

Areas

Exercise 7A

Question 1:

Here, $b = 24$ cm and $h = 14.5$ cm

$$\begin{aligned}\text{Area of triangle} &= \left(\frac{1}{2} \times \text{base} \times \text{height} \right) \text{sq units} \\ &= \left(\frac{1}{2} \times 24 \times 14.5 \right) \text{cm}^2 \\ &= 174 \text{ cm}^2\end{aligned}$$

Question 2:

Let height = x and base = $3x$

$$\text{Area of triangle} = \left(\frac{1}{2} \times \text{base} \times \text{height} \right) \text{sq units}$$

$$\begin{aligned}\therefore \text{Area of triangle} &= \frac{1}{2} \times x \times 3x \\ &= \frac{3}{2}x^2\end{aligned}$$

We know that, 1 hectare = 10000 sq metre

Rate of sowing the field per hectare = Rs.58

Total cost of sowing the triangular field = Rs.783

$$\Rightarrow \text{Total cost} = \text{Area of the triangular field} \times \text{Rs. 58}$$

$$\Rightarrow \frac{3}{2}x^2 \times \frac{58}{10000} = 783$$

$$\Rightarrow x^2 = \frac{783}{58} \times \frac{2}{3} \times 10000 \text{ sq metre}$$

$$\Rightarrow x^2 = 90000 \text{ sq metre}$$

$$\Rightarrow x = 300 \text{ m}$$

Hence, height = 300 m and base = 900 m.

Question 3:

Here, $a = 42$ cm, $b = 34$ cm and $c = 20$ cm

$$\text{Therefore, } s = \frac{42 + 34 + 20}{2} = 48$$

$$\begin{aligned}\text{Area} &= \sqrt{s(s-a)(s-b)(s-c)} \\ &= \sqrt{48(48-42)(48-34)(48-20)} \\ &= \sqrt{48 \times 6 \times 14 \times 28} \\ &= \sqrt{4 \times 4 \times 3 \times 3 \times 2 \times 14 \times 14 \times 2} \\ &= 4 \times 3 \times 2 \times 14 \\ &= 336 \text{ cm}^2\end{aligned}$$

Longest side = 42 cm

$$\Rightarrow b = 42 \text{ cm}$$

Let h be the height corresponding to the longest side.

$$\text{Area of the triangle} = \frac{1}{2} \times b \times h$$

$$\Rightarrow \frac{1}{2} \times b \times h = 336$$

$$\Rightarrow 42 \times h = 336 \times 2$$

$$\Rightarrow h = \frac{336 \times 2}{42} = 16 \text{ cm}$$

Question 4:

Here, $a = 18$ cm, $b = 24$ cm and $c = 30$ cm

$$\text{Therefore, } s = \frac{18 + 24 + 30}{2} = 36$$

$$\begin{aligned}\text{Area} &= \sqrt{s(s-a)(s-b)(s-c)} \\ &= \sqrt{36(36-18)(36-24)(36-30)} \\ &= \sqrt{36 \times 18 \times 12 \times 6} \\ &= \sqrt{6 \times 6 \times 6 \times 3 \times 3 \times 4 \times 6} \\ &= 6 \times 6 \times 3 \times 2 \\ &= 216 \text{ cm}^2\end{aligned}$$

Smallest side = 18 cm

Let h be the height corresponding to the smallest side.

$$\text{Area of the triangle} = \frac{1}{2} \times b \times h$$

$$\Rightarrow \frac{1}{2} \times b \times h = 216$$

$$\Rightarrow 18 \times h = 216 \times 2$$

$$\Rightarrow h = \frac{216 \times 2}{18} = 24 \text{ cm}$$

Question 5:

Here, $a = 91$ m, $b = 98$ m and $c = 105$ m

$$\text{Therefore, } s = \frac{91+98+105}{2} = \frac{294}{2} = 147$$

$$\begin{aligned}\text{Area} &= \sqrt{s(s-a)(s-b)(s-c)} \\ &= \sqrt{147(147-91)(147-98)(147-105)} \\ &= \sqrt{147 \times 56 \times 49 \times 42} \\ &= \sqrt{49 \times 3 \times 7 \times 2 \times 2 \times 2 \times 49 \times 7 \times 3 \times 2} \\ &= 49 \times 3 \times 2 \times 2 \times 7 \\ &= 4116 \text{ m}^2\end{aligned}$$

Longest side = 105m $\Rightarrow b=105$

Let h be the height corresponding to the longest side.

$$\text{Area of the triangle} = \frac{1}{2} \times b \times h$$

$$\Rightarrow \frac{1}{2} \times b \times h = 4116$$

$$\Rightarrow 105 \times h = 2 \times 4116$$

$$\Rightarrow h = \frac{2 \times 4116}{105} = 78.4 \text{ m}$$

Question 6:

Let the sides of the triangle be $5x$, $12x$ and $13x$.

