Chapter

2 MEASUREMENTS

Learning Objectives

- To recall the concepts of perimeter and area of square, rectangle, right angled triangle and combined shapes.
- To understand and find the area and perimeter of parallelogram, rhombus and trapezium.

Recap

In ancient days people used non-standardised measures such as cubit, king's foot, king's arm and yard etc. Later, people realised the need for standardised units and International System of Units which were introduced in the year 1971.

The SI Units of various measures are shown in the table

Distance	weight	Time
metre	gram	second

In Class VI, we studied about area and perimeter of rectangle, square and right angled triangle.

Perimeter is the distance around and Area is the region occupied by the closed shape.

Try these

Find the missing values for the following:

S.No.	Length	Breadth	Area	Perimeter
(i)	12 m	8 m		
(ii)	15 cm		90 $sq.cm$	
(iii)		50 mm		300 mm
(iv)	12 cm			44 cm

Hint:
The perimeter of a rectangle = $2\times(l + b)$ units.
Area of a rectangle = $l \times b$ square units.
(l and b are length and breadth of a rectangle).

S.No.	Side	Area	Perimeter
(i)	60 cm		
(ii)		64 $sq.m$	
(iii)			100 mm

Hint:
Perimeter of a square = $4 \times a$ units.
Area of a square = $a \times a$ square units.
('a' is the side of the square)

S.No.	base	height	Area
(i)	13 m	5 m	
(ii)	16 cm		240 $sq.cm$
(iii)		6 mm	84 $sq.mm$

Hint:
Area of the right angled triangle = $\frac{1}{2}(b\times h)$ square units
('b' is the base and 'h' is the height of the triangle)

2.1 Introduction

We have studied area of four sided shapes such as square and rectangle. Do you think that all the four sided shapes will happen to be square or rectangle? Think!

Let us learn about some more four sided shapes that we see around us through the conversation that follows.

Observe the shapes found in the figure

Teacher : Can you tell me the name of the shapes that you see in the figure?

Student : Yes teacher, there is a triangle, square and rectangle

Teacher : What is the shape, numbered 4 in the figure?

Student : The shape looks like a rectangle because the opposite sides are equal and parallel but the adjacent sides do not make right angle. Can we call such shapes as rectangles?

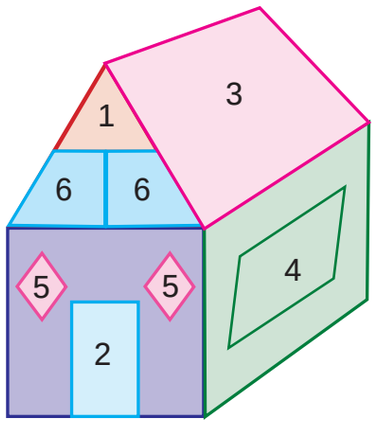


Fig.2.1

Teacher : Even though the opposite sides are equal and parallel, the adjacent sides do not make right angles instead they make acute and obtuse angles. This shape has a special name called parallelogram.

Student : Teacher, can you tell me about shape, numbered 5?

Teacher : Try to tell the properties that you know, then I will help you.

Student : Shape 5 has all the sides equal and looks like a square but the adjacent sides do not make right angles. Is there any special name for such shapes.

Teacher : Yes, it has a special name called rhombus. What about the shape, numbered 6?

Student : Shape 6 does not have any of the properties of square and rectangle. But one pair of opposite sides are parallel. Does this also have a different name?

Teacher : Yes, it is called trapezium.

Now, let us learn about all the three new shapes namely parallelogram, rhombus and trapezium.

2.2 Parallelogram

Ask any four students to come with a rope to form a rectangle ABCD as shown in Fig 2.2(i). Students standing at C and D are asked to move 4 equal steps to their left to form the shape as shown in Fig. 2.2(ii). Now, the new shape formed is called parallelogram. The pair of sides AB and CD are parallel to each other and the other pair of sides BC and AD are also parallel to each other. The length of the parallel sides are found to be equal.

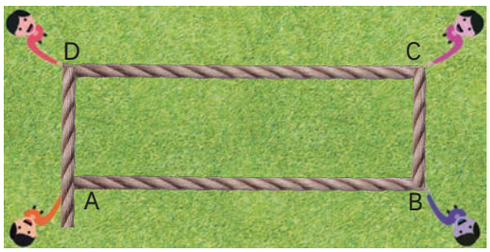


Fig.2.2(i)

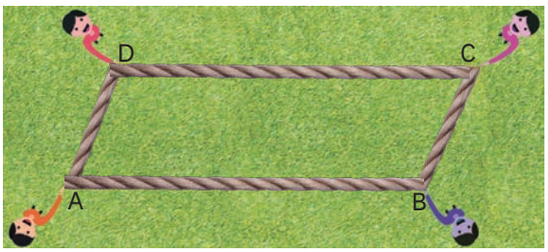
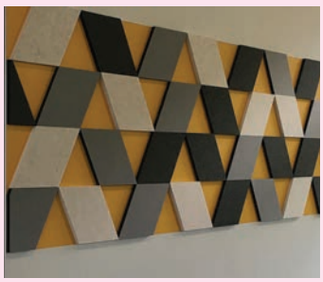


Fig.2.2(ii)

Hence, we can conclude that a parallelogram is a four sided closed shape, in which opposite sides are both parallel and equal.

