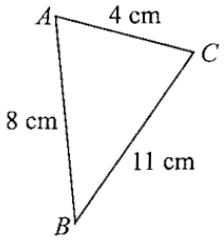
Heron's Formula

MATHEMATICAL REASONING

1. In the given figure, the area of the ΔABC is



(a) $13.24\,cm^2$ (b) $12.28\,cm^2$
(c) $11.32\,cm^2$ (d) $15.37\,cm^2$

2. The difference between the semi-perimeter and the sides of a ΔABC are 8 cm, 7 cm and 5 cm respectively. The area of the triangle is____.
(a) $20\sqrt{7}\,cm^2$ (b) $10\sqrt{14}\,cm^2$
(c) $20\sqrt{14}\,cm^2$ (d) $140\,cm^2$

3. The perimeter of a triangle is 540 m and its sides are in the ratio $25:17:12$. Find its area.
(a) $9100\,m^2$ (b) $9000\,m^2$
(c) $9200\,m^2$ (d) $9500\,m^2$

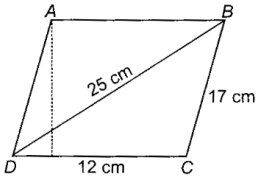
4. The perimeter of an isosceles triangle is 32 cm. The ratio of one of the equal sides to its base is $3:2$. Find the area of the triangle.
(a) $48\,cm^2$ (b) $28\sqrt{3}\,cm^2$
(c) $32\sqrt{2}\,cm^2$ (d) $44\,cm^2$

5. If each side of the rhombus is 40 m and its longer diagonal is 48 m, then the area of rhombus is____.
(a) $1536\,m^2$ (b) $1636\,m^2$
(c) $1236\,m^2$ (d) $1336\,m^2$

6. A triangle and a parallelogram have the same base and the same area. If the sides of the triangle are 26 cm, 28 cm and 30 cm, and the parallelogram stands on the base 28 cm, find the height of the parallelogram.
(a) 15 cm (b) 14 cm
(c) 12 cm (d) 13 cm

7. The area of a parallelogram ABCD in which AB = 12 cm, BC = 9 cm and diagonal AC = 15 cm is k cm2. Find the value of $\frac{k-100}{4}$.
(a) 3 (b) 4
(c) 2 (d) 5

8. In the given parallelogram, find the length of the altitude from vertex A on the side DC.

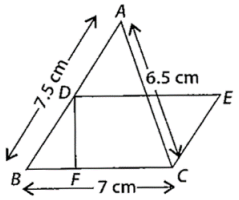


(a) 18 cm (b) 12 cm
(c) 15 cm (d) 25 cm

9. A rhombus shaped sheet with perimeter 40 cm and one diagonal 12 cm, is painted on both sides at the rate of ₹ 5 per cm^2. Find the cost of painting.
(a) ₹ 880 (b) ₹ 1020
(c) ₹ 960 (d) ₹ 980

10. The area of a triangle, two sides of which are 8 cm and 11 cm and the perimeter is 32 cm is $k\sqrt{30}\,cm^2$. Find the value of k.
(a) 8 (b) 6
(c) 7 (d) 9

11. In the given figure, AABC has sides AB = 7.5 cm, AC = 6.5 cm and BC = 7 cm. On base BC a parallelogram DBCE of same area as that of ΔABC is constructed. Find the height DF of the parallelogram.



(a) 3 cm (b) 6 cm
(c) 4 cm (d) 2 cm

12. The sides of a triangle are 11 cm, 15 err, and 16 cm. The altitude to the largest side is____.
(a) $30\sqrt{7}\,cm$ (b) $\frac{15\sqrt{7}}{2}cm$
(c) $\frac{15\sqrt{7}}{4}cm$ (d) $30\,cm$

13. A field is in the shape of a trapezium whose parallel sides are 25 m and 10 m. The non-parallel sides are 14 m and 13 m. Find the area of the field.