Its perimeter = $(5x + 12x + 13x) = 30x$

$\therefore 30x = 150$ m [given]

$$\Rightarrow x = \frac{150}{30} = 5 \text{ m}$$

Thus, sides of the triangle are;

$$5x = 5 \times 5 = 25 \text{ m}$$

$$12x = 12 \times 5 = 60 \text{ m}$$

$$13x = 13 \times 5 = 65 \text{ m}$$

Let $a = 25$ m, $b = 60$ m and $c = 65$ m.

$$\begin{aligned}\text{Now } s &= \frac{1}{2}(a+b+c) \\ &= \left(\frac{25+60+65}{2} \right) \text{ m} = \frac{150}{2} = 75 \text{ m.}\end{aligned}$$

$$\begin{aligned}\therefore \text{ area of the triangle} &= \sqrt{s(s-a)(s-b)(s-c)} \\ &= \sqrt{75(75-25)(75-60)(75-65)} \\ &= \sqrt{75 \times 50 \times 15 \times 10} \\ &= \sqrt{25 \times 3 \times 25 \times 2 \times 5 \times 3 \times 5 \times 2} \\ &= \sqrt{25 \times 25 \times 5 \times 5 \times 3 \times 3 \times 2 \times 2} \\ &= 25 \times 5 \times 3 \times 2 = 750 \text{ sq m.}\end{aligned}$$

\therefore area of the triangle = 750 sq m.

Question 7:

Let the sides of the triangle be $25x$, $17x$ and $12x$.

Then, its perimeter $= (25x + 17x + 12x) = 54x$

$$\Rightarrow 54x = 540$$

$$\Rightarrow x = \frac{540}{54} = 10\text{m.}$$

Thus, sides of the triangle are :

$$25x = 25 \times 10 = 250 \text{ m}$$

$$17x = 17 \times 10 = 170 \text{ m}$$

$$12x = 12 \times 10 = 120 \text{ m}$$

Let, $a = 250 \text{ m}$, $b = 170 \text{ m}$ and $c = 120 \text{ m}$

$$\begin{aligned}\text{Now, } s &= \frac{1}{2}(a + b + c) \\ &= \left(\frac{250 + 170 + 120}{2} \right) \text{m} \\ &= \left(\frac{540}{2} \right) \text{m} = 270 \text{ m}\end{aligned}$$

$$\begin{aligned}\therefore \text{ area of the triangle} &= \sqrt{s(s-a)(s-b)(s-c)} \\ &= \sqrt{270(270-250)(270-170)(270-120)} \\ &= \sqrt{3 \times 3 \times 3 \times 10 \times 10 \times 2 \times 10 \times 10 \times 5 \times 3} \\ &= 3 \times 3 \times 10 \times 10 \times 10 = 9000 \text{ m}^2\end{aligned}$$

$$\begin{aligned}\therefore \text{ Cost of ploughing the field at the rate of Rs. 18.80 per } 10 \text{ m}^2 \\ &= \frac{18.80}{10} \times 9000 = \text{Rs. } 16920\end{aligned}$$

\therefore Cost of ploughing the field = Rs. 16920.

Question 8:

One side of a triangular field = 85 m

Second side of a triangular field = 154 m

Let the third side of a triangular field be $x \text{ m}$

Perimeter (given) = 324 m

$$\therefore 85 \text{ m} + 154 \text{ m} + x \text{ m} = 324 \text{ m}$$

$$\Rightarrow x = 324 - 239$$

$$\Rightarrow x = 85 \text{ m}$$

\therefore the third side = 85 m

Let $a = 85 \text{ m}$, $b = 154 \text{ m}$ and $c = 85 \text{ m}$

$$\begin{aligned}\text{Now } S &= \frac{1}{2}(a + b + c) \\ &= \left(\frac{85 + 154 + 85}{2} \right) = \frac{324}{2} = 162\end{aligned}$$

$$\begin{aligned}\therefore \text{ area of the triangle} &= \sqrt{S(S-a)(S-b)(S-c)} \\ &= \sqrt{162(162-85)(162-154)(162-85)} \\ &= \sqrt{162 \times 77 \times 8 \times 77} \\ &= \sqrt{2 \times 9 \times 9 \times 7 \times 11 \times 2 \times 2 \times 2 \times 7 \times 11} \\ &= \sqrt{11 \times 11 \times 9 \times 9 \times 7 \times 7 \times 2 \times 2 \times 2 \times 2} \\ &= 11 \times 9 \times 7 \times 2 \times 2 = 2772 \text{ m}^2\end{aligned}$$

$$\therefore \text{ area of triangle} = 2772 \text{ m}^2$$

Also, area of triangle $= \frac{1}{2} \times \text{base} \times \text{height}$

$$2772 = \frac{1}{2} \times 154 \times h = 77h$$

$$\therefore 77h = 2772$$

$$\therefore h = \frac{2772}{77} = 36 \text{ m}$$

\therefore the length of the perpendicular from the opposite vertex on the side measuring 154 m = 36 m.

Question 9:

Let $a = 13$ cm, $b = 13$ cm and $c = 20$ cm

$$\begin{aligned}\text{Now, } s &= \frac{1}{2}(a + b + c) \\ &= \left(\frac{13 + 13 + 20}{2}\right) \text{ cm} = \frac{46}{2} = 23 \text{ cm}\end{aligned}$$

$$\begin{aligned}\therefore \text{ area of the triangle} &= \sqrt{s(s-a)(s-b)(s-c)} \\ &= \sqrt{23(23-13)(23-13)(23-20)} \\ &= \sqrt{23 \times 10 \times 10 \times 3} \\ &= 10\sqrt{69} \\ &= 10 \times 8.306 = 83.06 \text{ cm}^2\end{aligned}$$

$$\therefore \text{ area of an isosceles triangle} = 83.06 \text{ cm}^2$$

Question 10:

Let $\triangle ABC$ be an isosceles triangle and Let $AL \perp BC$.

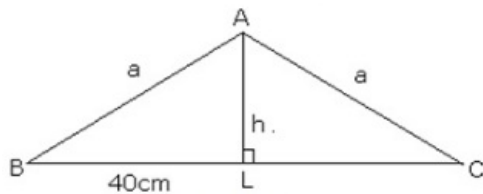
Given that $BC = 80$ cm and Area of $\triangle ABC = 360 \text{ cm}^2$

$$\therefore \frac{1}{2} \times BC \times AL = 360 \text{ cm}^2$$

$$\Rightarrow \frac{1}{2} \times 80 \times h = 360 \text{ cm}^2$$

$$\Rightarrow 40 \times h = 360 \text{ cm}^2$$

$$\Rightarrow h = \frac{360}{40} = 9 \text{ cm}$$



$$\begin{aligned}\text{Now } BL &= \frac{1}{2}(BC) \\ &= \left(\frac{1}{2} \times 80\right) \text{ cm} = 40 \text{ cm and } AL = 9 \text{ cm}\end{aligned}$$

$$\begin{aligned}a &= \sqrt{BL^2 + AL^2} \\ &= \sqrt{(40)^2 + (9)^2} \Rightarrow \sqrt{1600 + 81} \\ &\Rightarrow \sqrt{1681} = 41 \text{ cm}\end{aligned}$$

$$\therefore \text{ Perimeter} = (41 + 41 + 80) = 162 \text{ cm}$$

Perimeter of the triangle = 162 cm.

Question 11:

In an isosceles triangle, the lateral sides are of equal length.
Let the length of lateral side be x cm.

Then, base = $\frac{3}{2} \times x$ cm [given]

(i) Length of each side of the triangle :

Perimeter of an isosceles triangle = 42 cm

$$\Rightarrow x + x + \frac{3}{2}x = 42 \text{ cm}$$

$$\Rightarrow 2x + 2x + 3x = 84 \text{ cm}$$

$$\Rightarrow 7x = 84$$

$$\Rightarrow x = \frac{84}{7} = 12 \text{ cm}$$

\therefore length of lateral side = 12 cm

$$\text{And base} = \frac{3}{2}x = \frac{3}{2} \times 12 = 18 \text{ cm}$$

\therefore the length of each side of the triangle = 12 cm, 12 cm and 18 cm.