MATHEMATICS ALIVE - MEASUREMENTS IN REAL LIFE


Wall tiles


Sweet


Window

2.2.1 Area and Perimeter of the Parallelogram

Draw a parallelogram on a graph sheet as shown in Fig.2.3(i) and cut it. Draw a perpendicular line from one vertex to the opposite side. Cut the triangle and shift the triangle to the other side of the parallelogram as shown in Fig.2.3(ii). What shape is seen now? It is a rectangle as in Fig.2.3(iii). Hence, the area of the parallelogram is the same as that of the rectangle.

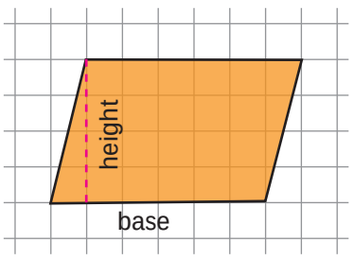


Fig.2.3(i)

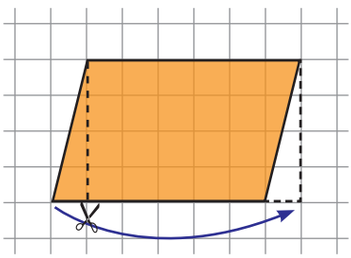


Fig.2.3(ii)

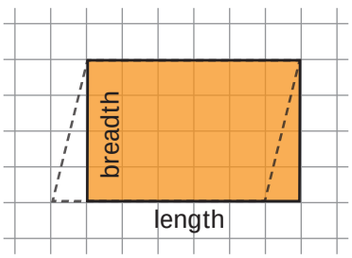


Fig.2.3(iii)

Therefore, area of the rectangle = length x breadth
= base x height $sq.units.$
= b x h $sq.units.$
= Area of the parallelogram.

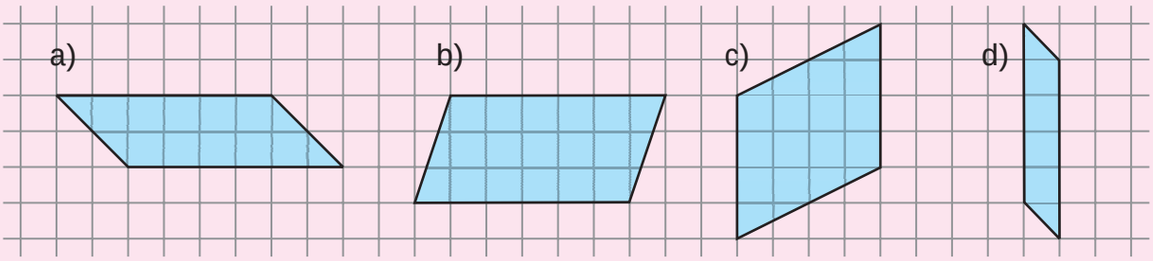
Further, the perimeter of a parallelogram is the sum of the lengths of the four sides.

Think

1. Explain the area of the parallelogram as sum of the areas of the two triangles.
2. A rectangle is a parallelogram but a parallelogram is not a rectangle. Why?

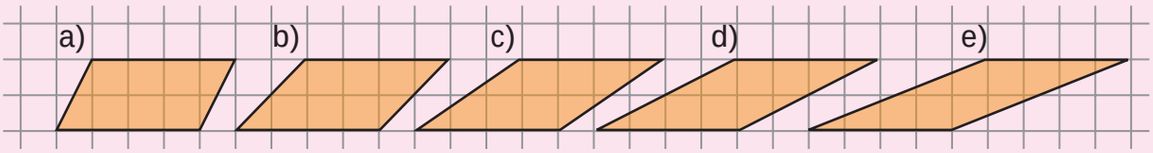
Try these

1. Count the squares and find the area of the following parallelograms by converting those into rectangles of the same area (without changing the base and height).

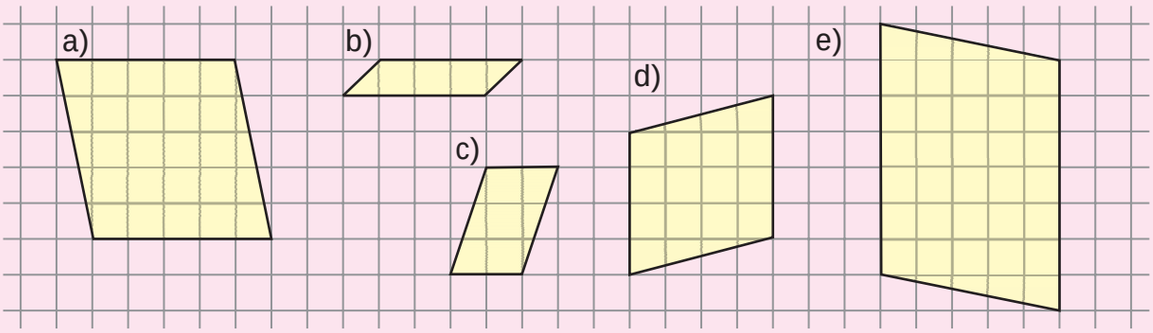


a._____ sq.units b._____ sq.units c._____ sq.units d._____ sq.units

2. Draw the heights for the given parallelograms and mark the measure of their bases and find the area. Analyse your result.