(a) $196\,cm^2$ (b) $186\,cm^2$

(c) $169\,cm^2$ (d) $199\,cm^2$

14. Find the cost of laying grass in a triangular field of sides 50 m, 65 m and 65 m at the rate of ₹ 7 per m^2.

(a) ₹ 9500 (b) ₹ 11000

(c) ₹ 10500 (d) ₹ 12500

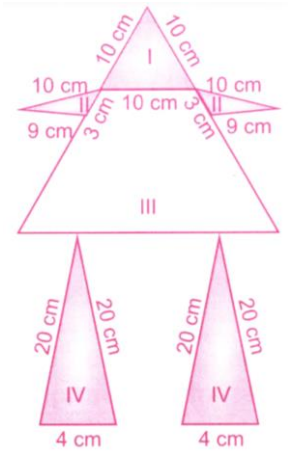
15. The base of an isosceles triangle measures 24 cm and its area is $192\ cm^2$. Find its perimeter.

(a) 64 cm (b) 46 cm

(c) 84 cm (d) 54 cm

EVERYDAY MATHEMATICS

16. Suman made a picture with some white paper and a single coloured paper as shown in figure. White paper is available at her home and free of cost. The cost of coloured paper used is at the rate of 10p per cm^2. Find the total cost of the coloured paper used. (Take $\sqrt{3} = 1.732$ and $\sqrt{11} = 3.31$)



(a) ₹ 14.92 (b) ₹ 14

(c) ₹ 16 (d) ₹ 13

17. An umbrella is made by stiching 12 triangular pieces of cloth of two different coloured as shown in given figure. Each piece measuring 40 cm, 40 cm and 18 cm. How much cloth of each colour is required for the umbrella?

(a) $2104.56\ cm^2$, $2104.56\ cm^2$

(b) $4209.22\ cm^2$, $2104.56\ cm^2$

(c) $1204.61\ cm^2$, $1204.61\ cm^2$

(d) $2014.61\ cm^2$, $1204.61\ cm^2$

18. A hand fan is made by stitching 10 equal size triangular strips of two different types of paper as shown below. The dimensions of equal strips are 25 cm, 25 cm and 14 cm. Find the total area of paper needed to make the hand fan.

(a) $840\,cm^2$ (b) $1680\,cm^2$

(c) $480\,cm^2$ (d) $7844\,cm^2$

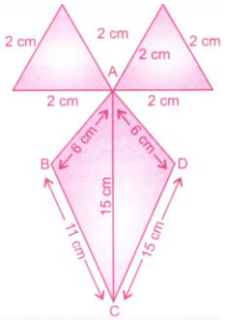
19. The perimeter of a field in the form of an equilateral triangle is 36 cm, then its area is given by

(a) $98\sqrt{3}\,cm^2$ (b) $8\sqrt{3}\,cm^2$

(c) $42\sqrt{3}\,cm^2$ (d) $36\sqrt{3}\,cm^2$

20. Tanya joined four triangles of cardboard to create a mask of Joker as shown in the given figure. Find the total area of the mask.

(Given $\sqrt{2} = 1.41, \sqrt{3} = 1.73$]



(a) $59.86\,cm^2$ (b) $50\,cm^2$

(c) $59\,cm^2$ (d) $53\,cm^2$

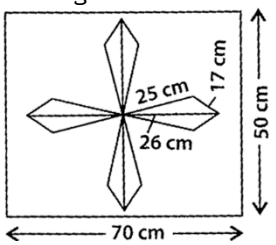
ACHIEVERS SECTION (HOTS)

21. ABC is an equilateral triangle of side $4\sqrt{3}$ cm. P, Q and R are mid-points of AB, CA and BC respectively. Find the area of triangle PQR is ____.

(a) $3\sqrt{3}\,cm^2$ (b) $2\sqrt{3}\,cm^2$

(c) $\frac{\sqrt{3}}{2}cm^2$ (d) $\frac{\sqrt{3}}{4}cm^2$

22. A design is made on a rectangular tile of dimensions $50\,cm \times 70\,cm$ as shown in figure. The design shows 8 triangles, each of sides 26 cm, 17 cm and 25 cm. Find the total area of the design and the remaining area of the tile respectively.



