| Pre-Board Examination (2025-26) SET- 1 |
|---|
| Class- X |
| Subject: Mathematics Basic (241) |
| Marking Scheme |

| Section A | | |
|---|---|---|
| 1. | (D) 4 | 1 |
| 2. | (C) $x^2 - x - 12$ | 1 |
| 3. | (D) 0, 8 | 1 |
| 4. | (B) an AP with d = 4 | 1 |
| 5. | (B) 3 | 1 |
| 6. | (A) (2, 2) | 1 |
| 7. | (B) 3 | 1 |
| 8. | (A) $\frac{4}{3}$ | 1 |
| 9. | (D) $\frac{1}{13}$ | 1 |
| 10. | (A) 2 | 1 |
| 11. | (B) 45° | 1 |
| 12. | (D) 110° | 1 |
| 13. | (C) 3 cm | 1 |
| 14. | (A) $\frac{\pi r^2 \theta}{360}$ | 1 |
| 15. | (A) a cone and a cylinder | 1 |
| 16. | (B) 2r cm | 1 |
| 17. | (B) median | 1 |
| 18. | (B)315 | 1 |
| 19. | A) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A) | 1 |
| 20. | D) Assertion (A) is false but reason (R) is true. | 1 |
| **Section B** | | |
| Section B consists of 5 questions of 2 marks each. | | |
| 21. | (A) It can be observed that, 2×5×7×11+11×13=11 × (70+13) = 11 x 83 which is the product of two factors other than 1. Therefore, it is a composite number.<br>OR | 2 |
| | (B) The smallest number which is divisible by any two numbers is their LCM.<br>So, Number which is divisible by both 306 and 657 = LCM (306, 657)<br>Since, $306 = 2 \times 3^2 \times 17$ and $657 = 3^2 \times 73$<br>LCM (306, 657) = $2 \times 3^2 \times 17 \times 73 = 22338$ | 1<br>1 |
| 22. | Let P(– 1, 6) divides joining of A(– 3, 10) and B(6, – 8) in the ratio $m_1:m_2$<br>Then, we know<br>$-1 = \frac{(m1\ X\ 6)+(m2\ X -3)}{m1+m2}$ [ since $x = \frac{(m1\ X\ x2)+(m2\ X\ x1)}{m1+m2}$<br>i.e.- $m_1 - m_2 = 6 m_1 - 3m_2$<br>i.e. $-m_1 - 6m_1 = m_2 - 3m_2$<br>i.e. $-7m_1 = -2m_2$<br>i.e. $m_1 : m_2 = 2:7$<br>So, the required ratio is 2:7 | 2 |
| 23. | Since P(x, y) is equidistant from the point A(3, 6) and B(– 3, 4), | 2 |