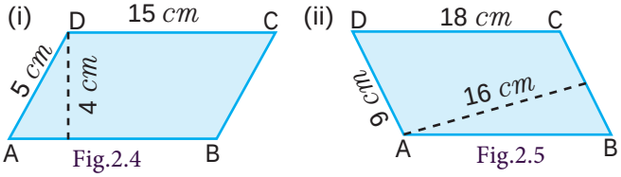
3. Find the area of the following parallelograms by measuring their base and height, using formula.



a.____ sq. units b.____ sq. units c.____ sq. units d.____ sq. units e.____ sq. units

4. Draw as many parallelograms as possible in a grid sheet with the area 20 square units each.

Example 2.1 Find the area and perimeter of the parallelogram given in the figures.



Solution

(i) From the Fig.2.4

Base of a parallelogram (b) = 15 cm, Height of a parallelogram (h) = 4 cm

Area of a parallelogram = b x h $sq.units$. Therefore, Area = 15 × 4 = 60 $sq.\ cm$.

Thus, area of the parallelogram is 60 $sq.\ cm$.

Perimeter of the parallelogram = sum of the length of the four sides.

= (15+5+15+5) = 40 cm.

(ii) From the Fig.2.5

Base of a parallelogram (b) = 9 cm, Height of a parallelogram (h) = 16 cm.

Area of a parallelogram = $b \times h$ $sq.units$ Therefore, Area = 9×16 = 144 $sq.\ cm$

Thus, area of the parallelogram is 144 $sq.\ cm$.

Perimeter of the parallelogram = sum of the length of the four sides.

= (18+9+18+9) = 54 cm.

Example 2.2 One of the sides and the corresponding height of the parallelogram are 12 m and 8 m respectively. Find the area of the parallelogram.

Solution

Given: b = 12 m, h = 8 m

Area of the parallelogram = $b \times h$ $sq.units$

= 12 × 8 = 96 $sq.m$

Therefore, Area of the parallelogram = 96 $sq.m$.

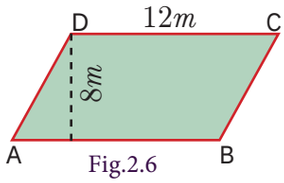


Fig.2.6

Example 2.3

Find the height 'h' of the parallelogram whose area and base are 368 $sq.\ cm$ and 23 cm respectively.

Solution

Given: Area = 368 $sq.\ cm$, base b = 23 cm

Area of the parallelogram = 368 $sq.\ cm$

$b \times h$ = 368

23 × h = 368

$h = \frac{368}{23}$ = 16 cm

Thus, the height of the parallelogram = 16 cm.

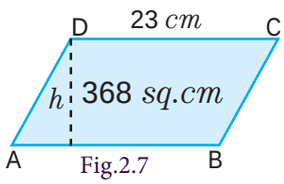


Fig.2.7

Example 2.4

A parallelogram has adjacent sides 12 cm and 9 cm. If the distance between its shorter sides is 8 cm, find the distance between its longer side.

Solution

Given that the adjacent sides of parallelogram are 12 cm and 9 cm

If we choose the shorter side as base, that is b = 9 cm then distance between the shorter sides is height, that is h = 8 cm

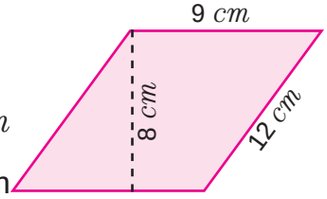


Fig.2.8

Area of parallelogram = $b \times h$ $sq.units$ = 9 × 8 = 72 $sq.\ cm$.

Again, if we choose longer side as base, that is b = 12 cm then distance between longer sides is height. Let it be 'h' units.

We know that, the area of the parellelogram = 72 $sq.cm$

$$b \times h = 72$$

$$12 \times h = 72$$

$$h = \frac{72}{12} = 6\ cm$$

Therefore, the distance between the longer sides = 6 cm.

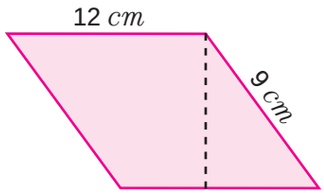


Fig.2.9

Example 2.5

The base of the parallelogram is thrice its height. If the area is 192 $sq.\ cm$, find the base and height.

Solution

Let the height of the parallelogram = $h\ cm$

Then the base of the parallelogram = $3h\ cm$

Area of the parallelogram = 192 $sq.\ cm$

$$b \times h = 192$$

$$3h \times h = 192$$

$$3h^2 = 192$$

$$h^2 = 64$$

$$h \times h = 8 \times 8$$

$$h = 8\ cm$$

$$\text{base} = 3h = 3 \times 8 = 24\ cm$$

Therefore, base of the parallelogram is 24 cm and height is 8 cm.

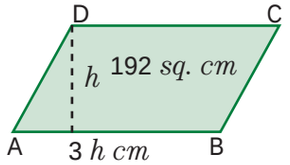


Fig.2.10

DO YOU KNOW?

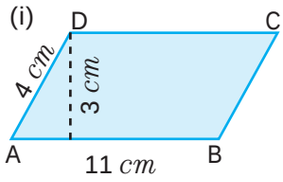
Most of the bridges are constructed using parallelogram as the structural design (For example, Pamban Bridge in Rameswaram)

Engineers use properties of parallelograms to build and repair bridges.

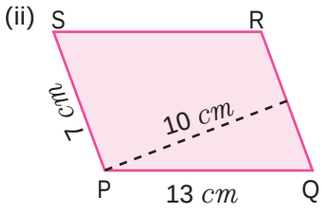
Exercise 2.1

1. Find the area and perimeter of the following parallelograms:

(i)



(ii)



2. Find the missing values.

S.No.	Base	Height	area
(i)	18 cm	5 cm	
(ii)	8 m		56 $sq.m$
(iii)		17 mm	221 $sq.mm$

3. Suresh won a parallelogram-shaped trophy in a state level Chess tournament. He knows that the area of the trophy is 735 $sq.\ cm$ and its base is 21 cm. What is the height of that trophy?

