Chapter-11
Perimeter and Area

C7X3Q3

11.1 You have already learnt that the perimeter of a plane surface is the measurement of length of its four sides and the region occupied by the closed figure is its area. Also you have already learnt how to find out the area and perimeter of a rectangle and square.

In this chapter we shall learn about the perimeter and area of parallelogram, triangle, quadrilateral, trapezium, rhombus and circle.

Let us recall :

figure	shape	perimeter	area
a, b	rectangle	$2\ (a+b)$	$a \times b$
a, a	square	$4a$	a^2

Let us try to find out the area of a rectanguler region. At first we shall draw a parallelogram and then try to convert it to a rectangle. As shown in the figure (11.1) draw a parallelogram and draw a perpendicular from the vertex of the parallelogram to the opposite side and make a cut out of the parallelogram. Cut the triangle from the left side of the parallelogram and paste it in the right side of the parallelogram. What is the new figure have you got? Is it not a rectangle?

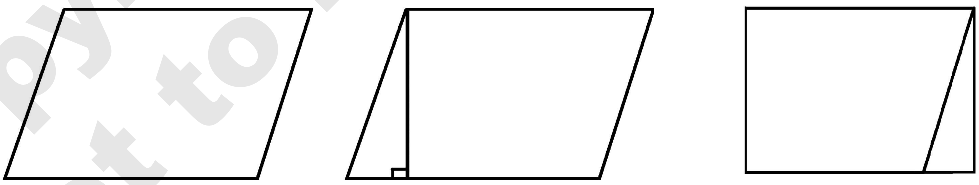


Figure - 11.1

Now you think about it. The parallelogram has been transformed into a rectangle. So the area of the parallelogram and the rectangle will be same. That means Area of the parallelogram = Area of the rectangle. In the new figure the length of the rectangle is equal to the base of the parallelogram and the breadth of the rectangle is equal to the height of the parallelogram.

(Remember that the perpendicular drawn from the vertex of the parallelogram to

the base is the height or altitude of the parallelogram.)
Now we have seen that

Area of Parallelogram = Area of Rectangle
$= \text{length} \times \text{breadth}$
$= l \times b$

But the length l and Breadth b of the rectangle are same with base b and height h of the parallelogram respectively.

$\therefore$ Area of the Parallelogram = base $\times$ height
$= b \times h$

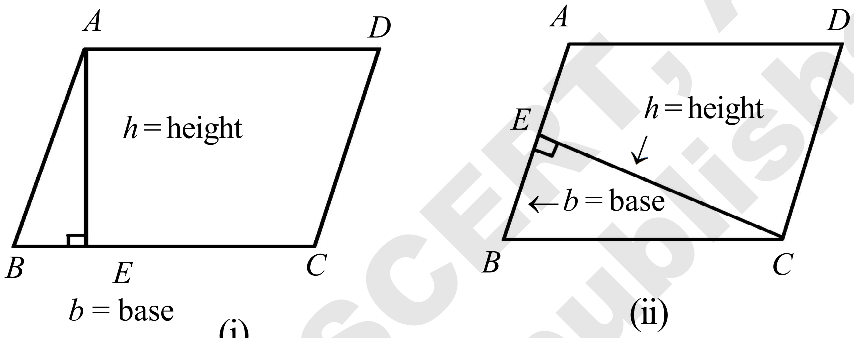


Figure - 11.2

BC = Base, AE = height in the first figure
AB = Base, CE = height in the second figure.

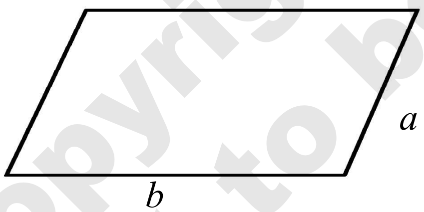


Figure -11.3

If the adjacent side of a parallelogram is a and b then the perimeter of the parallelogram = $2(a+b)$

Area of Parallelogram $= \text{base} \times \text{height}$

Base of Parallelogram $= \dfrac{\text{Area}}{\text{Height}}$

Height of Parallelogram $= \dfrac{\text{Area}}{\text{Base}}$

$\therefore$ Perimeter of Parallelogram = 2 $\times$ sum of the two adjacent side

Activity : Try to find out the area of the following Parallelogram

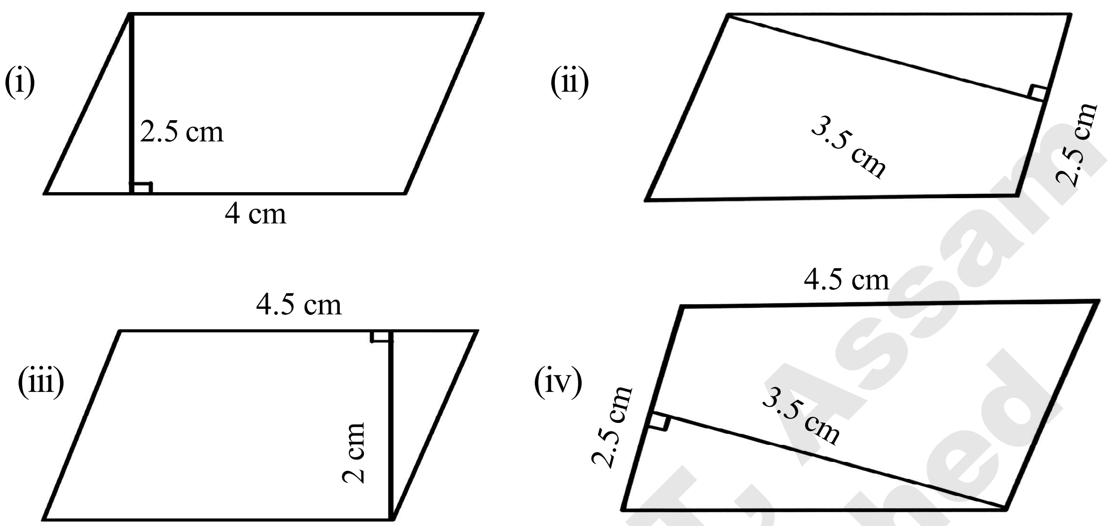


Figure - 11.4

Example 1 : The base and height of a Parallelogram is 5 cm and 3 cm respectively. Find the area of the Parallelogram.