| | | |
|---|---|---|
| | So, PA = PB<br>i.e. $PA^2 = PB^2$<br>i.e. $(3 – x)^2 + (6 - y)^2 = (-3 - x)^2 + (4 - y)^2$<br>i.e. $9 – 6x + x^2 + 36 – 12y + y^2 = 9 + 6x + x^2 + 16 – 8y + y^2$<br>i.e. $– 6x + 36 – 12y = 6x + 16 – 8y$<br>i.e. $– 6x + 36 – 12y - 6x - 16 + 8y = 0$<br>i.e. $-12x -4y + 20 = 0$<br>i.e. $3x + y - 5 = 0$<br>This is the required relation between x and y. | |
| 24. | Since $\cos 60^0 = \frac{1}{2}$ and $\cos 30^0 = \frac{\sqrt{3}}{2}$,<br>So, $A + B = 60^0$ …….. (i)<br>And $A – B = 30^0$ …….. (ii)<br>Solving equations (i) and (ii), we get<br>$A = 45^0$ and $B = 15^0$ | 2 |
| 25. | Numbers divisible by 5 are 10,15,20,25,30,35,40,45,50,55,60,65,70,75,80,85,90<br>Number of Fvaourable outcomes = 17<br>P(E) = 17/81<br>(OR)<br>A coin is tossed two times so the possible outcomes are (H,H), (H,T), (T,H), (T,T) = 4<br>Getting at most one head = (H,T), (T,H), (T,T)<br>so, the probability of getting at most one head = $\frac{3}{4}$ | 1<br>+<br>1 |
| | **Section C** | |
| | Section C consists of 6 questions of 3 marks each. | |
| 26. | Proof as given in NCERT textbook example. | 3 |
| 27. | Find the zeroes of the polynomial$6x^2 + 5\sqrt{3}x – 3$ by factorisation method and verify the relation between the zeroes and the coefficients of the polynomial.<br>Here, $p(x) = 6x^2 + 5\sqrt{3}x – 3$<br>$= 6x^2 + (6\sqrt{3} - \sqrt{3})x – 3$<br>$= 6x^2 + 6\sqrt{3}x - \sqrt{3}x – 3$<br>$= 6x(x + \sqrt{3}) - \sqrt{3}(x + \sqrt{3})$<br>$= (x + \sqrt{3})(6x - \sqrt{3})$<br>So, the zeros of the polynomial $6x^2 + 5\sqrt{3}x – 3$are $-\sqrt{3}$ and $\frac{\sqrt{3}}{6}$<br>Now, sum of zeros = $-\sqrt{3} + \frac{\sqrt{3}}{6}$<br>$= -\frac{5\sqrt{3}}{6} = -\frac{Coefficient\ of\ Coefficient\ of\ x}{Coefficient\ of\ Coefficient\ of\ x^2}$<br>Product of zeros = $-\sqrt{3} \text{ X } \frac{\sqrt{3}}{6}$<br>$= -\frac{3}{6} = -\frac{1}{2} = \frac{Constant\ term}{Coefficient\ of\ Coefficient\ of\ x^2}$ | 1<br>+<br>1<br>+<br>1 |
| 28. | For Given, To Prove, Construction 1-mark<br>For Correct Proof 2-marks | 3 |

**29.** Let the base of a triangle = x cm 1 + 1 + 1

Then, its altitude = (x - 17) cm

Hypotenuse = 25 cm

By Pythagoras theorem, we have

$x^2 + (x - 17)^2 = 25^2$

i.e. $x^2 + x^2 - 34x + 289 = 625$

i.e. $2x^2 - 34x - 336 = 0$

i.e. $x^2 - 17x - 168 = 0$

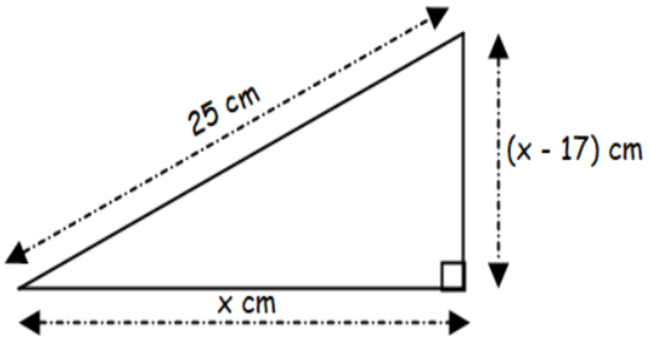
i.e. $x^2 - (24-7)x - 24 \times 7 = 0$

i.e. $x^2 - 24x + 7x - 24 \times 7 = 0$

i.e. $x(x - 24) + 7(x - 24) = 0$

i.e. $(x - 24)(x + 7) = 0$

so, x = 24, -7




Since x is taken length so, it cannot be negative.

Therefore, base of the triangle = 24 cm

And, its altitude = x – 17 = 24 – 17 = 7cm

OR

Here, we have

a = 6, b = -7, c = 2

so, discriminant = $b^2 - 4ac$

$= (-7)^2 - 4 \times 6 \times 2$

$= 49 - 48 = 1 > 0$, hence the equation will have real roots.

Now, by Quadratic Formula, we have

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{7 \pm \sqrt{1}}{2 X 6} = \frac{7 \pm 1}{12} = \frac{7+1}{12}, \frac{7-1}{12} = \frac{8}{12}, \frac{6}{12} = \frac{2}{3}, \frac{1}{2}$$

Therefore, the required roots are $\frac{2}{3}$ *and* $\frac{1}{2}$.