(ii) Area of the triangle :

Let $a = 12$ cm, $b = 12$ cm and $c = 18$ cm.

$$\begin{aligned} \text{Now, } s &= \frac{1}{2}(a+b+c) \\ &= \left(\frac{12+12+18}{2} \right) \text{ cm} = \left(\frac{42}{2} \right) \text{ cm} \\ &= 21 \text{ cm} \end{aligned}$$

$$\begin{aligned} \therefore \text{ area of the triangle} &= \sqrt{s(s-a)(s-b)(s-c)} \\ &= \sqrt{21(21-12)(21-12)(21-18)} \\ &= \sqrt{21 \times 9 \times 9 \times 3} \\ &= \sqrt{3 \times 7 \times 9 \times 9 \times 3} \\ &= 27\sqrt{7} = 71.42 \text{ cm}^2 \quad (\sqrt{7} = 2.64) \end{aligned}$$

\therefore area of the triangle = 71.42 cm².

(iii) Height of the triangle :

$$\text{Area of a triangle} = \frac{1}{2} \times \text{base} \times \text{height}$$

$$71.42 \text{ cm}^2 = \frac{1}{2} \times 18 \times h$$

$$\Rightarrow 71.42 \text{ cm}^2 = 9 \times h$$

$$\Rightarrow h = \frac{71.42}{9} = 7.94 \text{ cm}$$

\therefore the height of the triangle = 7.94 cm.

Question 12:

Let a be the length of a side of an equilateral triangle.

$$\therefore \text{ Area of an equilateral triangle} = \frac{\sqrt{3} \times a^2}{4} \text{ sq units}$$

$$\text{Area of the equilateral triangle} = 36\sqrt{3} \text{ cm}^2 \quad [\text{given}]$$

$$\Rightarrow \frac{\sqrt{3} \times a^2}{4} = 36 \times \sqrt{3}$$

$$\Rightarrow a^2 = \frac{36 \times \sqrt{3} \times 4}{\sqrt{3}}$$

$$\Rightarrow a^2 = 36 \times 4 = 144$$

$$\therefore a = \sqrt{144} = 12 \text{ cm}$$

Perimeter of an equilateral triangle = $3 \times a$

Since, $a = 12$ cm,

$$\text{Perimeter} = (3 \times 12) \text{ cm} = 36 \text{ cm}$$

Question 13:

Let a be the length of the side of an equilateral triangle

$$\therefore \text{Area of an equilateral triangle} = \frac{\sqrt{3}}{4} a^2 \text{ sq units}$$

$$\text{Area of the equilateral triangle} = 81\sqrt{3} \text{ cm}^2 \quad [\text{given}]$$

$$\Rightarrow 81\sqrt{3} \text{ cm}^2 = \frac{\sqrt{3}}{4} a^2$$

$$\Rightarrow a^2 = \frac{81\sqrt{3} \times 4}{\sqrt{3}} = 324$$

$$\Rightarrow a = \sqrt{324} = 18 \text{ cm}$$

$$\text{Height of an equilateral triangle} = \frac{\sqrt{3}}{2} a$$

Since $a = 18 \text{ cm}$,

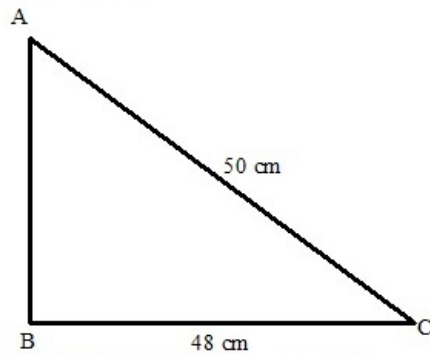
$$\text{Height of the equilateral triangle} = \frac{\sqrt{3}}{2} \times 18 = 9\sqrt{3} \text{ cm.}$$

Question 14:

Base of the right triangle is $BC = 48 \text{ cm}$

Hypotenuse of the right triangle is $AC = 50 \text{ cm}$

Let $AB = x \text{ cm}$



By Pythagoras Theorem, we have,

$$AC^2 = AB^2 + BC^2$$

That is we have

$$50^2 = x^2 + 48^2$$

$$\Rightarrow x^2 = 50^2 - 48^2$$

$$\Rightarrow x^2 = 2500 - 2304 = 196$$

$$\Rightarrow x = \sqrt{196} = 14 \text{ cm}$$

$$\therefore \text{Area of the right angle triangle} = \frac{1}{2} \times \text{base} \times \text{height}$$

$$= \frac{1}{2} \times 48 \times 14$$

$$= (24 \times 14) \text{ cm}^2 = 336 \text{ cm}^2$$

$$\therefore \text{Area of the triangle} = 336 \text{ cm}^2$$

Question 15:

$$(i) \text{Area of an equilateral triangle} = \frac{\sqrt{3}}{4} a^2$$

Where a is the side of the equilateral triangle

$$\begin{aligned}
 \therefore \text{area} &= \frac{\sqrt{3}}{4} \times 8^2 \\
 &= \frac{\sqrt{3}}{4} \times 64 \Rightarrow \sqrt{3} \times 16 \\
 &= 1.732 \times 16 \\
 &= 27.712 = 27.71 \text{ cm}^2, \begin{bmatrix} \text{correct upto 2} \\ \text{decimal places} \end{bmatrix}
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii) Height of an equilateral triangle} &= \frac{\sqrt{3}}{2} a \\
 &= \frac{\sqrt{3}}{2} \times 8 \\
 &= \sqrt{3} \times 4 \\
 &= 1.732 \times 4 = 6.928 \\
 &= 6.93 \text{ cm} \quad \begin{bmatrix} \text{Correct upto 2} \\ \text{decimal places} \end{bmatrix}
 \end{aligned}$$

Question 16:

Let a be the side of an equilateral triangle.

$$\therefore \text{Height of an equilateral triangle} = \frac{\sqrt{3}}{2} a \text{ units}$$

$$\text{Height of an equilateral triangle} = 9 \text{ cm} \quad [\text{given}]$$

$$\Rightarrow \frac{\sqrt{3}}{2} a = 9$$

$$\Rightarrow a = \frac{9 \times 2}{\sqrt{3}}$$

$$\Rightarrow = \frac{9 \times 2 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}} \quad [\text{Rationalizing the denominator}]$$

$$\Rightarrow = \frac{9 \times 2\sqrt{3}}{\sqrt{3} \times \sqrt{3}}$$

$$\Rightarrow a = 6\sqrt{3}$$

$$\Rightarrow \text{base} = 6\sqrt{3}$$

$$\begin{aligned}
 \text{Area of the equilateral triangle} &= \frac{1}{2} \times \text{base} \times \text{height} \\
 &= \frac{1}{2} \times 6\sqrt{3} \times 9 \quad [\because \text{base} = 6\sqrt{3} \text{ and height} = 9 \text{ cm}] \\
 &= 27\sqrt{3}
 \end{aligned}$$

$$\begin{aligned}
 \text{Area of the equilateral triangle} &= 27 \times 1.732 = 46.764 \\
 &= 46.76 \text{ cm}^2 \\
 &[\text{Correct to 2 places of decimal}]
 \end{aligned}$$

Question 17:

Let a=50cm, b=20cm and c=50cm.

Let us find s:

$$\begin{aligned}
 s &= \frac{1}{2} (a + b + c) \\
 &= \left(\frac{50 + 20 + 50}{2} \right) \text{ cm} = \left(\frac{120}{2} \right) \text{ cm} \\
 &= 60 \text{ cm}
 \end{aligned}$$

Now, area of one triangular piece of cloth

$$\begin{aligned}
 &= \sqrt{s(s-a)(s-b)(s-c)} \\
 &= \sqrt{60(60-50)(60-20)(60-50)} \\
 &= \sqrt{60 \times 10 \times 40 \times 10} \\
 &= \sqrt{6 \times 10 \times 10 \times 4 \times 10 \times 10} \\
 &= \sqrt{10 \times 10 \times 10 \times 10 \times 2 \times 2 \times 2 \times 3} \\
 &= 10 \times 10 \times 2\sqrt{6} \\
 &= 200\sqrt{6} = 200 \times 2.45 = 490 \text{ cm}^2
 \end{aligned}$$

$$\therefore \text{area of one piece of cloth} = 490 \text{ cm}^2$$

$$\text{Now area of 12 pieces} = (12 \times 490) \text{ cm}^2 = 5880 \text{ cm}^2$$