Solution :

Suppose, the base and height of the parallelogram be b and h respectively

Base of the Parallelogram (b) = 5 cm

Height of the Parallelogram (h) = 3 cm

$\therefore$ Area of the Parallelogram $= b \times h$

$= (5 \times 3)$ sq.cm

$= 15$ sq.cm

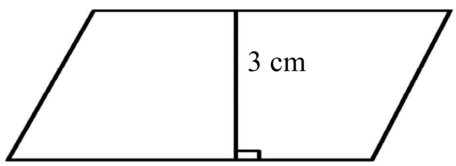


Figure -11.5

Example 2 : If the area of a Parallelogram 18 sq.cm and base is 6 cm, find its height.

Solution : Area = 18 sq.cm

Base = 6 cm

We know that

base × height = Area

$\therefore$ height $= \dfrac{\text{Area}}{\text{Base}}$

$\therefore$ height $= \dfrac{18}{6}$ cm

$= 3$ cm

11.2 Area of Triangle :

Let us adopt the following method to find the area of the triangle.

(i) Draw two congruent triangles on a paper and cut out the two triangle. Now arrange the two triangles as shown in figure 11.6 so that they form a parallelogram.

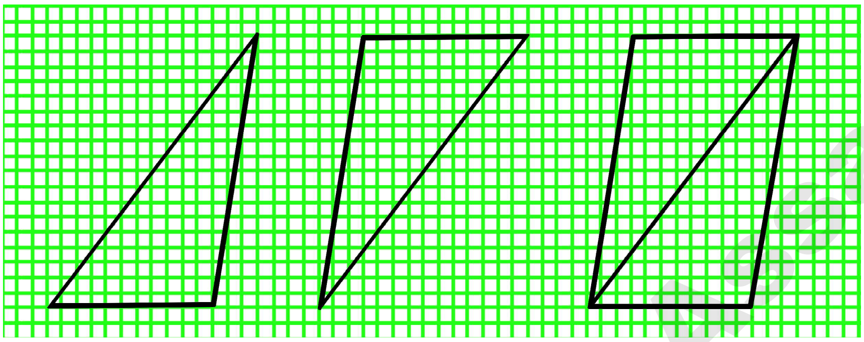


Figure - 11.6

(If we cut one triangle and place it on a piece of paper and cut another triangle, both will be congruent triangles)

When you observe the figure, you will see that the base and height of the triangle is same with base and height of the parallelogram. So, the sum of the area of the two triangle is the area of the parallelogram. So it is seen that– The area of each of the triangles is half of the area of the Parallelogram.

Hence, Area of each triangle $= \frac{1}{2} \times$ (area of parallelogram)

$= \frac{1}{2} \times$ (base × height)

$= \frac{1}{2} \times (b \times h)$

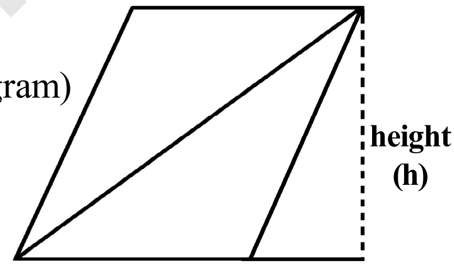


Figure - 11.7

Activity : Now with coloured paper prepare :

(i) Two congruent acute triangles.

(ii) Two congruent right angled triangles.

(iii) Two congruent isosceles triangles.

(iv) Two congruent equilateral triangles and verify the truth cited above.

Activity :

Draw rectangle, square, parallelogram on a chart paper and draw one diagonal in each figure. Cut out the figures carefully. Then cut each of them through diagonal so as to get two triangles. Examine whether the triangle obtained from each figure are congruent or not by placing them one upon the other. Write down the conclusion in your own words.

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

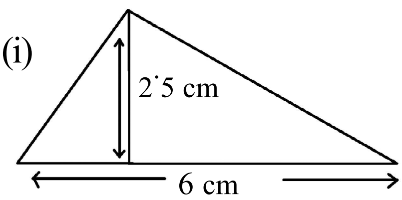
$$\text{Base} = \frac{2 \times \text{Area of triangle}}{\text{height}}$$

$$\text{Height} = \frac{2 \times \text{Area of triangle}}{\text{base}}$$

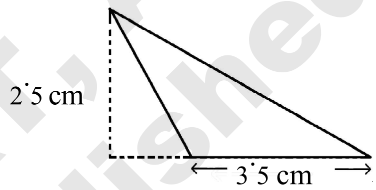
Perimeter of Triangle = sum of the three sides
If three sides are AB, BC, CA then
the perimeter = AB + BC + CA

Example 3 : Find the area of the triangles given below–

(i)



(ii)



Solution :

(i) Base of the triangle b = 6 cm
Height of the triangle h = 2˙5 cm

$$\text{Area of the Triangle} = \frac{1}{2}(\text{base} \times \text{height})$$

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

$$= \left(\frac{1}{2} \times 6 \times 2{\cdot}5\right) \text{ sq.cm}$$

$$= 7{\cdot}5 \text{ sq. cm}$$

(ii) Base = 3˙5 cm
Height = 2˙5 cm

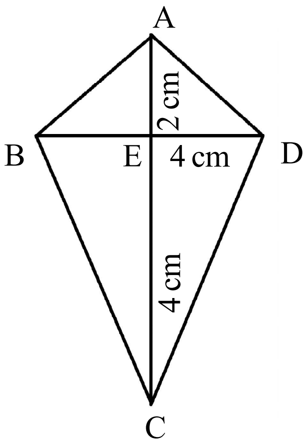
$$\text{Area of the Triangle} = \frac{1}{2}(\text{base} \times \text{height})$$

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

$$= \left(\frac{1}{2} \times 3{\cdot}5 \times 2{\cdot}5\right) \text{ sq.cm}$$

$$= 4{\cdot}38 \text{ sq. cm (approx)}$$

Activity 1 : Once during a holiday Rajat and Rahul made two kites. Rajat said "My kite is bigger than yours". Rahul immediately replied, "No, mine is bigger." Let us find out the area of the each kite to prove which one is bigger.