**30.** We have, LHS = $(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2$ 3

$= \sin^2 A + 2\sin A \operatorname{cosec} A + \operatorname{cosec}^2 A + \cos^2 A + 2\cos A \sec A + \sec^2 A$

[ using identity $(a + b)^2 = a^2 + 2ab + b^2$ 1

$= (\sin^2 A + \cos^2 A) + 2\sin A \operatorname{cosec} A + \operatorname{cosec}^2 A + 2\cos A \sec A + \sec^2 A$

$= 1 + 2 + \operatorname{cosec}^2 A + 2 + \sec^2 A$

[since $\sin^2 A + \cos^2 A = 1$, $\sin A \operatorname{cosec} A = 1$, $\cos A \sec A = 1$

$= 5 + (1 + \cot^2 A) + (1 + \tan^2 A)$ 1

[since $\operatorname{cosec}^2 A = 1 + \cot^2 A$ and $\sec^2 A = 1 + \tan^2 A$

$= 7 + \tan^2 A + \cot^2 A$ = RHS 1

Hence proved

OR

We have, LHS = $(\sin\alpha + \cos\alpha)(\tan\alpha + \cot\alpha)$

$= \sin\alpha \times \tan\alpha + \cos\alpha \times \tan\alpha + \sin\alpha \times \cot\alpha + \cos\alpha \times \cot\alpha$

$= \sin\alpha \times \frac{\sin\alpha}{\cos\alpha} + \cos\alpha \times \frac{\sin\alpha}{\cos\alpha} + \sin\alpha \times \frac{\cos\alpha}{\sin\alpha} + \cos\alpha \times \frac{\cos\alpha}{\sin\alpha}$

[ since $\tan A = \frac{\sin A}{\cos A}$ and $\cot A = \frac{\cos A}{\sin A}$ 1

$$= \frac{\sin^3\alpha + \sin^2\alpha\cos\alpha + \sin\alpha\cos^2\alpha + \cos^3\alpha}{\sin\alpha\cos\alpha}$$

$$= \frac{(\sin^3\alpha + \cos^3\alpha) + (\sin^2\alpha\cos\alpha + \sin\alpha\cos^2\alpha)}{\sin\alpha\cos\alpha}$$

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

[ using identity, $a^3 + b^3 = (a + b)(a^2 + b^2 - ab)$ 1

$$= \frac{(\sin\alpha + \cos\alpha)[\sin^2\alpha + \cos^2\alpha - \sin\alpha\cos\alpha + \sin\alpha\cos\alpha]}{\sin\alpha\cos\alpha}$$

$$= \frac{(\sin\alpha + \cos\alpha)[1 - 0]}{\sin\alpha\cos\alpha}$$

[ since, $\sin^2A + \cos^2A = 1$

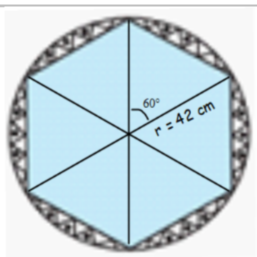
$= \frac{(\sin\alpha)}{\sin\alpha \cos\alpha} + \frac{(\cos\alpha)}{\sin\alpha \cos\alpha}$

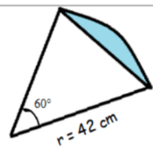
$= \frac{1}{\cos\alpha} + \frac{1}{\sin\alpha}$

$= \sec\alpha + \text{cosec}\,\alpha$ = RHS   $[\frac{1}{\cos A} = \sec A, \ \frac{1}{\sin A} = \text{cosec} A$   1

Hence proved

**31.** Here, we are




Area of the design   1 + 1 + 1

= 6 X Area of a segment of the circle

[ since designed is made on six segments

$= 6 \text{ X } [\frac{\theta}{360}\pi r^2 - \frac{1}{2}r^2\sin\theta]$

[ since, Area of segment = $\frac{\theta}{360}\pi r^2 - \frac{1}{2}r^2\sin\theta$

$= 6 \text{ X } r^2[\frac{60°}{360}\pi - \frac{1}{2}\sin 60°]$

[a segment is subtending an angle 60° at the centre

$= 6 \text{ X } 42 \text{ X } 42 \ (\frac{1}{6} X \frac{22}{7} - \frac{1}{2} X \frac{\sqrt{3}}{2})$

$= \frac{6 X 42 X 42}{84}(44 - 21\sqrt{3})$

= 126 (44 – 21 X 1.7)

= 126 (44 – 21 X 1.7)

= 126 (44 – 35.7)

= 126 X 8.3

= 1045.8 $cm^2$

Now, cost of making the design = Area of design X cost per $100cm^2$

$= 1045.8 \text{ X } \frac{20}{100}$

= 209.16

Therefore, the cost of making the designs at the rate of ₹20 per $100cm^2$is ₹209.16.