4. Janaki has a piece of fabric in the shape of a parallelogram. Its height is 12 m and its base is 18 m. She cuts the fabric into four equal parallelograms by cutting the parallel sides through its mid-points. Find the area of each new parallelogram.

5. A ground is in the shape of parallelogram. The height of the parallelogram is 14 metres and the corresponding base is 8 metres longer than its height. Find the cost of levelling the ground at the rate of ₹ 15 per $sq.\ m$.

Objective type questions

6. The perimeter of a parallelogram whose adjacent sides are 6 cm and 5 cm is

(i) 12 cm (ii) 10 cm (iii) 24 cm (iv) 22 cm

7. The area of a parallelogram whose base 10 m and height 7 m is

(i) 70 $sq.\ m$ (ii) 35 $sq.\ m$ (iii) 7 $sq.\ m$ (iv) 10 $sq.\ m$

8. The base of the parallelogram with area is 52 $sq.\ cm$ and height 4 cm is

(i) 48 cm (ii) 104 cm (iii) 13 cm (iv) 26 cm

9. What happens to the area of the parallelogram, if the base is increased 2 times and the height is halved?

(i) Decreases to half (ii) Remains the same

(iii) Increases by two times (iv) none

10. In a parallelogram the base is three times its height. If the height is 8 cm then the area is

(i) 64 $sq.\ cm$ (ii) 192 $sq.\ cm$ (iii) 32 $sq.\ cm$ (iv) 72 $sq.\ cm$

2.3 Rhombus

Take four sticks of equal length and four connectors. Connect four sticks to form a square as shown in the Fig.2.11(i). Then, try to make any two opposite vertices closer as shown in the Fig.2.11(ii) such that opposite sides remain parallel to each other to get a new shape called rhombus.

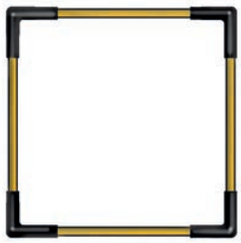


Fig.2.11(i)

Fig.2.11(ii)

Hence, we conclude that, in a parallelogram, if all the sides are equal then it is called a rhombus.

Note

In a rhombus, (i) all the sides are equal (ii) opposite sides are parallel (iii) diagonals divide the rhombus into 4 right angled triangles of equal area. (iv) the diagonals bisect each other at right angles.

2.3.1 Area of the rhombus if base and height are given

Draw a rhombus on a graph sheet as shown in the Fig.2.12(i) and cut it. Draw a perpendicular line from one vertex to the opposite side. Cut the triangle and shift the triangle to the other side of the rhombus as shown in the Fig.2.12(ii).What shape do you see? It is a rectangle. Hence, the area of the rhombus is the same as that of the rectangle.

Area of the rectangle

= length × breadth $sq.units$

= base × height $sq.units$

= area of the rhombus

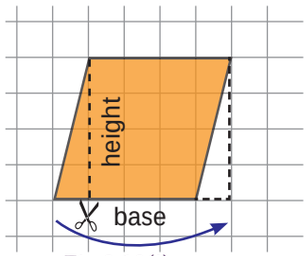


Fig.2.12(i)

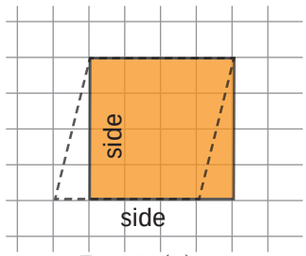


Fig.2.12(ii)

2.3.2 Area of the rhombus if the diagonals are given

Let us find, area of the rhombus ABCD by splitting it into two triangles.

Here AB = BC = CD = DA and diagonals AC (d_1) and BD (d_2) are perpendicular to each other.

Area of the rhombus ABCD = Area of triangle ABC + Area of triangle ADC

$$= \frac{1}{2} \times AC \times OB + \frac{1}{2} \times AC \times OD$$

$$= \frac{1}{2} \times AC\ (OB+OD)$$

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

$$= \frac{1}{2} \times d_1 \times d_2\ sq.\ units$$

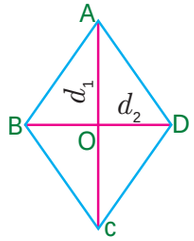


Fig.2.13

Therefore, area of the rhombus = $\frac{1}{2}$ (product of diagonals) $square\ units$.

Try these

1. Observe the Fig. 2.14 and answer the following questions.

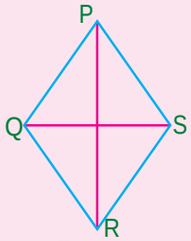


Fig.2.14

(i) Name two pairs of opposite sides.
(ii) Name two pairs of adjacent sides.
(iii) Name the two diagonals

2. Find the area of the rhombus given in Fig. 2.15 and Fig. 2.16

(i)

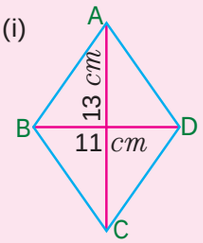


Fig.2.15

(ii)

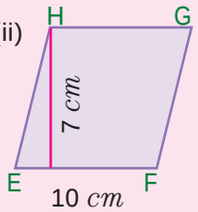


Fig.2.16

Example 2.6

Find the area of the rhombus whose side is 17 cm and the height is 8 cm.