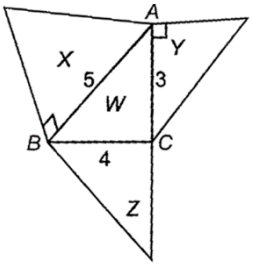
(a) $1632\,cm^2, 1886\,cm^2$

(b) $1538\,cm^2, 1632\,cm^2$

(c) $1632\,cm^2, 1868\,cm^2$

(d) $1538\,cm^2, 1632\,cm^2$

23. Right isosceles triangles are constructed on the sides of right angled ΔABC with sides 3, 4, 5 units, as shown. A capital letter indicates area of each triangle. Which one of the following is true?



(a) $X + Z = Y + W$ (b) $W + X = Z$

(c) $Y + Z = X$ (d) $X + W = \frac{1}{2}(Y + Z)$

24. State T for true and 'F' for false.

(i) The lengths of the three sides of a triangular field are 40 m, 24 m and 32 m respectively. The area of the triangle is 384 m^2.

(ii) The area of a quadrilateral ABCD in which B = 3 cm, BC = 4 cm, CD = 4 cm, DA = 5 cm and AC = 5 cm is 18 cm^2.

(iii) An advertisement board is in the form of an isosceles triangle with its sides equal to 12 m, 10 m and 10 m. The cost of painting it at ₹ 2.25 per m^2 is 18 cm^2. 112.

(iv) Heron's formula cannot be used to calculate area of quadrilaterals.

	(i)	(ii)	(iii)	(iv)
(a)	T	F	F	T
(b)	F	T	F	F
(c)	T	F	T	F
(d)	T	F	F	F

25. Find the area of quadrilateral ABCD in which AB = 9 cm, 6C = 40 cm, CD = 28 cm, DA = 15 cm and $\angle ABC = 90^\circ$.

(a) $300\,cm^2$ (b) $180\,cm^2$

(c) $126\,cm^2$ (d) $306\,cm^2$

HINTS & EXPLANATIONS

1. (b) : Here a = 1 cm, b = 4 cm, c = 8 cm

$\therefore\ s = \frac{11+4+8}{2} = \frac{23}{2} = 11.5\,cm$

Area

$= \sqrt{11.5 \times (11.5-11) \times (11.5-4) \times (11.5-8)}$

$= \sqrt{11.5 \times 0.5 \times 7.5 \times 3.5}$

$= \sqrt{150.94} = 12.28\,cm^2$

2. (c) : Let the sides of ΔABC be a, b, c

Then,

$(s-a) = 8, (s-b) = 7$ and $(s-c) = 5$

$\Rightarrow (s-a) + (s-b) + (s-c) = 20$

$\Rightarrow (s-a) + (s-b) + (s-c) = 20$

$\Rightarrow 3s - (a+b+c) = 20$

$\Rightarrow 3s - 2s = 20$

$\Rightarrow s = 20 \qquad \left[\because s = \frac{a+b+c}{2}\right]$

$\therefore$ Area of $\Delta ABC = \sqrt{20 \times 8 \times 7 \times 5}$

$= \sqrt{5600}\,cm^2 = 20\sqrt{14}\,cm^2$

3. (b) : Let the sides of the triangle be

$a = 25x, b = 17x, c = 12x$

Perimeter of triangle = 540cm

$\Rightarrow 25x + 17x + 12x = 540$

$\Rightarrow 54x + 540 \Rightarrow x = 10$

$\therefore\ a = 25 \times 10 = 250m, b = 17 \times 10 = 170m,$

$c = 12 \times 10 = 120m.$

Now, $s = \frac{540}{2} = 270m$

$\therefore$ Area of triangle

$= \sqrt{270(270-250)(270-170)(270-120)}$

$= \sqrt{270 \times 20 \times 100 \times 150}\, m^2 = 9000\, m^2$.

