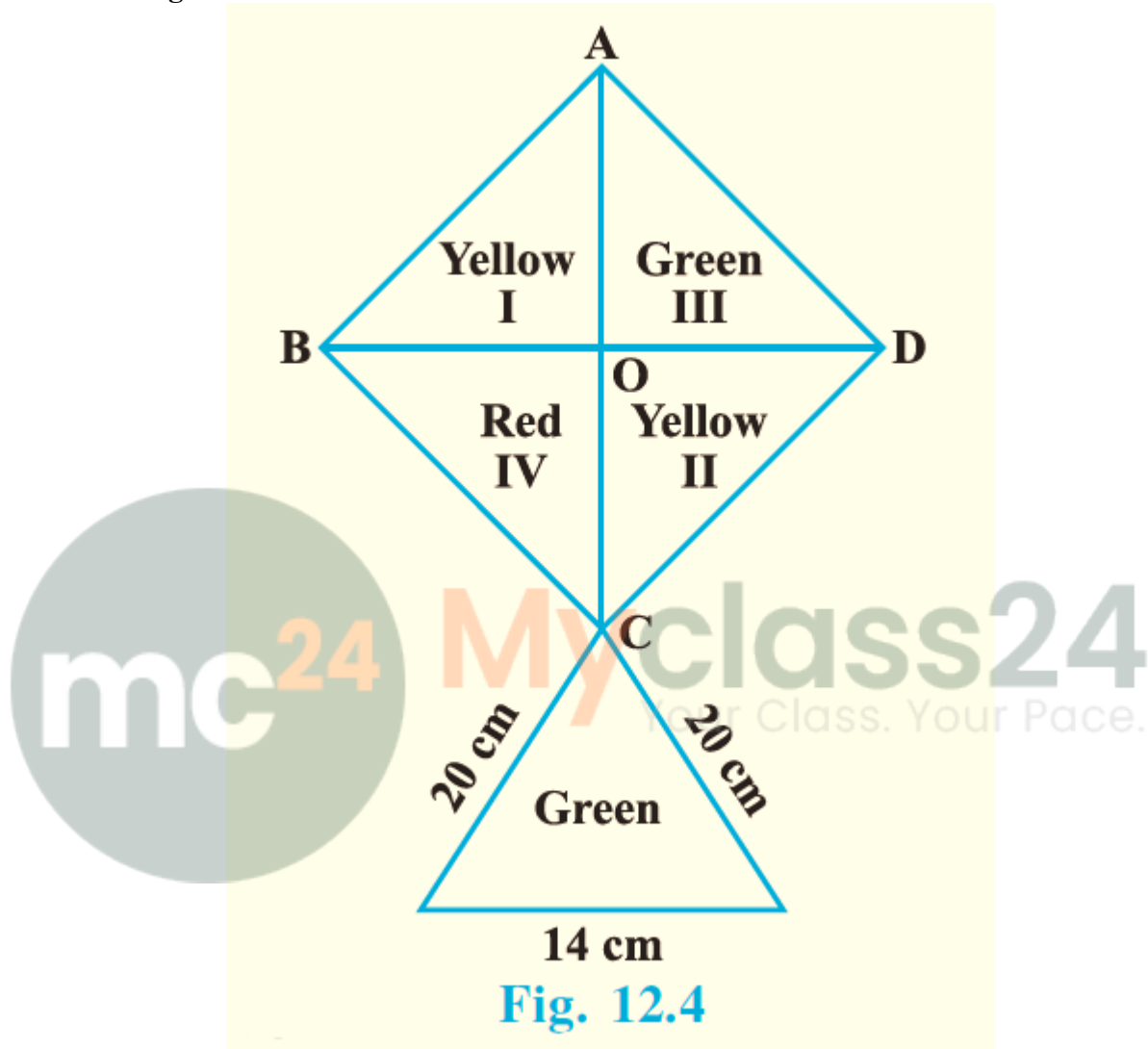


EXERCISE 12.4

How much paper of each shade is needed to make a kite given in Fig. 12.4, in which ABCD is a square with diagonal 44 cm.