Solution

Given:

Base = 17 cm, height = 8 cm

Area of the rhombus = b x h $sq.\ units$

= 17 x 8 = 136

Therefore, area of the rhombus = 136 $sq.\ cm.$

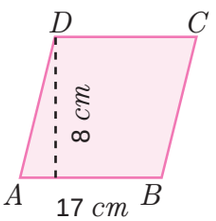


Fig.2.17

Think

1. Can you find the perimeter of the rhombus?
2. Can diagonals of a rhombus be of the same length?
3. A square is a rhombus but a rhombus is not a square. Why?
4. Can you draw a rhombus in such a way that the side is equal to the diagonal.

Example 2.7

Calculate the area of the rhombus having diagonals equal to 6 m and 8 m.

Solution

Given: d_1 = 6 m, d_2 = 8 m

Area of the rhombus = $\frac{1}{2}$ x (d_1 x d_2) $sq.\ units$

= $\frac{1}{2}$ x (6 x 8)

= $\frac{48}{2}$

= 24 $sq.m$

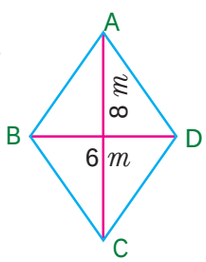


Fig.2.18

Hence, area of the rhombus is 24 $sq.m.$

Example 2.8

If the area of the rhombus is 60 $sq.\ cm$ and one of the diagonals is 8 cm, find the length of the other diagonal.

Solution

Given, the length of one diagonal (d_1) = 8 cm

Let, the length of the other diagonal be $d_2\ cm$

Area of the rhombus = 60 $sq.\ cm$ (given)

$$\frac{1}{2} \times (d_1 \times d_2) = 60$$

$$\frac{1}{2} \times (8 \times d_2) = 60$$

$$8 \times d_2 = 60 \times 2$$

$$d_2 = \frac{120}{8}$$

$$= 15$$

Therefore, length of the other diagonal is 15 cm.

Example 2.9

The floor of an office building consists of 200 rhombus shaped tiles and each of its length of the diagonals are 40 cm and 25 cm. Find the total cost of polishing the floor at ₹ 45 per $sq.m$.

Solution

Given, the length of the diagonals of a rhombus shaped tile are 40 cm and 25 cm

The area of one tile $= \frac{1}{2} \times (d_1 \times d_2)\ sq.\ units$

$= \frac{1}{2} \times 40 \times 25$

$= 500\ sq.\ cm$

Therefore, the area of 200 such tiles $= 200 \times 500$

$= 100000\ sq.\ cm$

$= \frac{100000}{10000}\ (1\ sq.\ m = 10000\ sq.\ cm)$

$= 10\ sq.\ m$

Therefore, the cost of polishing 200 such tiles at the rate of ₹ 45 per $sq.\ m$

= 10 x 45 = ₹ 450.

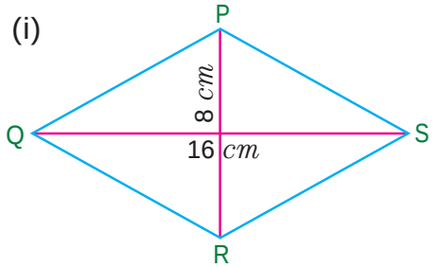
DO YOU KNOW?

In railways the terminology, "Diamond Crossing" refers to the point where two railway lines cross, forming the shape of rhombus at the crossing point. The most famous diamond crossing is at Nagpur, where lines from the North, South, East, and Western railways meet.

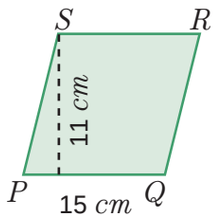
Exercise 2.2

1. Find the area of rhombus PQRS shown in the following figures.

(i)



(ii)



2. Find the area of a rhombus whose base is 14 cm and height is 9 cm.

3. Find the missing value.

S.No.	Diagonal (d_1)	Diagonal (d_2)	Area
(i)	19 cm	16 cm	
(ii)	26 m		468 $sq.\ m$
(iii)		12 mm	180 $sq.\ mm$

4. The area of a rhombus is 100 $sq.\ cm$ and length of one of its diagonals is 8 cm. Find the length of the other diagonal.

5. A sweet is in the shape of rhombus whose diagonals are given as 4 cm and 5 cm. The surface of the sweet should be covered by an aluminum foil. Find the cost of aluminum foil used for 400 such sweets at the rate of ₹ 7 per 100 $sq.\ cm$.

Objective type questions

6. The area of the rhombus with side 4 cm and height 3 cm is

(i) 7 $sq.\ cm$ (ii) 24 $sq.\ cm$ (iii) 12 $sq.\ cm$ (iv) 10 $sq.\ cm$

7. The area of the rhombus when both diagonals measuring 8 cm is

(i) 64 $sq.\ cm$ (ii) 32 $sq.\ cm$ (iii) 30 $sq.\ cm$ (iv) 16 $sq.\ cm$

8. The area of the rhombus is 128 $sq.\ cm$ and the length of one diagonal is 32 cm. The length of the other diagonal is

(i) 12 cm (ii) 8 cm (iii) 4 cm (iv) 20 cm

9. The height of the rhombus whose area 96 $sq.\ m$ and side 24 m is

(i) 8 m (ii) 10 m (iii) 2 m (iv) 4 m

10. The angle between the diagonals of a rhombus is

(i) 120° (ii) 180° (iii) 90° (iv) 100°

2.4 Trapezium

We are familiar with parallelogram and rhombus. What will happen in a parallelogram if one pair of parallel sides are not equal? Can you draw it? How will it look like? The shape looks as given in Fig.2.19.

