117.1 km/hr.

**Section D**

32. Let the speed of the train be x km/hr for first 54 km and for next 63 km, speed is (x + 6) km/hr.

According to the question

$\frac{54}{x} + \frac{63}{x+6} = 3$

$\frac{54(x+6)+63x}{x(x+6)} = 3$

or, 54x + 324 + 63x = 3x(x + 6)

or, $117x + 324 = 3x^2 + 18x$

or, $3x^2 - 99x - 324 = 0$

or, $x^2 - 33x - 108 = 0$

or, $x^2 - 36x + 3x - 108 = 0$

or, x(x - 36) + 3(x - 36) = 0

(x - 36)(x + 3) = 0

x = 36

x = - 3 rejected.

(as speed is never negative)

Hence First speed of train = 36 km/h

OR

Let the width of the path be x m

Length of the field including the path = (20 + 2x) m

Breadth of the field including the path = (14 + 2x) m.

Area of rectangle = L $\times$ B

Area of the field including the path = (20 + 2x) (14 + 2x) $m^2$ .

Area of the field excluding the path = (20 $\times$ 14) $m^2$= 280 $m^2$.

$\therefore$ Area of the path = (20 + 2x)(14 + 2x) - 280

(20 + 2x) (14 + 2x) - 280 = 111

$\Rightarrow 4x^2 + 68x - 111 = 0$

Factorise the equation,

$\Rightarrow 4x^2 + 74x - 6x - 111 = 0$

$\Rightarrow$ 2x(2x + 37) - 3(2x + 37) = 0

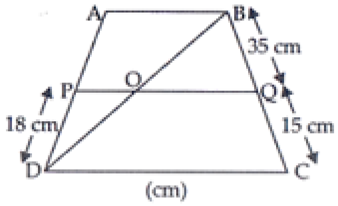
$\Rightarrow (2x + 37)(2x - 3) = 0$

$\Rightarrow$ x = $-\frac{37}{2}$ or x = $\frac{3}{2}$

As width can't be negative.

$\Rightarrow x = \frac{3}{2} = 1.5$

Therefore, the width of the path is 1.5 m.

33. 


In trapezium ABCD

AB || CD (Given)

PQ || DC (Given)

and PD = 18 cm, BQ = 35 cm and QC = 15 cm

To find: AD

∴ AB || CD || PQ ......(i)

In ΔBCD,

OQ || CD [From (i)]

$\therefore \frac{BO}{OD} = \frac{BQ}{QC}$ (ii) [By BPT]

Similarly, in ΔDAB,

PO || AB [From (i)]

$\therefore \frac{BO}{OD} = \frac{AP}{PD}$ (iii) [By BPT]

From (ii) and (iii)

$\frac{AP}{PD} = \frac{BQ}{QC}$

$\Rightarrow \frac{AP}{18} = \frac{35}{15}$

$\Rightarrow AP = \frac{35}{15} \times 18 = 7 \times 6$

⇒ AP = 42 cm

∴ AD = AP + PD = 42 cm + 18 cm = 60 cm.

34. Height of the cylinder = 3 m.

Total height of the tent above the ground = 13.5 m

height of the cone = (13.5 - 3)m = 10.5 m

Radius of the cylinder = radius of cone = 14 m

Curved surface area of the cylinder = $2\pi rh \mathrm{m}^2 = \left(2 \times \frac{22}{7} \times 14 \times 3\right) \mathrm{m}^2 = 264\mathrm{m}^2$

$\therefore \quad l = \sqrt{r^2 + h^2} = \sqrt{14^2 + (10.5)^2} = \sqrt{196 + 110.25} = \sqrt{306.25} = 17.5$

∴ Cured surface area of the cone = $\pi rl = \left(\frac{22}{7} \times 14 \times 17.5\right) \mathrm{m}^2 = 770\mathrm{m}^2$

Let S be the total area which is to be painted. Then,

S = Curved surface area of the cylinder + Curved surface area of the cone

$\Rightarrow S = (264 + 770)\ m^2 = 1034\ m^2$

Hence, Cost of painting = S $\times$ Rate = ₹ $(1034 \times 2)$ = ₹ 2068

OR

Radius of lower cylinder = 14 cm

Volume of pole $= \frac{22}{7} \times 14 \times 14 \times 200 + \frac{22}{7} \times 7 \times 7 \times 50$