## Section D

Section D consists of 4 questions of 5 marks each.

**32.** From first eqn., we have   1 + 1 + 2 + 1

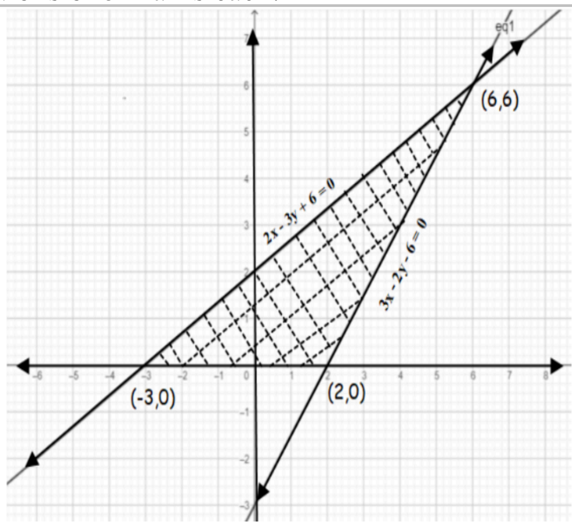
| x | 0 | 2 |
|---|---|---|
| y | -3 | 0 |

$y = \frac{3x-6}{2}$ ,

From second eqn., we have

| x | 0 | 3 |
|---|---|---|
| y | 2 | 4 |

$y = \frac{2x+6}{3}$ ,



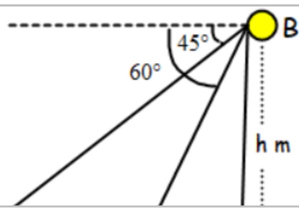

From the graph, x = 6, y = 6 is the solution of given equations.

Now, area of $\Delta = \frac{1}{2}$ b X h

$= \frac{1}{2}$ X 5 X 6

= 15 sq units

**33.** Let B is a balloon h m vertically above a straight road from where the angles of depression of two cars G and C,100 m apart at an instant are found to be 45° and 60°respectively.   1 + 2 + 2




Let CA = x m.

From rt $\Delta$BAC, we have

$\frac{CA}{BA}$ = cot60°   [ $since\ \frac{base}{perpendicular}$ = cot θ

i.e. x = h X $\frac{1}{\sqrt{3}}$ ……(i)   [ $since\ cot60° = \frac{1}{\sqrt{3}}$

Also from rt ΔBAG, we have

$\frac{GA}{BA}$ = cot45°

i.e. 100 + x = h X 1   [ $since\ cot45° = 1$

i.e. 100 + h X $\frac{1}{\sqrt{3}}$ = h  [ From eqn. (i)

i.e. 100$\sqrt{3}$ + h = h$\sqrt{3}$

i.e. h = $\frac{100}{\sqrt{3}-1} = \frac{100}{\sqrt{3}-1}$ X $\frac{\sqrt{3}+1}{\sqrt{3}+1}$   [Rationalising denominator

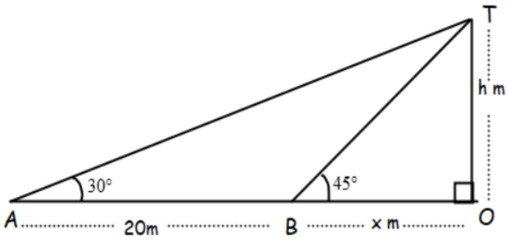
= $\frac{100(\sqrt{3}+1)}{3-1}$

= $50(\sqrt{3}+1)$m

So, the height of the balloon is $50(\sqrt{3}+1)$m.

OR

Let the angle of elevation of the top of a tower T having height h m from certain point A is 30°. If the observer moves 20 metres towards the tower at point B, the angle of elevation of the top increases by 15° i.e. 30°+15°=45°. Let BO=x m.