Rajat's kite

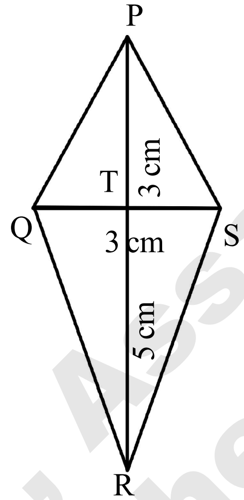


Figure -11.8 **Rahul's Kite**

To find the area of the kite Rajat has made two triangles ΔABD and ΔBCD in his kite connecting BD He has found out the area as follows–

Area of kite ABCD = area of ΔABD + area of ΔBCD

$= \frac{1}{2} \times BD \times AE + \frac{1}{2} \times BD \times CE$

$= \frac{1}{2} \times 4 \text{ cm} \times 2 \text{ cm} + \frac{1}{2} \times 4 \text{ cm} \times 4 \text{ cm}$

$= 4$ sq. cm + 8 sq. cm

$= 12$ sq. cm

> That you have already learnt in equilaternal and isosceles triangles the median is the height,

Similarly try to find out the area of the Rahul's kite. Decide whose kite is bigger?

Activity 2 :

In the river bank Arun's father purchased a plot of land. The shape of the land is like ABCD as shown in figure. Find the area of the plot.

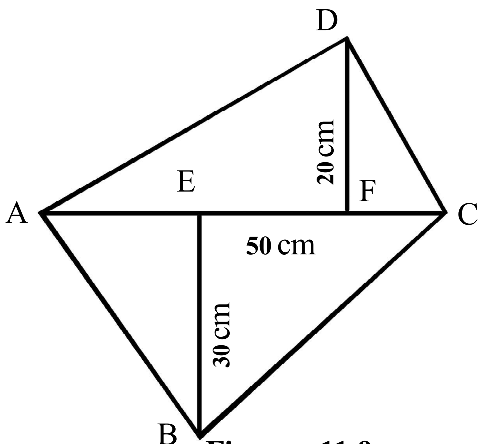


Figure - 11.9

Solution

1st Step : Join AC. What you have got ? Have you got two triangles ?

2nd Step : Draw altitudes BE and DF on base AC in ΔABC and ΔACD respectively.

Now Area of $\Delta ABC = \frac{1}{2} \times AC \times BE$

Similarly, Area of $\Delta ACD = \frac{1}{2} \times AC \times DF$

Now the area of the land whose shape is ABCD $= \text{area of } \Delta ABC + \text{area of } \Delta ACD$

$$= \frac{1}{2} \times AC \times BE + \frac{1}{2} \times AC \times DF$$

$$= \frac{1}{2} \times AC \times (BE + DF)$$

Thus to find out the area of a quadrilateral we shall consider any one of the diagonals (AC) as base on which the two perpendiculars BE (h_1) and DF (h_2) as height.

Area of quadrilateral $= \frac{1}{2} \times AC \times (BE + DF)$

$$= \frac{1}{2} \times AC \times (h_1 + h_2)$$

$$= \frac{1}{2} \times \text{diagonal} \times \text{sum of the perpendiculars}$$

Try to find out the area of the quadrilaterals given below–

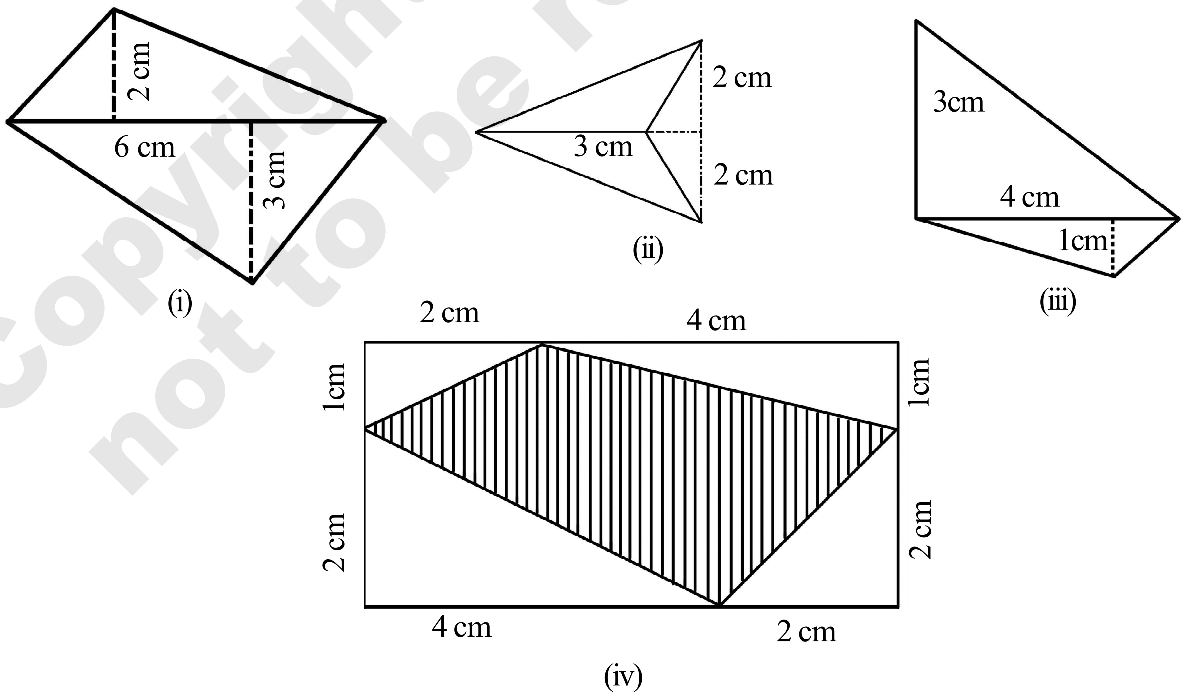
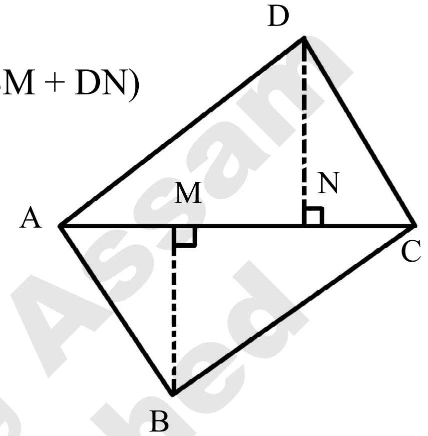


Figure - 11.10

find out area of the shaded part in figure (iv), if it is a rectangle.