Solution:

According to the figure,

$$AC = BD = 44\text{cm}$$

$$AO = 44/2 = 22\text{cm}$$

$$BO = 44/2 = 22\text{cm}$$

From $\triangle AOB$,

$$AB^2 = AO^2 + BO^2$$

$$\Rightarrow AB^2 = 22^2 + 22^2$$

$$\Rightarrow AB^2 = 2 \times 22^2$$

$$\Rightarrow AB = 22\sqrt{2} \text{ cm}$$

$$\text{Area of square} = (\text{Side})^2$$

$$= (22\sqrt{2})^2$$

$$= 968 \text{ cm}^2$$

$$\begin{aligned} \text{Area of each triangle (I, II, III, IV)} &= \text{Area of square} / 4 \\ &= 968 / 4 \\ &= 242 \text{ cm}^2 \end{aligned}$$

To find area of lower triangle,

$$\text{Let } a = 28, b = 28, c = 14$$

$$s = (a + b + c) / 2$$

$$\Rightarrow s = (28 + 28 + 14) / 2 = 70 / 2 = 35.$$

$$\begin{aligned} \text{Area of the triangle} &= \sqrt{s(s-a)(s-b)(s-c)} \\ &= \sqrt{35(35-28)(35-28)(35-14)} \\ &= \sqrt{35 \times 7 \times 7 \times 21} \\ &= 49\sqrt{15} = 189.77 \text{ cm}^2 \end{aligned}$$

Therefore,

We get,

$$\begin{aligned} \text{Area of Red} &= \text{Area of IV} \\ &= 242 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Area of Yellow} &= \text{Area of I} + \text{Area of II} \\ &= 242 + 242 \\ &= 484 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Area of Green} &= \text{Area of III} + \text{Area of lower triangle} \\ &= 242 + 189.77 \\ &= 431.77 \text{ cm}^2 \end{aligned}$$

1. The perimeter of a triangle is 50 cm. One side of a triangle is 4 cm longer than the smaller side and the third side is 6 cm less than twice the smaller side. Find the area of the triangle.

Solution:

Let the smaller side be = x cm

Then, larger side = (x + 4) cm

And, third side = (2x-6) cm

Given that,

Perimeter = 50 cm

$$\Rightarrow x + (x + 4) + (2x-6) = 50$$

$$\Rightarrow 4x - 2 = 50$$

$$\Rightarrow 4x = 52$$

$$\Rightarrow x = 13$$

Therefore, smaller side = 13cm

Larger side = x + 4 = 13 + 4 = 17cm

Third side = 2x-6 = 2×13 - 6 = 26-6 = 20cm

To find area of triangle,

Let a = 13, b = 17, c = 20

$$s = (a + b + c) / 2$$

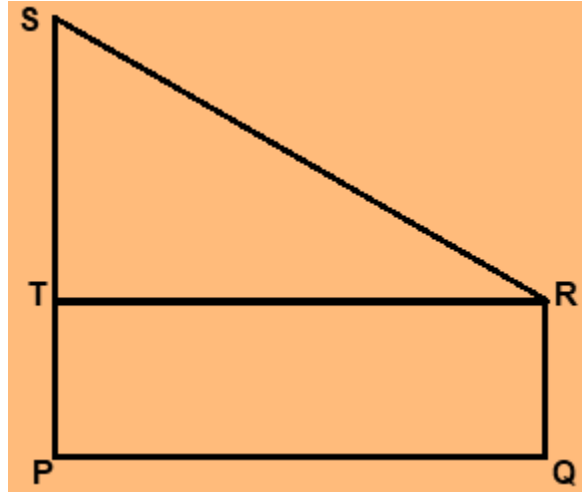
$$\Rightarrow s = (13 + 17 + 20) / 2 = 50 / 2 = 25.$$

$$\begin{aligned} \text{Area of triangle} &= \sqrt{s(s-a)(s-b)(s-c)} \\ &= \sqrt{25(25-13)(25-17)(25-20)} \\ &= \sqrt{25 \times 12 \times 8 \times 5} \end{aligned}$$

$$= 20\sqrt{30} \text{ cm}^2$$

2. The area of a trapezium is 475 cm^2 and the height is 19 cm . Find the lengths of its two parallel sides if one side is 4 cm greater than the other.