4. (c) : Perimeter = 32 cm

Let one of the equal sides be $3x$ and other be $2x$

$\therefore\ 3x + 3x + 2x = 32$

$\Rightarrow\ 8x = 32 \Rightarrow x = 4$

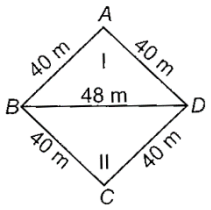
Sides of isosceles triangles are

12 cm, 12cm, 8 cm

$\therefore\ s = \dfrac{32}{2} = 16\, cm$

Area $= \sqrt{16 \times 4 \times 4 \times 8} = 32\sqrt{2}\, cm^2$

5. (a) : Here, each side of rhombus = 40 cm. One of the diagonal = 48 m



a = 40, b = 40, c = 48

$s = \dfrac{a+b+c}{2} = \dfrac{40+40+48}{2} = \dfrac{128}{2} = 64\, m$

Area of triangle I

$= \sqrt{64(64-40)(64-40)(64-48)}$

$= \sqrt{64(24)(24)(16)}$

$= 768\, m^2$

Similarly, area of

triangle $|| = 768\, m^2$

So,

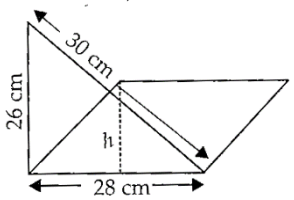
So, area of rhombus

$= 768\, m^2 + 768\, m^2$

$= 15.36\, m^2$

6. (c) : For the given triangle, we have

a = 28 cm, b = 30 cm, c = 26 cm



So, $s = \dfrac{a+b+c}{2} = \dfrac{28+30+26}{2}$

$s = \dfrac{a+b+c}{2} = \dfrac{28+30+26}{2}$

$= \dfrac{84}{2} = 42\, cm$

Area of the triangle

$= \sqrt{42(42-28)(42-30)(42-26)}\, cm^2$

$= \sqrt{42 \times 14 \times 12 \times 16}\, cm^2$

$= \sqrt{112896}\, cm^2 = 336\, cm^2$

Area of the parallelogram

= Area of the triangle

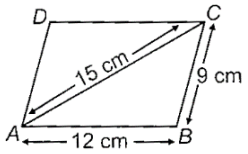
$\therefore$ Area of the parallelogram $= 336\, cm^2$

$\Rightarrow\ base \times height = 336 \Rightarrow 28 \times h = 336$

$\Rightarrow\ h = \dfrac{336}{28} cm = 12\, cm$

Thus, the height of the parallelogram = 12 cm

7. (c) : In ΔABC,



$a = 9\, cm, b = 15\, cm,$

$c = 12\, cm$

$s = \dfrac{a+b+c}{2}$

$= \dfrac{12+9+15}{2} = \dfrac{36}{2} = 18$

Area of $\Delta ABC = \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{18(18-12)(18-9)(18-15)}$

$= \sqrt{18 \times 6 \times 9 \times 3} = 54\, cm^2$

Area of parallelogram ABCD

$= 2$(Area of ΔABC)

$= 2 \times 54 = 108\, cm^2 = k\, cm^2$ (given)

$\Rightarrow\ k = 108$

$\therefore$ The value of $\dfrac{k-100}{4} = \dfrac{108-100}{4} = 2$

8. (c) : In $\Delta ABCD$ let a = 12cm, b = 17 cm and c = 25 cm.

$\therefore$ Semi-perimeter of $\Delta ABCD$.

$S = \left(\dfrac{12+17+25}{2}\right) cm = \dfrac{54}{2} cm = 27\, cm$

$\therefore$ Area of ΔBCD

$= \sqrt{27(27-12)(27-17)(27-25)}\, cm^2$

$= \sqrt{27 \times 15 \times 10 \times 2}\, cm^2 = 90\, cm^2$

Now, area of parallelogram ABCD

$= 2 \times$ Area of ΔBCD

$= (2 \times 90)\, cm^2 = 180\, cm^2$ ...(i)

Let altitude of parallelogram ABCD from vertex A be h cm.