Example 4 : In the quadrilateral ABCD the measure of diagonal AC = 4cm. BM and DN are perpendicular on AC respectively. BM = 3 cm, DN = 3 cm. Find out area of the quadrilateral ABCD.



Solution : Area of quadrilateral ABCD $= \frac{1}{2} \times AC \times (BM + DN)$

$= \frac{1}{2} \times 4 \times (3+3)$sq.cm

$= (2 \times 6)$sq.cm

$= 12$ sq.cm

11.3 Area of Trapezium :

You know that trapezium is such a quadrilateral in which two opposite sides are parallel.

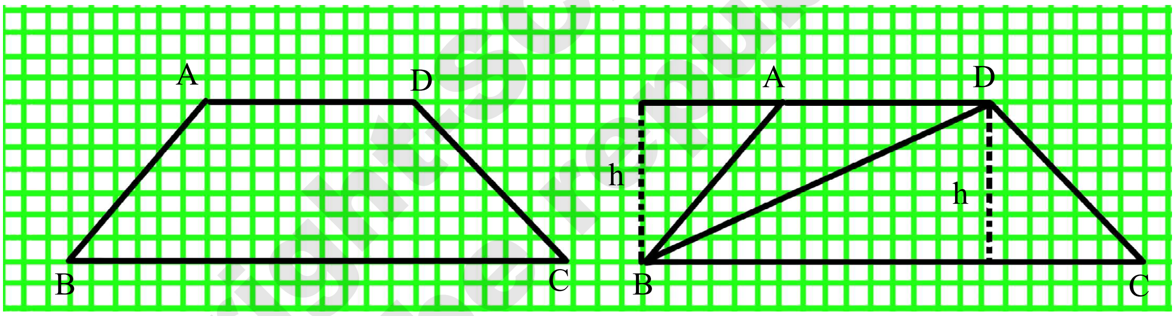


Figure - 11.11

In figure 11.11 ABCD is a Trapezium, in which A D||BC, in the distance between the parallel line AD and BC, BD is the diagonal of the trapezium. BD divides the trapezium into two triangles.

Look at that, Area of trapezium ABCD = Area of ΔABD + Area of ΔDBC

$= \frac{1}{2} \times AD \times h + \frac{1}{2} \times BC \times h$

$= \frac{1}{2} \times h \times (AD \times BC)$

$= \frac{1}{2} \times$ distance between two parallel lines

× sum of length of two parallel lines.

Activity :

In figure 11.12(i) a plot of land is shown the shape of a trapezium. Can you divide the land into three parts as shown in figure (ii) so that

(i) Area of the land $= \frac{1}{2} \times h \times (a + b)$

Draw the figure in chart paper and cut it out to find the area if necessary

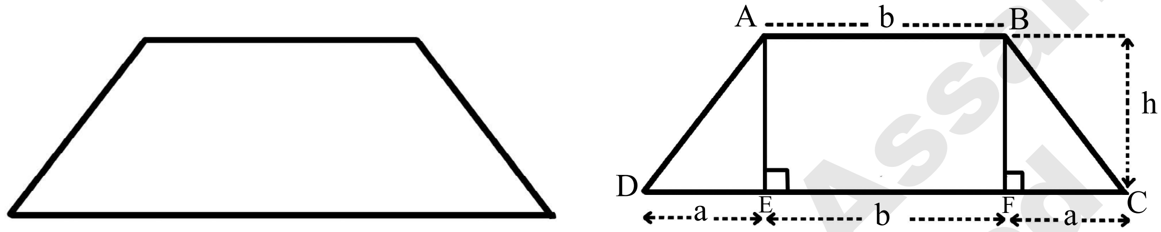


Figure - (i) **Figure - 11.12** **Figure - (ii)**

(ii) If $a = 5$m, $b = 8$ m and h = 6 m, then find out the area of the land. (Always write the unit while area is calculated)

Remember :

> To find the area of the trapezium measure of length of parallel lines and perpendicular distance between the parallel lines must be known.

11.4 Area of Rhombus :

You must have known that rhombus is a special parallelogram which has four equal sides.

In the adjacent figure ABCD is a rhombus in which

AB = BC = CD = DA.

∴ Like the formula of parallelogram

Area of Rhombus = Base × Height

$= b \times h$

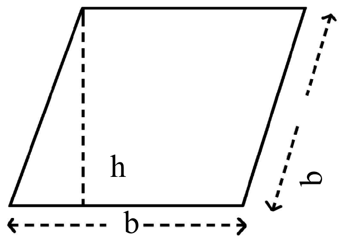


Figure - 11.13

Remember that the diagonal of a Rhombus bisects perpendicularly.

What you have done while calculating the area of a quadrilateral ? You have drawn perpendiculars to a diagonal from the opposite sides. Now, have you observed that the diagonal and both the sub-perpendicular meet at a point O, that means BD is the other diagonal. Hence both the diagonals of a rhombus bisect perpendicularly.

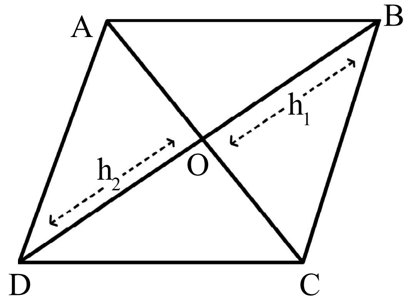


Figure - 11.14

Area of ABCD = area of ΔABD + Area of ΔBDC

$$= \frac{1}{2} BD \times AO + \frac{1}{2} BD \times OC$$

$$= \frac{1}{2} BD \times (AO + OC)$$

$$= \frac{1}{2} BD \times AC$$

$\therefore$ Area of Rhombus $= \frac{1}{2} \times$ (Product of two diagonals)

(i) Area of Rhombus = Base × Height

Base of Rhombus $= \frac{\text{Area}}{\text{height}}$

Height of Rhombus $= \frac{\text{Area}}{\text{base}}$

(ii) Area of Rhombus	$= \frac{1}{2} \times$ (Product of the diagonals)
Product of the diagonals	= 2 × Area of rhombus
Measure of any one diagonal	$= \frac{2 \times \text{Area of rhombus}}{\text{other diagonal}}$
Perimeter Rhombus	= sum of the four sides = 4 × measure of one side (think why)

Example 5 : (i) Find out the area and perimeter of the rhombus which measures in one side 3·5 cm and its height is 3·2 cm.
(ii) Find the area of a rhombus in which the measure of the two diagonals are 10 cm and 12 cm respectively.