From rt ΔTOB, we have

$\frac{BO}{TO}$ = cot45°   [ $since\ \frac{base}{perpendicular}$ = cot θ

i.e. x = h X 1 ……(i)   [ $since\ cot45° = 1$

Also from rt ΔTOA, we have

$\frac{AO}{TO}$ = cot30°

i.e. 20+ x = h X $\sqrt{3}$[ $since\ cot30° = \sqrt{3}$

i.e. 20+ h = $\sqrt{3}$ h[ From eqn. (i)

i.e. $\sqrt{3}$ h – h = 20

i.e. $h(\sqrt{3}-1)$ = 20

i.e. h = $\frac{20}{\sqrt{3}-1}$

= $\frac{20}{\sqrt{3}-1}$ X $\frac{\sqrt{3}+1}{\sqrt{3}+1}$   [Rationalising denominator

= $\frac{20(\sqrt{3}+1)}{3-1}$

= $10(\sqrt{3}+1)$ m

So, the height of the tower is $10(\sqrt{3}+1)$m.

34. In $\Delta AOP$ and $\Delta AOC$,

$AP = AC$ [Tangents from the point]

$OP = OC$ [Radii of the same circle]

$OA = OA$ [Common]

$\therefore \Delta AOP \cong \Delta AOC$ [By SSS congruence]

$\Rightarrow \angle PAO = \angle CAO$ [CPCT]

$\Rightarrow \angle PAC = 2\angle PAO = 2\angle CAO$

$\Rightarrow \angle PAC = 2\angle OAC$ ...(i)

Similarly, $\angle QBC = 2\angle OBC$ ...(ii)

Adding equations (i) and (ii), we get:

$\angle PAC + \angle QBC = 2(\angle OAC + \angle OBC)$

$\Rightarrow 180^\circ = 2(\angle OAC + \angle OBC)$

$\Rightarrow \angle OAC + \angle OBC = 90^\circ$

Then, in triangle AOB, we have

$\angle AOB + \angle OAC + \angle OBC = 180^\circ$

$\Rightarrow \angle AOB + 90^\circ = 180^\circ$

$\Rightarrow \angle AOB = 90^\circ$. Hence, **proved**.

Marks: 1 + 2 + 2

35.

| Class interval | f | cf |
|---|---|---|
| 0-10 | 5 | 5 |
| 10-20 | x | 5 + x |
| 20-30 | 20 | 25 + x |
| 30-40 | 15 | 40 + x |
| 40-50 | y | 40 + x + y |
| 50-60 | 5 | **45 + x + y** |
| **Total** | **60** | |

From the table, we have

$45 + x + y = 60$

i.e. $x + y = 15$ …................(i)

If the median of the distribution given below is 28.5, then the median class is 20-30.

Hence, $l = 20$

$h = 10$

$cf = 5 + x$

$f = 20$

$n/2 = 30$

We know,

Marks: 1 + 1 + 2 + 1

Median = $l + \left(\frac{\frac{n}{2} - cf}{f}\right) X\ h$

i.e. $28.5 = 20 + [\frac{30-(5+x)}{20}]$ X 10

i.e. 8.5 X 2 = 25 – x

i.e. x = 25 – 17 = 8

Substituting x = 8 in eqn. (i), we get

8 + y = 15

i.e. y = 7

Therefore, the value of x is 8 and y is 7.

OR

Here, $h = 3$.

| Class interval | Frequency ($f_i$) | Cumulative frequency ($cf$) | Class marks ($x_i$) | $u_i = \frac{x_i - a}{h}$ | $f_i u_i$ |
|---|---|---|---|---|---|
| 1 – 4 | 6 | 6 | 2.5 | –2 | –12 |
| 4 – 7 | 30($f_1$) | 36($c$) | 5.5 | –1 | –30 |
| 7 – 10 | 40($f_m$) | 76 | $8.5 = a$ | 0 | 0 |
| 10 – 13 | 16($f_2$) | 92 | 11.5 | 1 | 16 |
| 13 – 16 | 4 | 96 | 14.5 | 2 | 8 |
| 16 – 19 | 4 | 100 | 17.5 | 3 | 12 |
| | | | $n = 100$ | | $\Sigma f_i u_i = -6$ |

$\because \quad n = 100$

$n \quad 100$

Since 40 is the maximum frequency, so the median class is (7 – 10).