A parallelogram with one pair of non-parallel sides is known as a Trapezium.

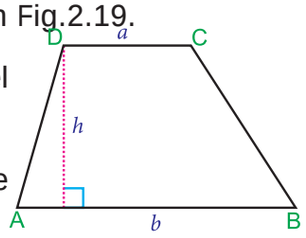


Fig.2.19

The distance between the parallel sides is the height of the trapezium.

Here the sides AD and BC are not parallel, but AB is parallel to DC.

Isosceles Trapezium

If the non - parallel sides of a trapezium are equal (AD = BC) then, it is known as an isosceles trapezium.

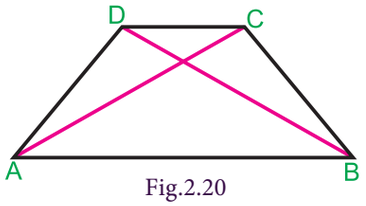


Fig.2.20

2.4.1 Area of the Trapezium

ABCD is a trapezium with parallel sides AB and DC measuring 'a'units and 'b' units respectively. Let the distance between the two parallel sides be 'h' units. The diagonal BD divides the trapezium into two triangles ABD and BCD.

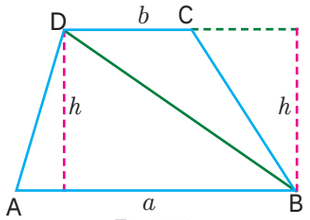


Fig.2.21

Area of the trapezium = area $\triangle$ of ABD + area of $\triangle$ BCD

$= \frac{1}{2}$ x AB x h + $\frac{1}{2}$ x DC x h [since the two triangles ABD and BCD have same heights]

Area of a trapezium $= \frac{1}{2}$ x $\{h$ x (AB + DC)$\}$

Therefore, Area of the trapezium = $\frac{1}{2}$ x h $(a+b)$ $sq.units.$

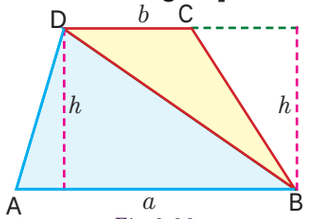


Fig.2.22

Example 2.10

Find the area of the trapezium whose height is 14 cm and the parallel sides are 18 cm and 9 cm of length.

Solution

Given, height (h) = 14 cm

parallel sides are (a) = 18 cm and (b) = 9 cm

Area of the trapezium = $\frac{1}{2}$ x h $(a+b)$

= $\frac{1}{2}$ x 14 (18+9)

= 7(27)

= 189 $sq.$ cm

Therefore, area of the trapezium is 189 $sq.$ $cm.$

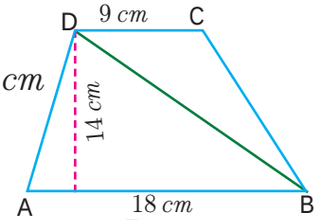


Fig.2.23

Example 2.11

The parallel sides of a trapezium are 23 cm and 12 cm. The distance between the parallel sides is 9 cm. Find the area of the trapezium.

Solution

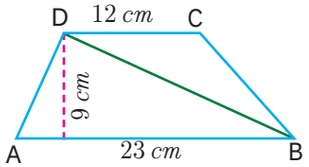


Fig.2.24

Given, height (h) = 9 cm

Parallel sides are (a) = 23 cm and (b) = 12 cm

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

$= \frac{1}{2} \times 9\ (23+12)$

$= \frac{1}{2} \times 9\ (35)$

$= 157.5$ $sq.\ cm$

Therefore, Area of the trapezium is 157.5 $sq.\ cm$.

Example 2.12

The area of a trapezium is 828 $sq.\ cm$. If the lengths of its parallel sides are 19.6 cm and 16.4 cm, find the distance between them.

Solution

Given, Area of the Trapezium= 828 cm^2

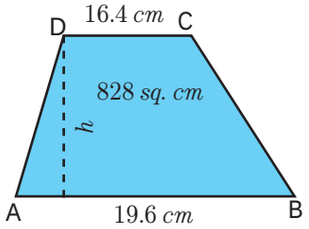


Fig.2.25

$\frac{1}{2} \times h\ (a+b) = 828$

$\frac{1}{2} \times h\ (19.6+16.4) = 828$

$\frac{1}{2} \times h\ (36) = 828$

$h\ (18) = 828$

$h = \frac{828}{18}$

$h = 46\ cm$

Therefore, distance between the parallel sides = 46 cm

Example 2.13

The area of a trapezium is 352 $sq.\ cm$ and the distance between its parallel sides is 16 cm. If one of the parallel sides is of length 25 cm then find the length of the other side.

Solution

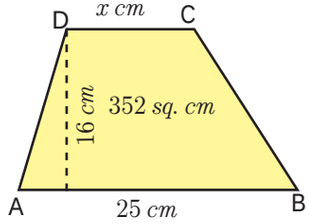


Fig.2.26

Let, the length of the required side be 'x' cm.