Solution : (i) Side of rhombus, a = 3·5 cm
hieght of rhombus, h = 3·2 cm
$\therefore$ Area of rhombus = Side × Height
= $b \times h$
= (3·5 cm × 3·2 cm) sq. cm
= 11·20 sq.cm
= 3·2 cm

Perimeter = 4 × side
= 4 × 3·5 cm
= 14 cm

(ii) Diagonal of Rhombus, h_1 = 10 cm

Diagonal of Rhombus, h_2 = 12 cm

$\therefore$ Area of rhombus $= \frac{1}{2} \times h_1 \times h_2$

$= \left(\frac{1}{2} \times 10 \times 12\right)$ sq.cm

$= 60$ sq. cm

Exercise - 11.1

1. Given below are any two values (base, height or area) of parallelograms. Fill up the gap by finding the value of other.

parallelograms	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Base	10 cm	20 cm	15 cm	....	15.6 cm	....
Height	7 cm	....	2.5 cm	25 cm	....	8.4 cm
Area	....	400 sq. cm	....	325 sq. m	16.38 sq. cm	48.72sq. cm

2. Some structure any two values of [area (A), base (B) or height (H)] of triangle. Fill up the gaps.

(i) A = 64 sq. cm B = 8 cm H = ...

(ii) A = ... B = 3 m H = 214 cm

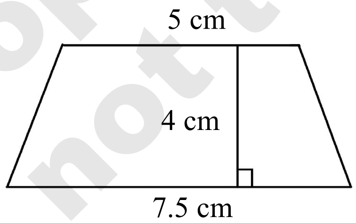
(iii) A = 94 sq. cm B = ... H = 7 m

(iv) A = 1256 sq. cm B = ... H = 31.4 mm

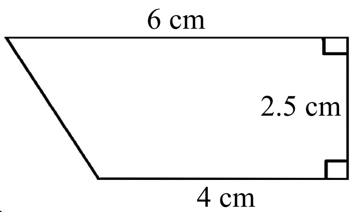
(v) A = 16.38 sq. cm B = 15.6 cm H = ...

3. Find area of each of the following trapeziums.

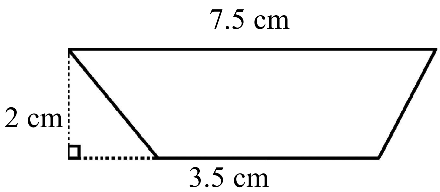
(i)



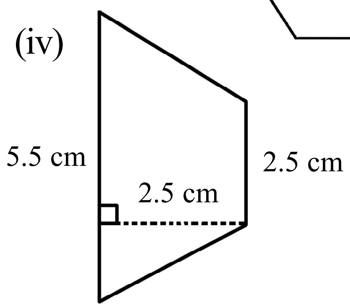
(ii)



(iii)



(iv)

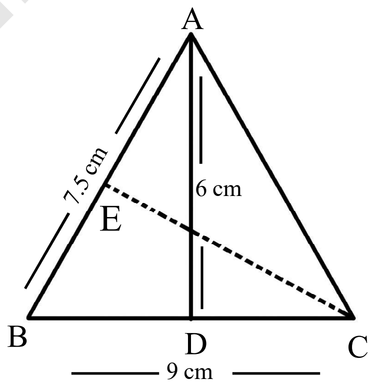


4. Given below are any two measures (base, height or diagonals) of rhombus. Fill up the following table by using different formulas.

Sl. No.	Base	Height	One Diagonal	Onther Diagonal	Area
(i)			10 cm	8.2 cm	....
(ii)	8 cm	....			56 sq. cm
(iii)	20 cmcm	7 cm			....
(iv)			18 cm	14 cm	....
(v)	2.7 cm	....			4.725 sq. cm
			....	30 cm	120 sq. cm

5. The measure of base and height of a parallelogram are 1m 50 cm and height 75 cm respectively. Find the area in sq.cm.

6. The measures of adjacent sides of a parallelogram are 12cm and 9 cm respectively. The perpendicular distance of the long sides is 6 cm. Find the area of the parallelogram. (Draw the figure)



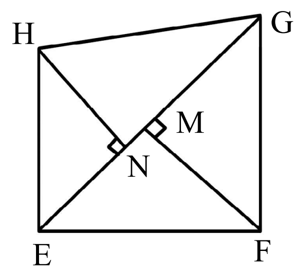
7. The area of a right angle triangle is 30 sq.cm. One of the sides of the right angle is 6 cm, find out measure of other side of the right angle.

8. Triangle ABC is an isosceles triangle where AB = AC = 7.5 cm and BC = 9 cm (see diagram). The height AD which is drawn from A to Bc measures 6 cm. Find the area of the triangle ABC. Also find the measure of the height CE.

9. In the right angle triangle ABC, $\angle A=90^0$. AD is perpendicular on BC. If AB=12 cm, AC=5 cm, BC=13 cm, then find
(i) Area of ΔABC (ii) Length of AD

10. In a quadrilateral ABCD the diagonal AC is 12 m. If BL $\perp$AC, DM$\perp$AC and BL=3cm, DM=7cm then find the area of one quadrilateral ABCD?

11. EG is the diagonal of quadrilateral EFGH. FM and HN are perpendicular on EG. If EG = 28 cm, FM = 7 cm and HN = 5 cm, then find–
(i) Area of ΔEFG (ii) Area of ΔEHG
(iii) Area of quadilateral EFGH



12. The area of a quadrilateral is 11 sq.cm. The measure of the sub perpendiculars which are drawn on the diagonal are 2·5 cm and 1·5 cm respectively. Find the measure of the diagonal.
13. The measures of parallel lines of a trapezium are 18 cm and 16 cm respectively. The distance between the parallel lines is 8 cm. Find the area of the trapezium.
14. The area of a trapezium shape field is 600 sq.cm. The length of the parallel bank are 20m and 30m respectively. Find the distance between the parallel bank.
15. The area of a trapezium shaped paper is 11 sq.cm, the distance between the parallel side is 5·5 cm and the measure of a parallel side is 2·5 cm. Find the length of the other parallel side.
16. Find the area of a rhombus in which the length of the diagonals are 7m and 6m respectively. Find the area of the rhombus and express it in terms of sqcm.
17. Find the area of a rhombus, in which the length of one side is 6 cm and height is 8cm. If the length of one diagonal is 8 cm, find the length of other diagonal.
18. The area of a rhombus is 56 sq.cm. Find the height of the rhombus if its perimeter is 32 cm.
19. The diagonal of a rhombus is 6 cm, if the area of the rhombus is 24 sq,cm then find the length of the other diagonal.
20. If the area of a parallelogram is 15 sq.cm and base is 5 cm then find its height.