Here, $l = 7, f_m = 40, cf = 36$ and $h = 3$.

$$\therefore \textbf{Median} = l + \left(\frac{\frac{n}{2} - cf}{f_m}\right) \times h$$

$$= 7 + \left(\frac{50 - 36}{40}\right) \times 3 = 7 + \frac{14}{40} \times 3$$

$$= 7 + \frac{21}{20} = 7 + \frac{10.5}{10}$$

$$= 7 + 1.05 = \mathbf{8.05}$$

$$\textbf{Mean} = a + \frac{\Sigma f_i u_i}{\Sigma f_i} \times h = 8.5 + \frac{(-6)}{100} \times 3$$

$$= 8.5 + \frac{(-18)}{100} = 8.50 - 0.18 = \mathbf{8.32}.$$

Now since the maximum number of letters in surnames = 40

$\therefore$ Modal class = 7 – 10

$$\therefore \textbf{Mode} = l + \left(\frac{f_m - f_1}{2f_m - f_1 - f_2}\right) \times h$$

$$= 7 + \left(\frac{40 - 30}{80 - 30 - 16}\right) \times 3$$

$$= 7 + \frac{10}{34} \times 3 = 7 + \frac{30}{34} = 7 + 0.88$$

$$= \mathbf{7.88}.$$

**Section E**

Section E consists of 3 case study based questions of 4 marks each.

| | | |
|---|---|---|
| 36. | **Given**<br>Pipes are stacked in rows with counts forming an arithmetic sequence that decreases by 1 each row. Bottom row = 20, next = 19, etc. Total pipes = 200. | 4 |

#### (i) Number of rows

Let the number of rows be $r$. Topmost row will have $20-(r-1)$ pipes. Sum of the $r$ terms:

$$S=\frac{r(\text{first}+\text{last})}{2}=\frac{r(20+[20-(r-1)])}{2}=\frac{r(41-r)}{2}.$$

Set $S=200$:

$$\frac{r(41-r)}{2}=200 \quad \Rightarrow \quad r(41-r)=400.$$

Solve the quadratic:

$$r^2-41r+400=0 \quad \Rightarrow \quad (r-16)(r-25)=0.$$

Possible roots $r=16$ or $r=25$. $r=25$ would make the top row negative, so take $r=16$.

## Answer (i): 16 rows.

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#### (ii) Pipes in the topmost row

Topmost = $20-(16-1)=20-15=5$.

**Topmost row:** $5$ pipes.

They also asked: *Find the number of pipes lying between the top and bottom row.*
If "between" means **excluding** top and bottom rows, then

$$\text{pipes between}=200-(20+5)=175.$$

If they meant **number of rows between**, that is $16-2=14$ rows.

**Answer (ii):** Topmost = $5$ pipes; pipes between top & bottom (excluding them) = $175$ (or $14$ rows between).

| | | |
|---|---|---|
| | **(iii) A stack of 105 pipes arranged in 6 rows — find bottom row**<br>Let bottom row $= b$. Rows go $b, b-1, b-2, b-3, b-4, b-5$. Sum:<br>$S = \frac{6(b+(b-5))}{2} = 3(2b-5) = 6b-15.$<br>Set $6b - 15 = 105$:<br>$6b = 120 \Rightarrow b = 20.$<br>**Answer (iii):** Bottom row has $20$ pipes. | |
| 37. | i) Volume of Sphere = $\frac{4}{3}\pi r^3$ 1<br>ii) Shape the Paridakshinapatha is forming a ring.1<br>iii) volume of the stupa = volume of hemisphere + volume of the cuboid<br>$= \frac{2}{3}\pi r^3 + lbh$<br>$= \frac{2}{3} X \frac{22}{7} X 14^3$ + 8m x 6m x 4m<br>= 5749.33 + 192<br>= 5941.33 $m^3$ 2<br>OR<br>The cloth require to cover the hemispherical dome<br>= CSA of hemisphere – Area of base of cuboidal top<br>$= 2\pi r^2 - lb$<br>$= 2 X \frac{22}{7} X 14^2 - 8 X 6$<br>= 1232 – 48<br>= 1184 $m^2$ 2 | 4 |
| 38. | i) Similarity of triangles. 1<br>ii) 1.6 : 1.2 = 4 : 3 1<br>iii) Since heights of objects and their shadow at same time form similar triangles so,<br>4 : 3 = 20 : x<br>i.e. x = $\frac{20 X 3}{4}$ = 15m<br>So, the length of shadow of Alina's house is 15m. 2<br>OR<br>Since heights of objects and their shadow at same time form similar triangles so,<br>4 : 3 = h : 54<br>i.e. h = $\frac{4 X 54}{3}$ = 72m 2 | 4 |