Also, area of parallelogram = Base $\times$ Altitude

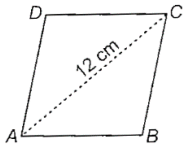
$\Rightarrow\ 180 = DC \times h$ [From (i)]

$\Rightarrow\ 180 = 12 \times h$

$\therefore \quad h = \frac{180}{12} = 15$

Required length of the altitude is 15 cm.

9. (c) : Let ABCD be a rhombus having sides A = BC = CD = DA = $x\,cm$



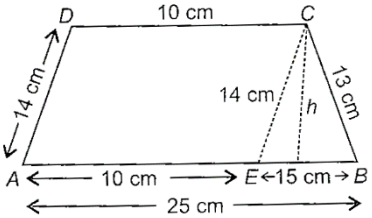
Perimeter of rhombus
$= 40\,cm$ [Given]
$\Rightarrow x + x + x + x = 40$
$\Rightarrow 4x = 40$
$\Rightarrow x = 10$
In ΔABC, let $a = 10\,cm, b = 12\,cm$ and $c = 10\,cm$
Now, semi-perimeter of $\Delta ABC, s = \frac{a+b+c}{2}$
$= \left(\frac{10+10+12}{2}\right) cm = \frac{32}{2} cm = 16\,cm$
$\therefore$ Area of ΔABC
$= \sqrt{16(16-10)(16-10)(16-12)}\,cm^2$
$= \sqrt{16\times 6\times 6\times 4}\,cm^2 = 48\,cm^2$
$= \sqrt{16\times 6\times 6\times 4}\,cm^2 = 48\,cm^2$
Now, area of the rhombus ABCD
$= 2(\text{Area of } \Delta ABC) = (2\times 48)\,cm^2 = 96\,cm^2$
$\because$ Cost of painting the sheet of area
$1\,cm^2$ = ₹ 5
$\therefore$ Cost of painting the sheet of area
$96\,cm^2$ = ₹ (96×5) = ₹ 480
Thus, the cost of painting the sheet on both sides = ₹ (2×480) = ₹ 960

10. (a) : Here we have perimeter of the triangle = 32 cm
Let a = 8 cm and b = 11 cm
Third side, $c = 32 - (8+11) = 13\,cm$
$\therefore \quad s = \frac{32}{2} = 16\,cm$
Therefore, area of the triangle
$= \sqrt{s(s-a)(s-b)(s-c)}$
$= \sqrt{16\times 8\times 5\times 3}\,cm^2$
$= 80\sqrt{30}\,cm^2 = k\sqrt{30}\,cm^2$
$\therefore k\sqrt{30} = 8\sqrt{30} \Rightarrow k = 8$

11. (a) : In ΔABC, a = 7 cm, b = 6.5 cm and c = 7.5 cm
$\therefore \; s = \left(\frac{7.5+7+6.5}{2}\right) cm = \frac{21}{2} cm = 10.5\,cm$
$\therefore$ Area of ΔABC
$= \sqrt{10.5(10.5-7.5)(10.5-7)(10.5-6.5)}\,cm^2$
$= \sqrt{10.5\times 3\times 3.5\times 4}\,cm^2 = \sqrt{441}\,cm^2$
$= 21\,cm^2$
Since, Area of ΔABC
= Area of parallelogram BCED
$\therefore \; 21 = BC \times DF$
$\Rightarrow \; 21 = 7 \times DF$
$\Rightarrow \; DF = \frac{21}{7} = 3\,cm$

12. (c) : We have, sides of triangle 11 cm, 15 cm and 16 cm.
$s = \frac{11+15+16}{2} = 21$
$\therefore$ Area of triangle
$= \sqrt{21(21-11)(21-15)(21-16)}$
$= 30\sqrt{7}\,cm^2$
Let altitude to the largest side be h cm
$\therefore \quad \frac{1}{2}\times 16 \times h = 30\sqrt{7} \Rightarrow 8h = 30\sqrt{7}$
$\Rightarrow \quad h = \frac{15\sqrt{7}}{4} cm$

13. (a) : Let ABCD be the trapezium with sides AB = 25 cm, CD = 10 cm, AD = 14 cm, BC = 14 cm.