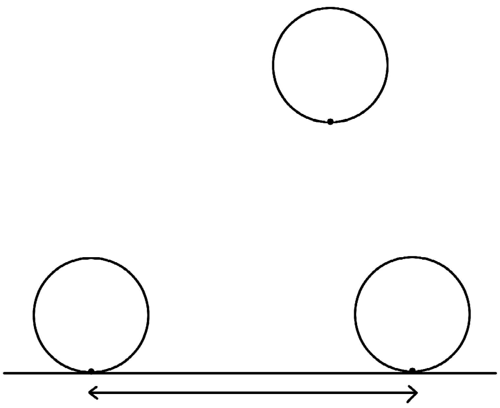
11.5 Circumfence of a Circle

Take a bangle considering it as circle and put a mark on the bangle. Now circle the bangle with a thread beginning at the marked point and circling all around the bangle. Now cut the thread where the other end of it meet at the marked point. Then measure the thread with a ruler. You cannot measure the bangle with the ruler but you can measure the thread.

Make a mark on paper, keep the bangle on the paper and match the mark of the bangle with the mark on paper and roll the bangle forward along a straight line till the marked point on the bangle again touches the paper and put another mark on paper at the where it touches point.

Now measure the distance along the straight line. It can be seen that the distance of the line on the paper and the length of the thread that we circled on the circumfence of the bangle earlier is same.

You can perform the same test by taking a coin instead of bangle.



Measure of circumfence
Figure - 11.15

Draw a circle of any radius on card board with the help of a compass and cut the circular portion. Mark a point on the edge of the circular card-board. Now circle a thread from the point that we marked till it reaches the same point again covering the circle. Cut the thread at this point.

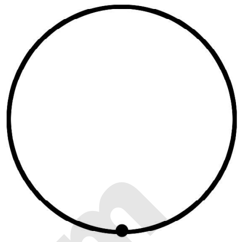


Figure - 11.16

Activity :

Draw a circle of radius 3·5 in a card board and cut out the circle portion. Now calculate the ratio of circumfence and diameter.

Cut out some circles from a card board and measure their radius and circumfences then fill up the table using the information –

Radius	Diameter	Circumfence	Circumfence ÷ Diameter

After completion of the table what do you observe? You will notice that the ratio of circumfence and diameter is approximately same, in each case. You will also observe that the measure of circumfence is a little more than three times of its diameter.

In each case the ratio of circumfence and diameter is almost same. It is denoted by the constant π (an alphabet of Greek language)

$$\therefore \quad \frac{\text{Circumfence (c)}}{\text{Diameter (d)}} = \pi \quad (\pi \text{ is read Pi})$$

The value of π is considered approximately $\frac{22}{7}$ or 3.14

Circumfence is denoted by c and diameter is denoted by d.

So, $\frac{c}{d} = \pi$ (look at one table)

or $c = d\pi$

or $c = 2r\pi$ (radius is half of the diameter)

or $c = 2\pi r$

Activity : Take two bangles of different sizes, now mark a point in each of the bangles. Now on a sheet of paper, move the bangles from the spot (that you have already marked) till you reach the spot again. You will then observe that the distance covered by the bangle of greater radius is more than the bangle with less radius. The distance covered by the bangles is the circumfence of each one of the bangles.

Example 6 : Find the circumfence of a circle of radius 10.5 cm

Solution : radius, $r = 10{\cdot}5$ cm

$$= \frac{105}{10} \text{ cm}$$

$$= \frac{21}{2} \text{ cm}$$

Circumfence of circle, $c = 2\pi r$

$$= 2 \times \frac{22}{7} \times \frac{21}{2} \text{ cm} = 66 \text{ cm}$$

Example 7 : Find the diameter of a circular region of circumfence 154 cm. ($\pi = \frac{22}{7}$)

Solution : Here, $c = 154$ cm

We know that $c = 2\pi r$

$$c = 2r\pi$$

$$c = d\pi$$

$$\therefore \quad d = \frac{c}{\pi}$$

or $$d = \left(154 \div \frac{22}{7}\right) \text{cm}$$

$$= \left(154 \times \frac{7}{22}\right) \text{cm}$$

$$= 49 \text{ cm}$$

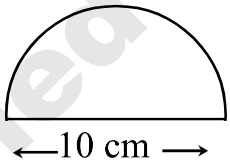
Exercise - 11.2

1. Find out the diameter of the circle using the circumfence given below: (Hint : $\pi = \frac{22}{7}$)

   (a) 28 cm (b) 56 mm (c) 42 cm

2. What length of fencing wire will be required to fence a garden of radius 14 m ? What will be the expenditure if the cost of fancing wire is ₹ 55·00 per meter ? ($\pi = \frac{22}{7}$)

3. Find the circumfence of the half circle shaped region given in the adjacent figure.



4. The diameter of a wheel of a vehicle is 70 cm. How many times will the wheel will be needed to rotate to complete the distance of 33 km? ($\pi = \frac{22}{7}$)

5. The radius of a circle is 84 cm and radius of another circle is 91 cm. By how much is the circumfence of the second circle is more than the first circle ?

6. The length of side of a square is 3 m and the radius of a circle is 7m. Find the difference of the perimeter of the square and the circumfence of the circle.

7. Runima made a circle with a 44 cm string. Find out the diameter of the circle ? If a square is made with the same string, then what will be the length of each side of the square ? ($\pi = \frac{22}{7}$)

8. The diameter of a wheel of a vehicle is 98 cm. What distance the vehicle will cover when the wheel rotates 300 times?

9. ₹ 2640.00 has been spent to fence circular garden. What will be the circumfence of the garden if the cost of fencing is ₹ 28.00 per meter ?