Solution:



Let the given trapezium be PQRS, given in the figure.

According to the question,

$$PQ = 19 \text{ cm}$$

$$\text{Let } RQ = x \text{ cm}$$

Then,

$$PS = (x + 4) \text{ cm}$$

Construction:

Draw a perpendicular from R on PS which will also be parallel to PQ.

Now,

We get,

PQRT is a rectangle,

$$\text{Area of rectangle PQRT} = PQ \times QR$$

$$\Rightarrow \text{Area(PQRT)} = 19 \times x = 19x$$

Now,

$$PS = PT + TS$$

$$\text{Since } PT = QR = x \text{ cm}$$

$$(x + 4) = x + TS$$

$$\Rightarrow TS = 4 \text{ cm}$$

$$\text{Area of triangle RST} = \frac{1}{2} \times RT \times ST$$

$$\text{Since } RT = PQ = 19 \text{ cm}$$

$$\Rightarrow \text{Area}(\Delta RST) = \frac{1}{2} \times 19 \times 4$$

$$= 38 \text{ cm}^2$$

$$\text{Area(PQRS)} = \text{Area(PQRT)} + \text{Area}(\Delta RST)$$

$$\Rightarrow 475 = 19x + 38$$

$$\Rightarrow 19x = 475 - 38$$

$$\Rightarrow 19x = 437$$

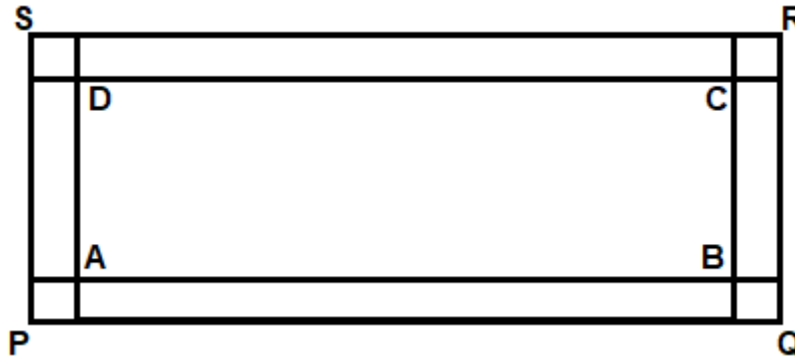
$$\Rightarrow x = 23 \text{ cm}$$

$$(x + 4) = 23 + 4 = 27 \text{ cm}$$

Therefore, lengths of parallel sides is 23cm and 27cm.

3. A rectangular plot is given for constructing a house, having a measurement of 40 m long and 15 m in the front. According to the laws, a minimum of 3 m, wide space should be left in the front and back each and 2 m wide space on each of other sides. Find the largest area where house can be constructed.

Solution:



Let the given rectangle be rectangle PQRS,

According to the question,

$PQ = 40\text{m}$ and $QR = 15\text{m}$

As 3m is left in both front and back,

$AB = PQ - 3 - 3$

$\Rightarrow AB = 40 - 6$

$\Rightarrow AB = 34\text{m}$

Also,

Given that 2m has to be left at both the sides,

$BC = QR - 2 - 2$

$\Rightarrow BC = 15 - 4$

$\Rightarrow BC = 11\text{m}$

Now, Area left for house construction is area of ABCD.

Hence,

$\text{Area(ABCD)} = AB \times CD$

$= 34 \times 11$

$= 374 \text{ m}^2$