Question 18:

Let, $a = 16$ cm, $b = 12$ and $c = 20$ cm

Let us now find s :

$$\begin{aligned}s &= \frac{1}{2}(a + b + c) \\&= \left(\frac{16 + 12 + 20}{2}\right) \text{ cm} = \left(\frac{48}{2}\right) \text{ cm} \\&= 24 \text{ cm}\end{aligned}$$

$$\begin{aligned}\text{Area of one triangular tile} &= \sqrt{s(s-a)(s-b)(s-c)} \\&= \sqrt{24(24-16)(24-12)(24-20)} \\&= \sqrt{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3} \\&= 2 \times 2 \times 2 \times 2 \times 3 \\&= 96 \text{ cm}^2\end{aligned}$$

$$\therefore \text{Area of one tile} = 96 \text{ cm}^2$$

$$\Rightarrow \text{Area of 16 tiles} = 96 \times 16 = 1536 \text{ cm}^2$$

Cost of polishing the tiles per sq.cm = Re.1

$$\begin{aligned}\text{Thus, the total cost of polishing all the tiles} &= \text{Rs. } (1 \times 1536) \\&= \text{Rs. } 1536.\end{aligned}$$

Question 19:

Consider the right triangle ABC.

By Pythagoras Theorem, we have,

$$\begin{aligned}BC &= \sqrt{AB^2 - AC^2} \\&= \sqrt{17^2 - 15^2} \\&= \sqrt{289 - 225} \\&= \sqrt{64} \\&= 8 \text{ cm}\end{aligned}$$

$$\text{Perimeter of quad. ABCD} = 17 + 9 + 12 + 8 = 46 \text{ cm}$$

$$\begin{aligned}\text{Area of triangle } \triangle ABC &= \frac{1}{2} \times \text{base} \times \text{height} \\&= \frac{1}{2} \times BC \times AC \\&= \frac{1}{2} \times 8 \times 15 \\&= 60 \text{ cm}^2\end{aligned}$$

For area of triangle ACD,

Let $a = 15$ cm, $b = 12$ cm and $c = 9$ cm

$$\text{Therefore, } s = \frac{a+b+c}{2} = \frac{15+12+9}{2} = 18 \text{ cm}$$

$$\begin{aligned}\text{Area of } \triangle ACD &= \sqrt{s(s-a)(s-b)(s-c)} \\&= \sqrt{18(18-15)(18-12)(18-9)} \\&= \sqrt{18 \times 3 \times 6 \times 9} \\&= \sqrt{18 \times 18 \times 3 \times 3} \\&= 18 \times 3 = 54 \text{ cm}^2\end{aligned}$$

$$\begin{aligned}\text{Thus the area of quad. ABCD} &= \text{Area of } \triangle ABC + \text{Area of } \triangle ACD \\&= 60 + 54 = 114 \text{ cm}^2.\end{aligned}$$

Question 20:

Perimeter of quad. ABCD = $34 + 29 + 21 + 42 = 126$ cm

Area of triangle BCD = $\frac{1}{2} \times 20 \times 21 = 210$ cm²

For area of triangle ABD,

Let $a = 42$ cm, $b = 20$ cm and $c = 34$ cm

Therefore, $s = \frac{42 + 20 + 34}{2} = \frac{96}{2} = 48$ cm

$$\begin{aligned}\text{Area of ABD} &= \sqrt{s(s-a)(s-b)(s-c)} \\ &= \sqrt{48(48-42)(48-20)(48-34)} \\ &= \sqrt{48 \times 6 \times 28 \times 14} \\ &= \sqrt{16 \times 3 \times 3 \times 2 \times 2 \times 14 \times 14} \\ &= 4 \times 3 \times 2 \times 14 = 336 \text{ cm}^2\end{aligned}$$

Area of quad. ABCD = Area \triangle ABD + Area \triangle BCD

Thus the area of quad. ABCD = $336 + 210 = 546$ cm².

Question 21:

Consider the right triangle ABD.