10. A circular portion of radius 4 cm is taken away from a circular paper of radius 10 cm. By what length the circumfence of the removed piece of paper is smaller than the circumfence of the first piece of paper.

11.6 Area of a Circle :

1st Method : We can use graph paper to find out the area of a circle. Draw a circle of radius $r = 4{\cdot}5$ cm on graph paper (as shown in figure 11.17). Calculate each of the squares with within the circle.

If the square within a circle is half or more than half, then consider it as one unit and ignore it if the square is less than half.

In this way we can find the area of a circle by counting the squares. In this method we can get only the approximate area of a circle.

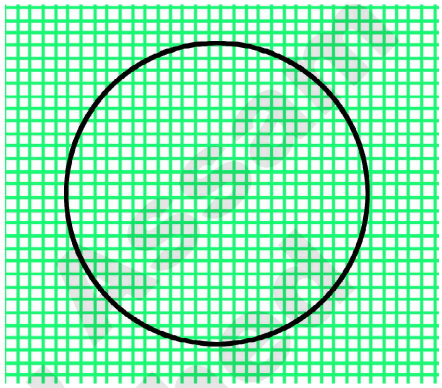


Figure - 11.17

11.6.1 Second method of finding the area of a circle

Divide the circle into 24 parts as shown in figure (11.18 (i), (ii). If you can divide the circle in more parts then you will find more accurate result.

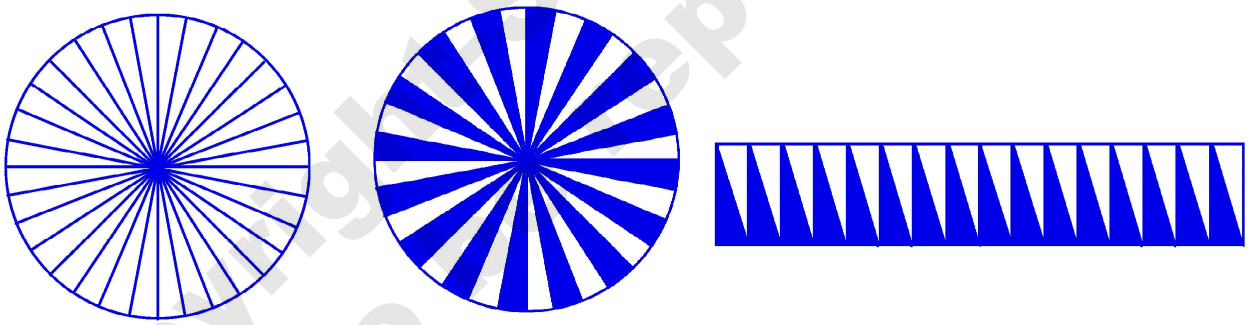


Figure (i) Figure (ii) Figure (iii)

Figure - 11.18

Every part or sector in the circle shown in figure (i) & (ii) like an isosceles triangle in the length of the equal sides which is equal to the radius of the circle. Arrange the sectors as shown in figure (iii) in such a way that there is no gap between them.

Now you see in Fig. (iii) it looks like a rectangle, whose breadth is equal to the radius of the circle and length is half of the circumfence of the circle, because half of the bases of the triangle is included in the length of the rectangle.

$\therefore$ Length of the rectangle $= \frac{1}{2} \times 2\pi r$

$= \pi r$

and breadth of the rectangle $= r$

$\therefore$ the area of the rectangle $=$ length $\times$ breadth

$= \pi r \times r$

$= \pi r^2$

$=$ area of circle

Remember that the rectangle will be more accurate if the number of sectors is more.

A rea of circle $= \pi r^2$

Let us examine this formula once again. Let us take the radius of one circle as r. As shown in the figure (11.19) draw a regular polygon inside the circle. The area of the polygon will be the sum of the area of the n isosceles triangle. The base and height of each isosceles triangle is b and h respectively.

Now area of the polygon containing n sides

$=$ area of n isosceles triangle

$= n \times \frac{1}{2} \times b \times h$

$= \frac{1}{2} \times h \times$ perimeter of the polygon

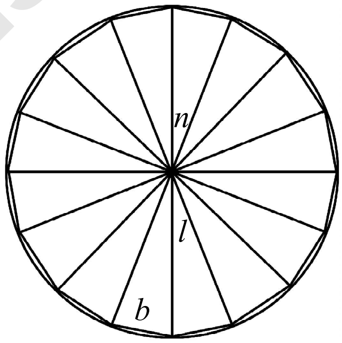


Figure - 11.19

If we increase the number of sides of the polygon, then the perimeter of the polygon will be nearer to the circumfence of the circle and the height of the triangles will approximately be nearer to the radius of the circle.

Then the area of the circle = area of the polygon (approximately)

$= \frac{1}{2} \times h \times$ circumfence of the circle

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

$= \pi r^2$ sq. cm

Remember, if d is the diameter of the circle then $r = \frac{d}{2}$

then the area of the circle $= \pi(\frac{d}{2})^2$

$= \frac{1}{4}\pi d^2$

Example 8 : 1. Find the area of the circle having radius 1·05 m.

2. Find the area of the circle having diameter 40 cm. (take $\pi = 3{\cdot}14$)

Solution :

1. Area of the circle $= \pi\ (1{\cdot}05)^2$ sq.m

$= 3{\cdot}14 \times 1{\cdot}05 \times 1{\cdot}05$ sq.m

$= 3{\cdot}46185$ sq.m

2. Area of the circle $= \frac{1}{4}\pi d^2$

$= \frac{1}{4} \times 3{\cdot}14 \times 40^2$ sq.m

$= \frac{1}{4} \times 3{\cdot}14 \times 40 \times 40$ sq.m $= 1256$ sq.m

Example 9 :

There is a circular path of 6 m breadth around a flower garden of radius 4 m as shown in figure (11.20).

(a) Find the area of the flower garden.

(b) Find the area of the flower garden along with the path.