We draw $CE \,||\, AD$
$\therefore$ Area of trapezium ABCD
= area of parallelogram AECD + area of ΔECB
Now, In ΔECB
$s = \frac{14+13+15}{2} = 21$
$\therefore$ Area of ΔECB
$= \sqrt{21(21-14)(21-13)(21-15)}$
$= 84\,cm^2$
Also, Area of $\Delta EBC = \frac{1}{2}\times BE \times h$
$\Rightarrow \; \frac{1}{2}\times 15 \times h = 84$

$\therefore h = 11.2 cm$

$\therefore$ Area of parallelogram AECD = $AE \times h$

$= 10 \times 11.2$

$= 112 cm^2$

Hence, Area of trapezium ABCD

$= (112 + 84) \text{cm}^2 = 196 cm^2$

14. (c) : Let sides of triangular field be a = 50 m, b = 65 m and c = 65 m

Semi-perimeter of triangular field. $s = \frac{a+b+c}{2}$

$= \left(\frac{50+65+65}{2}\right) m = \frac{180}{2} m = 90 m$

Area of triangular field

$= \sqrt{90(90-50)(90-65)(90-65)}\, m^2$

$= \sqrt{90 \times 40 \times 25}\, m^2 = 1500 m^2$

$\because$ Cost of laying grass in $1 m^2$ area = ₹ 7

$\therefore$ Cost of laying grass in $1500 m^2$ area

= ₹ (7×1500) = ₹ 10500

15. (a) : Let the other two equal sides of an isosceles triangle be a cm.

Then, $s = \frac{a+a+24}{2} = (a+12) cm$

Area of triangle $= 192 cm^2 = 192 cm^2$

$\Rightarrow \sqrt{(a+12)(a+12-a)(a+12-a)(a+12-24)} = 192$

$\Rightarrow 144(a^2 - 144) = (192)^2$

$\Rightarrow a^2 = 400 \Rightarrow a = 20 cm$

$\therefore$ Perimeter = 20 + 20 + 24 = 64 cm

16. (a) : (I) $s = \frac{10+10+10}{2} = 15 cm$

$\therefore$ Area of $I = \sqrt{15 \times 5 \times 5 \times 5} = 25\sqrt{3}\, cm^2$

$= 43.3 cm^2$

(II) $s = \frac{10+9+3}{2} = 11 cm$

$\therefore$ Area of $II = 2\sqrt{11 \times 1 \times 2 \times 8} = 8\sqrt{11}\, cm^2$

$= 26.48 cm^2$

(IV) $s = \frac{20+20+4}{2} = 22 cm$

$\therefore$ Area of $IV = 2\sqrt{22 \times 2 \times 2 \times 18}$

$= 24\sqrt{11} cm^2 = 79.44 cm^2$

$\therefore$ Total area of coloured paper used

$= (43.3 + 26.48 + 79.44) cm^2 = 149.22 cm^2$

Cost of coloured paper used $= \frac{10}{100} \times 149.22$

= ₹ 14.92

17. (a) : We have, a = 40 cm, b = 40 cm and c = 18 cm

$s = \frac{40+40+18}{2} = 49 cm$

$\therefore$ Area of one triangular piece

$= \sqrt{49 \times 9 \times 9 \times 31} = 350.76 cm^2$

$\therefore$ Area of 6 triangular piece 350.76×6

$= 21.04.56 cm^2$

Similarly, area of another 6 triangular piece

$= 21.04.56 cm^2$

18. (b) : $s = \frac{25+25+14}{2} = 32 cm$

$\therefore$ Area of 1 triangular piece

$= \sqrt{32 \times 7 \times 7 \times 18} = 168 cm^2$

$\therefore$ Total area of paper needed to make the hand

$fan = (168 \times 10) cm^2 = 1680 cm^2$

19. (d) : Since. All the sides are equal in an equilateral triangle.

So, perimeter = a + a + a, where a is the side of equilateral triangle.