By Pythagoras Theorem, we have

$$\begin{aligned}AB &= \sqrt{BD^2 - AD^2} \\ \therefore AB &= \sqrt{26^2 - 24^2} \\ &= \sqrt{676 - 576} \\ &= \sqrt{100}\end{aligned}$$

$$AB = 10 \text{ cm}$$

$$\Rightarrow \text{base} = 10 \text{ cm}$$

$$\text{Area of the triangle ABD} = \frac{1}{2} \times \text{base} \times \text{height}$$

$$\Rightarrow \text{Area of } \triangle \text{ABD} = \frac{1}{2} \times 10 \times 24 \quad [\because \text{base} = 10 \text{ cm, height} = 24 \text{ cm}]$$

$$\Rightarrow \text{Area of } \triangle \text{ABD} = 120 \text{ cm}^2$$

$$\text{Area of equilateral triangle BCD} = \frac{\sqrt{3}}{4} a^2$$

$$\Rightarrow = \frac{1.73}{4} (26)^2 \quad [a = 26 \text{ cm, } \sqrt{3} = 1.73]$$

$$\Rightarrow = 292.37 \text{ cm}^2$$

Area of quad. ABCD = Area of \triangle ABD + Area of \triangle BCD

$$= 120 + 292.37$$

$$= 412.37 \text{ cm}^2.$$

Question 22:

Consider the triangle ABC,

Let $a = 26$ cm, $b = 30$ cm and $c = 28$ cm

$$s = \frac{26 + 30 + 28}{2} = \frac{84}{2} = 42 \text{ cm}$$

$$\begin{aligned} \text{Area of ABC} &= \sqrt{s(s-a)(s-b)(s-c)} \\ &= \sqrt{42(42-26)(42-30)(42-28)} \\ &= \sqrt{42 \times 16 \times 12 \times 14} \\ &= \sqrt{14 \times 3 \times 16 \times 4 \times 3 \times 14} \\ &= \sqrt{14 \times 14 \times 3 \times 3 \times 16 \times 4} \\ &= 14 \times 3 \times 4 \times 2 \\ &= 336 \text{ cm}^2 \end{aligned}$$

In a parallelogram, diagonal divides the parallelogram in two equal area therefore

$$\begin{aligned} \therefore \text{Area of quad. ABCD} &= \text{Area of } \triangle ABC + \text{Area of } \triangle ACD \\ &= \text{Area of } \triangle ABC \times 2 \\ &= 336 \times 2 \\ &= 672 \text{ cm}^2. \end{aligned}$$

Question 23:

Consider the triangle ABC,

Let $a = 10$ cm, $b = 16$ cm and $c = 14$ cm

$$s = \frac{10 + 16 + 14}{2} = \frac{40}{2} = 20$$

$$\begin{aligned} \text{Area of ABC} &= \sqrt{s(s-a)(s-b)(s-c)} \\ &= \sqrt{20(20-10)(20-16)(20-14)} \\ &= \sqrt{20 \times 10 \times 4 \times 6} \\ &= \sqrt{10 \times 2 \times 10 \times 4 \times 3 \times 2} \\ &= \sqrt{10 \times 10 \times 4 \times 2 \times 2 \times 3} \\ &= 10 \times 2 \times 2 \times \sqrt{3} \\ &= 40\sqrt{3} \text{ cm}^2 \end{aligned}$$

In a parallelogram, diagonal divides the parallelogram in two equal area therefore

$$\begin{aligned} \therefore \text{Area of quad. ABCD} &= \text{Area of } \triangle ABC + \text{Area of } \triangle ACD \\ &= \text{Area of } \triangle ABC \times 2 \\ &= 40\sqrt{3} \times 2 \\ &= 80\sqrt{3} \text{ cm}^2 \\ &= 138.4 \text{ cm}^2 \quad [\because \sqrt{3} = 1.73] \end{aligned}$$

Question 24:

$$\begin{aligned} \text{Area of triangle ABD} &= \frac{1}{2} \times \text{base} \times \text{height} \\ &= \frac{1}{2} \times BD \times AL \\ &= \frac{1}{2} \times 64 \times 16.8 \\ &= 537.6 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Area of triangle BCD} &= \frac{1}{2} \times \text{base} \times \text{height} \\ &= \frac{1}{2} \times BD \times CM \\ &= \frac{1}{2} \times 64 \times 13.2 \\ &= 422.4 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Area of quad. ABCD} &= \text{Area of } \triangle ABD + \text{Area of } \triangle BCD \\ &= 537.6 + 422.4 = 960 \text{ cm}^2. \end{aligned}$$