Then, area of the trapezium $= \frac{1}{2} \times h\ (a+b)$ $sq.\ units$

$= \frac{1}{2} \times 16\ (25+x)$

$$= \quad 200+8x$$

But, the area of the trapezium $= 352\ sq.\ cm$ (given)

Therefore, $200 + 8x = 352$

$$\Rightarrow 8x = 352 - 200$$

$$\Rightarrow 8x = 152$$

$$\Rightarrow x = \frac{152}{8}$$

$$\Rightarrow x = 19$$

Therefore, the length of the other side is 19 cm.

Think

1. Can you find the perimeter of the trapezium? Discuss.
2. Mention any three life situations where the isosceles trapeziums are used.

Example 2.14

The collar of a shirt is in the form of isosceles trapezium whose parallel sides are 17 cm and 14 cm and the distance between them is 4 cm. Find the area of canvas that will be used to stitch the collar.

Solution

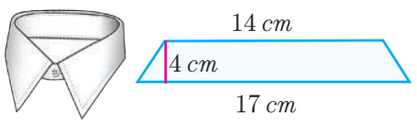


Fig.2.27

Given height $(h) = 4\ cm$

Parallel sides are $(a) = 17\ cm$ and $(b) = 14\ cm$

$$\text{Area of the trapezium} = \frac{1}{2} \times h\ (a+b)\ sq.\ units$$

$$= \frac{1}{2} \times 4\ (17+14)$$

$$= \frac{1}{2} \times 4\ (31)$$

$$= 62\ sq.\ cm$$

Therefore, the area of canvas used is 62 $sq.\ cm$.

DO YOU KNOW?

Though there are various common types of cross sections available for irrigation canals, trapezoidal cross section is widely used, because it prevents overflowing during heavy rains, maximum water flow is possible with minimum time (least frictional resistance) and safety measures can be taken easily while someone or something falls into it.

Exercise 2.3

1. Find the missing values.

S.No.	Height 'h'	Parallel side 'a'	Parallel side 'b'	Area
(i)	10 m	12 m	20 m	
(ii)		13 cm	28 cm	492 $sq.\ cm$
(iii)	19 m		16 m	323 $sq.\ m$
(iv)	16 cm	15 cm		360 $sq.\ cm$

2. Find the area of a trapezium whose parallel sides are 24 cm and 20 cm and the distance between them is 15 cm.

3. The area of a trapezium is 1586 $sq.\ cm$. The distance between its parallel sides is 26 cm. If one of the parallel sides is 84 cm then, find the other side.

4. The area of a trapezium is 1080 $sq.\ cm$. If the lengths of its parallel sides are 55.6 cm and 34.4 cm, find the distance between them.

5. The area of a trapezium is 180 $sq.\ cm$ and its height is 9 cm. If one of the parallel sides is longer than the other by 6 cm, find the length of the parallel sides.

6. The sunshade of a window is in the form of isosceles trapezium whose parallel sides are 81 cm and 64 cm and the distance between them is 6 cm. Find the cost of painting the surface at the rate of ₹ 2 per $sq.\ cm$.

7. A window is in the form of trapezium whose parallel sides are 105 cm and 50 cm respectively and the distance between the parallel sides is 60 cm. Find the cost of the glass used to cover the window at the rate of ₹ 15 per 100 $sq.\ cm$.

Objective type questions

8. The area of the trapezium, if the parallel sides are measuring 8 cm and 10 cm and the height 5 cm is

   (i) 45 $sq.\ cm$ (ii) 40 $sq.\ cm$ (iii) 18 $sq.\ cm$ (iv) 50 $sq.\ cm$

9. In a trapezium if the sum of the parallel sides is 10 cm and the area is 140 $sq.\ cm$, then the height is

   (i) 7cm (ii) 40 cm (iii) 14 cm (iv) 28 cm

10. when the non-parallel sides of a trapezium are equal then it is known as

    (i) a square (ii) a rectangle

    (iii) an isosceles trapezium (iv) a parallelogram

Exercise 2.4

Miscellaneous Practice problems

1. The base of the parallelogram is 16 cm and the height is 7 cm less than its base. Find the area of the parallelogram.

2. An agricultural field is in the form of a parallelogram, whose area is 68.75 $sq.\ hm$. The distance between the parallel sides is 6.25 hm. Find the length of the base.

3. A square and a parallelogram have the same area. If the side of the square is 48 m and the height of the parallelogram is 18 m, find the length of the base of the parallelogram.

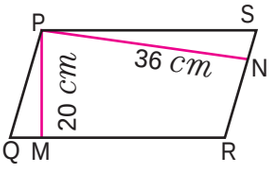
4. The height of the parallelogram is one fourth of its base. If the area of the parallelogram is 676 $sq.\ cm$, find the height and the base.

5. The area of the rhombus is 576 $sq.\ cm$ and the length of one of its diagonal is half of the length of the other diagonal then find the length of the diagonals.

6. A ground is in the form of isosceles trapezium with parallel sides measuring 42 m and 36 m long. The distance between the parallel sides is 30 m. Find the cost of levelling it at the rate of ₹ 135 per $sq.m$.

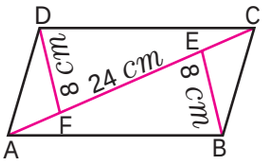
Challenge Problems

7. In a parallelogram PQRS (see the diagram) PM and PN are the heights corresponding to the sides QR and RS respectively. If the area of the parallelogram is 900 $sq.\ cm$ and the length of PM and PN are 20 cm and 36 cm respectively, find the length of the sides QR and SR.