$\Rightarrow 3a = 36 \Rightarrow a = 12 cm$

Area $= \frac{\sqrt{3}}{4} a^2 = \frac{\sqrt{3}}{4} (12)^2 = \frac{\sqrt{3}}{4} \times 44$

$= 36\sqrt{3}\, cm^2$

20. (a) : Area of I & II part

$= 2 \times \frac{\sqrt{3}}{4} \times (2)^2 = 2\sqrt{3}\, cm^2 = 3.46 cm^2$

Since, $s = \frac{6+11+15}{2} = 16 cm$

[For III & IV part]

$\therefore$ Area of III & IV part $= 2 \times \sqrt{16 \times 10 \times 15 \times 1}$

$= 56.4\, cm^2$

Hence, total area of the mask

$= (3.46 + 56.4) cm^2 = 59.86 cm^2$

21. (a) :

22. (c) : Area of rectangular tile

$= (50 \times 70) \text{cm}^2 = 3500 cm^2$

We have,

$a = 25 cm, b = 17 cm$ and $c = 26 cm$

$\therefore s = \frac{a+b+c}{2} = \left(\frac{25+17+6}{2}\right) cm$

= 34 cm

$\therefore$ Area of 1 triangular tile

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{34(34-25)(34-17)(34-26)}\, cm^2$

$= \sqrt{34 \times 9 \times 17 \times 8}\, cm^2 = 204\, cm^2$

$\therefore$ Total area of 8 triangles $= (204 \times 8) cm^2$

$= 1632\, cm^2$

So, area of the design $= 1632\, cm^2$

Also, remaining area of the tile

$= (3500 - 1632)\,\text{cm}^2 = 1868\, cm^2$

23. (c) :

24. (d) : (i) True: a = 40 m, b = 24 m and c = 32 m

$s = \frac{1}{2}(40 + 24 + 32) = 48\, m$

Area $= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{48 \times 8 \times 24 \times 16} = 384\, m^2$

(II) False: In ΔACD, we have

$s = \frac{a+b+c}{2} = \frac{5+5+4}{2} = 7\, cm$

Area (ΔACD)

$= \sqrt{7 \times 2 \times 2 \times 3}$

$= \sqrt{84} = 2\sqrt{21}\, cm^2$

In ΔACB,

$s = \frac{a+b+c}{2} = \frac{5+4+3}{2} = 6\, cm$

Area $(\Delta ACB) = \sqrt{6 \times 1 \times 1 \times 3 \times 2} = \sqrt{36} = 6\, cm^2$

Area of quadrilateral ABCD = Area (ΔACD) + Area (ΔACB)

$= 2\sqrt{21} + 6 = 2(3 + \sqrt{21}) cm^2$

(III) False: $s = \frac{a+b+c}{2}$

$= \frac{10+10+12}{2} = \frac{32}{2} = 16\, m$

Area of advertisement board

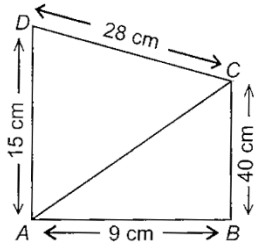
$= \sqrt{16 + 6 \times 6 \times 4} = 6 \times 8 = 48\, m^2$

Cost of painting= ₹ (48×2.25) = ₹ 108.

(IV) False: Heron's formula can be used to calculate area of quadrilaterals dividing it into tow triangles.

25. (d) : In right angled ΔABC, using Pythagoras theorem $(AC)^2 = (9)^2 + (40)^2 = 1681$

$\Rightarrow AC = 41\, cm$



$\therefore$ Area of $\Delta ABC = \frac{1}{2} \times 9 \times 40 = 180\, cm^2$

Now, in ΔADC

$s = \frac{15 + 28 + 41}{2} = 42\, cm$

$\therefore$ Area of $\Delta ADC = \sqrt{42 \times 27 \times 14 \times 1}$

$= 126\, cm^2$

Hence, area of quadrilateral ABCD

$= (180 + 126)\,\text{cm}^2 = 306\, cm^2$