(c) Find the area of the path.(π =3·14)

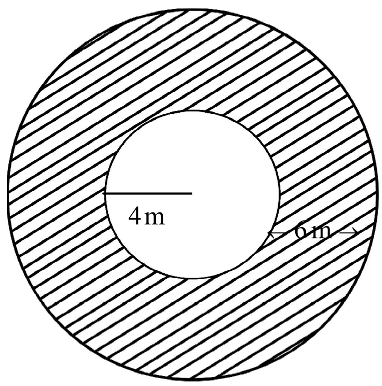


Figure - 11.20

Solution :

(a) The area of the flower garden $= \pi 4^2$ sq.m

$= 3{\cdot}14 \times 16$ sq.m

$= 50{\cdot}24$ sq.m

(b) The area of the flower garden

along with the path $= \pi 10^2$ sq.m

$= 3{\cdot}14 \times 100$ sq.m

$= 314$ sq.m

(c) Area of the path $= (314-50.24)$ sq.m

$= 263{\cdot}76$ sq.m

Two or more circles with same centre is called cocentric circle. In figure (11.20) the difference between the cocentric circle is the area of the path.

Remember :

The figures (11.20) and (11.21) do not seem to be similar and the radius in the figure (11.21) is 10m and 4m respectively and thses two circles are not cocentric yet the area of the shaded part of the figure 11.20 and 11.21 are equal. Think what is the reason behind it?

We know that :

Area of a circle $= \pi r^2$

Area of the half circle $= \frac{1}{2}\pi r^2$

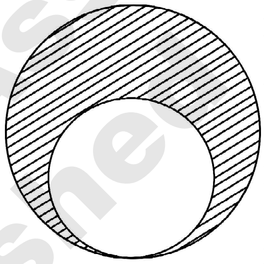


Figure - 11.21

Example 10 : Find the area of the shaded semi circular part of the figure given in the figure.

Solution :

$$= \left[\frac{1}{2}\pi\left(\frac{2{\cdot}5}{2}\right)^2 + \frac{1}{2}\pi\left(\frac{2{\cdot}5}{2}\right)^2\right] \text{ sq.cm}$$

$$= \pi\left(\frac{2{\cdot}5}{2}\right)^2 \text{ sq.cm}$$

$$= \pi\frac{6{\cdot}25}{4} \text{ sq.cm}$$

$$= 3{\cdot}14\times\frac{6{\cdot}25}{4} \text{ sq.cm} = 4{\cdot}90 \text{ sq.cm}$$

Exercise - 11.3

1. Write the correct answer from the given options :

   (i) The area of the circle of radius 10˙5 cm will be

   (a) 346˙5 sq.cm (b) 340˙5 sq.cm (c) 34˙65 sq.cm (d) 34˙05 sq.cm

(ii) The radius of a circular paper of area 616 sq.cm is

(a) 7 cm (b) 28 cm (c) 14 cm (d) 3·5 cm

2. Draw the circles with following radius and the area of the circles– Take $\left[\pi = \frac{22}{7}\right]$

(a) 5 cm (b) 4·6 cm (c) 5·5 m

3. Find the radius and diameter of the circles whose area is given below–

(a) 154 cm (b) $\frac{550}{7}$ cm

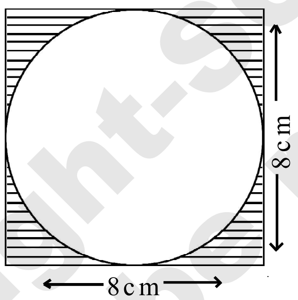
4. Find the cost of polishing of a circular table of radius 3meter if the cost of expenditure is ₹ 30·00 per sq.meter. ($\pi = 3{\cdot}14$)

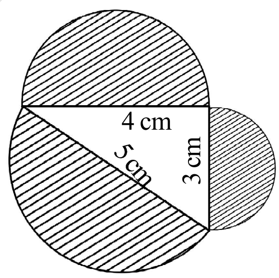
5. The radius of a circle is 84 cm and radius another of circle is 91 cm. By how much is amount the area of the second circle more than the first circle. ($\pi = \frac{22}{7}$)

6. A square is made by folding a string from a circle of circumfence 28 cm.

(a) Find the area of square and circle (b) Which area will be greater and how much?

7. Find the area of the shaded part of the figures given below–





8. There is a path of breadth 1 meter around a circlular flower garden. The diameter of the garden is 66 meter. Find out the area of the path. Take ($\pi = 3{\cdot}14$)

9. The circumfence of a circle is 31·4 cm. Find out the radius and area of the circle ($\pi = 3{\cdot}14$)

10. From a square sheet aluminium having side of 6 cm, a circlular portion of radius 2cm is cut out. What is the area of aluminium sheet that will be left over? ($\pi = 3{\cdot}14$)

11. Find out the circumfence and area of a half circle of diameter 21 cm. ($\pi = \frac{22}{7}$)

12. The area of a circuler disc is 38.5 sq.cm. What is the circumfence of the disc.($\pi = \frac{22}{7}$)

13. A path of 1 meter breadth is constructed inside a square shaped garden of side measuring 30 meter. Find the area of the path ?

14. Two pedestrian path ways of breadth 1 meter each is constructed mutually perpendicular through the middle of a square garden of side measuring 30 meter.

    (i) Find out the area of pedestrian path ways.

    (ii) What will be the total amount of expenditure to plant carpetgrass in the remaining area if the cost of per sq. meter of carpet grass is ₹ 40 ?

15. There is a path of 3 meter breadth out side of a park of length 125 meter and breadth 65 meter. Find out the area of the path.

16. From a rectangular aluminium sheet of 10 meter length and 5 meter breadth, two circles of 2 meter radius are removed. Find the area of remaining part of the rectangular sheet.

17. A veranda of breadth 2·25 meter is constructed surrounding a rectangular room of length 5·5 meter and breadth 4 meter –

    (i) Find the area of the veranda.

    (ii) Find out the cost of construction of the veranda if the cost of per sq.meter of construction is ₹ 200.

What we have learnt

1. Perimeter is the distance around a closed region and area of the region is the space in the plane occupied by the closed figure.

2. Different methods of finding area and perimeter of closed region are as follows –

   (a) Perimeter of a square = 4 × side

   (b) Perimeter of a rectangle = 2 × (height + breadth)

   (c) Area of a square = side × side

   (d) Area of a rectangle = height × breadth

3. Area of Parallelogram = base × height

4. Area of Triangle = $\frac{1}{2}$ × base × height

5. (a) The distance around a circular region is known as its circumfence.

   (b) The circumfence of a circle = πd ; (d is the diameter of a circle and $\pi = \frac{22}{7}$ or 3·14)

   (c) Area of circle = πr^2, (r is radius of the circle)