$= 130900\ cm^3$

Mass of the pole = 8 $\times$ 130900

= 1047200 gm or 1047.2 kg

35.

| No. of wickets: | 20 - 60 | 60 - 100 | 100 - 140 | 140 - 180 | 180 - 220 | 220 - 260 | Sum |
|---|---|---|---|---|---|---|---|
| ($f_i$) No. of bowlers: | 7 | 5 | 16 | 12 | 2 | 3 | 45 |
| $x_i$ | 40 | 80 | 120 | 160 | 200 | 240 | |
| $u_i$ | -2 | -1 | 0 | 1 | 2 | 3 | |
| $f_i x_i$ | -14 | -5 | 0 | 12 | 4 | 9 | 6 |

| cf | 7 | 12 | 28 | 40 | 42 | 45 | |
|---|---|---|---|---|---|---|---|

Mean = $a+\frac{\sum f_i u_i}{\sum f_i}\times h = 120+\frac{6\times40}{45}$ = 125.33

Median = $l+\frac{\frac{N}{2}-c}{f}\times h = 100+\frac{22.5-12}{16}\times 40$ = 126.25

**Section E**

36. i. Let production in a 1st year be 'a' unit and increase in production (every year) be 'd' units.
Increase in production is constant, therefore unit produced every year forms an AP.
Now, $a_3$ = 6000
a + 2d = 6000 $\Rightarrow$ a = 6000 - 2d ...(i)
and $a_7$ = 7000 $\Rightarrow$ a + 6d = 7000
$\Rightarrow$ (6000 - 2d) + 6d = 7000 $\Rightarrow$ 4d = 1000 [using eq. (i)]
$\Rightarrow$ d = 250
When d = 250, eq. (i) becomes
a = 6000 - 2(250) = 5500
$\therefore$ Production in 1st year = 5500
ii. Production in fifth year
$a_5$ = a + 4d = 5500 + 4(250) = 6500
iii. Total production in 7 years = $\frac{7}{2}$(5500 + 7000) = 43750
**OR**
$a_n$ = 1000 units
$a_n$ = 1000
$\Rightarrow$ 10000 = a + (n - 1)d
$\Rightarrow$ 1000 = 5500 + 250n - 250
$\Rightarrow$ 10000 - 5500 + 250 = 250n
$\Rightarrow$ 4750 = 250n
$\Rightarrow$ n = $\frac{4750}{250}$ = 19

37. i. Point of intersection of diagonals is their midpoint
So, $\left[\frac{(1+7)}{2}, \frac{(1+5)}{2}\right]$
= (4, 3)
ii. Length of diagonal AC
AC = $\sqrt{(7-1)(7-1)+(5-1)(5-1)}$
= $\sqrt{52}$ units
iii. Area of campaign board
= 6 $\times$ 4
= 24 units square
**OR**
Ratio of lengths = $\frac{AB}{AC}$
= $\frac{6}{\sqrt{52}}$
= 6 : $\sqrt{52}$

38. i. The angle of depression from the balloon at a point B to the car at point P.
In $\triangle$APB
tan B = $\frac{AB}{AP}=\frac{100}{100}=1$
$\Rightarrow$ tan B = 1
$\Rightarrow$ tan B = tan $45^o$
$\Rightarrow$ B = $45^o$
ii. The speed of the balloon is
Speed = $\frac{\text{Distan }ce}{\text{Time}}$
$\Rightarrow$ Speed = $\frac{100}{15}=\frac{25}{3}$ = 6.6 m/sec

iii. The vertical distance travelled by the balloon when angle of depression is $60^{o}$.

In $\triangle$APC

Let BC = x

$\tan 60^\circ = \frac{AC}{AP} = \frac{AB+x}{100}$

$\Rightarrow \sqrt{3} = \frac{100+x}{100}$

$\Rightarrow 100\sqrt{3} - 100 = x$

$\Rightarrow$ x = $100(\sqrt{3} - 1)$

$\Rightarrow$ x = 73.21 m

**OR**

The total time taken by the balloon to reach the point C from ground.

Time = $\frac{\text{D}istance}{\text{Speed}}$

$\Rightarrow T = \frac{100(\sqrt{3}-1)}{\frac{25}{3}}$

$\Rightarrow T = 12(\sqrt{3} - 1)$ = 8.78 sec