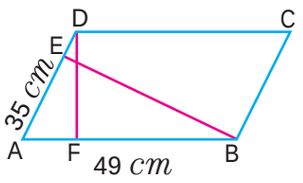


8. If the base and height of a parallelogram are in the ratio 7:3 and the height is 45 cm then, find the area of the parallelogram.

9. Find the area of the parallelogram ABCD, if AC is 24 cm and BE = DF= 8 cm.



10. The area of the parallelogram ABCD is 1470 $sq\ cm$. If AB = 49 cm and AD = 35 cm then, find the heights DF and BE.

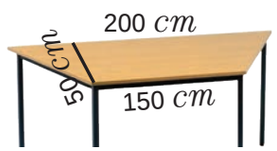


11. One of the diagonals of a rhombus is thrice as the other. If the sum of the length of the diagonals is 24 cm, then find the area of the rhombus.

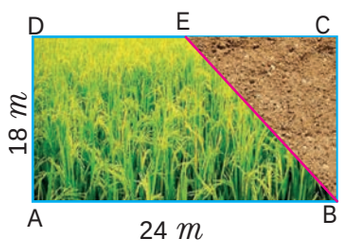
12. A man has to build a rhombus shaped swimming pool. One of the diagonal is 13 m and the other is twice the first one. Then find the area of the swimming pool and also find the cost of cementing the floor at the rate of ₹ 15 per $sq.cm$.

13. Find the height of the parallelogram whose base is four times the height and whose area is 576 $sq.\ cm$.

14. The table top is in the shape of trapezium with measurements given in the figure. Find the cost of the glass used to cover the table at the rate of ₹ 6 per 10 $sq.\ cm$.



15. Arivu has a land ABCD with the measurements given in the figure. If a portion ABED is used for cultivation (where E is the mid-point of DC), find the cultivated area.

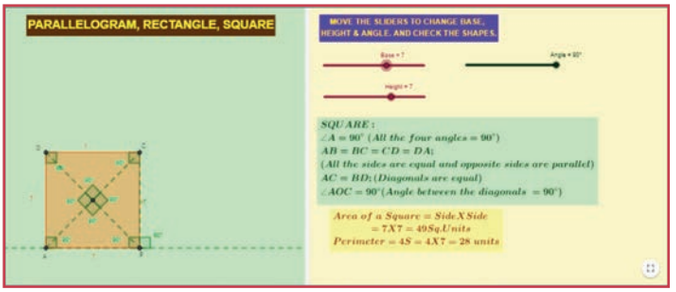


Summary

- Parallelogram is a four sided closed shape in which opposite sides are both parallel and equal.
- Area of the Parallelogram = b x h $sq.\ units$, where b = base ; h = height.
- In a parallelogram if all the sides are equal then it is called Rhombus.
- Area of rhombus = $\frac{1}{2}$ x d_1 × d_2 $sq.\ units$, where d_1, d_2 are the diagonals.
- A parallelogram with one pair of non-parallel sides is known as a Trapezium.
- Area of the Trapezium = $\frac{1}{2}$ x h $(a+b)$ $sq.\ units$. Let the distance between the two parallel sides be 'h' units.
- If the non - parallel sides of a Trapezium are equal then it is known as an isosceles Trapezium.

ICT Corner

Expected Result is shown in this picture



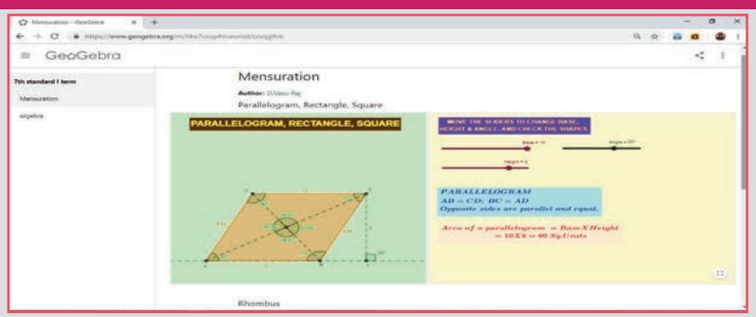
Step – 1 :

Open the Browser type the URL Link given below (or) Scan the QR Code. GeoGebra work sheet named "7th std Mensuration" will open. In the right side of the work sheet there are three sliders to change Length, Breadth and Corner angle.

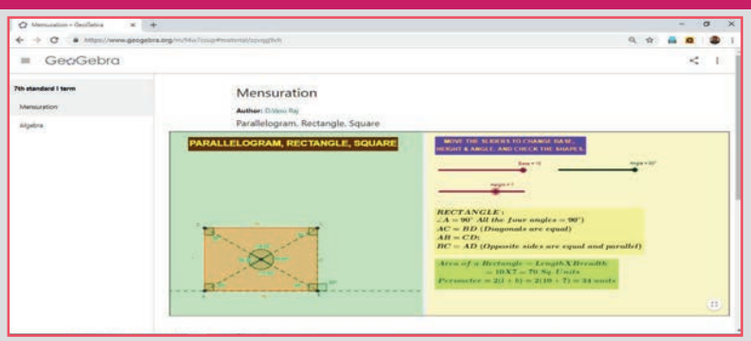
Step - 2 :

Move the sliders to get, Parallelogram or Rectangle or Square and see the points given and observe.

Step 1



Step 2



Browse in the link

Mensuration: https://ggbm.at/zzvqg9vh or Scan the QR Code.