



12

Rectilinear Plane Figures

By studying this lesson, you will be able to,

- identify the properties of the rectilinear plane figures triangle, rectangle, square, trapezium and parallelogram.

12.1 Plane figures

Let us first consider a plane.

The surface of a blackboard, a kitchen table and a notice board lies on a plane.

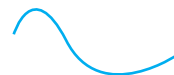


Now, let us recall about line segments.

The following figures denote a straight line segment and a curved line segment.

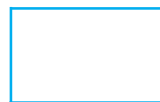
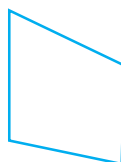


A straight line segment



A curved line segment

In mathematics, figures drawn on flat surfaces using straight line segments and curved line segments are defined as **plane figures**. Given below are some plane figures.



Ball

Since the surface of a ball is not flat, a figure drawn on a ball's surface is not a plane figure.



12.2 Closed plane figures and open figures

Plane figures such as the following three figures which are completely bounded by line segments are defined as **closed plane figures**.

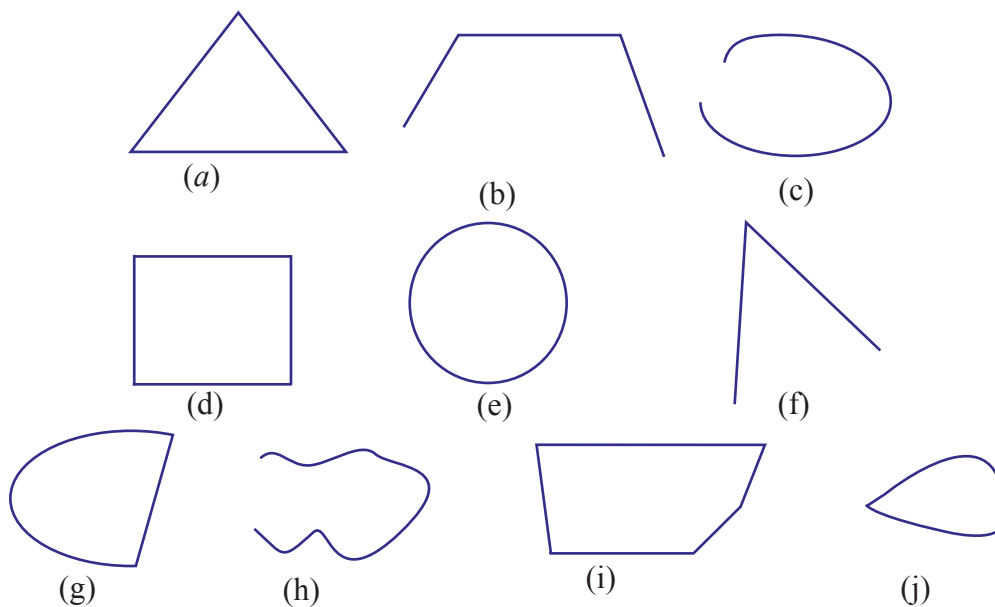


Plane figures such as the following figures which are not completely bounded by line segments are called **open figures**.



Exercise 12.1

- (1) Select the closed plane figures from the following figures and write down the corresponding letters.





12.3 Rectilinear plane figures

Given below are some examples of closed figures bounded by straight line segments only. Such figures are called **closed rectilinear plane figures**.



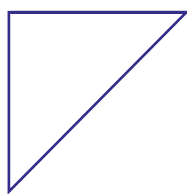
This figure is not closed. Therefore, even though it contains straight line segments only, it is not a closed rectilinear plane figure.



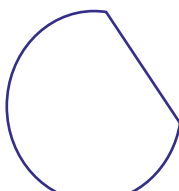
This figure contains curved lines. Therefore, even though it is closed, it is not a closed rectilinear plane figure.

Exercise 12.2

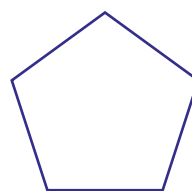
(1) Select the rectilinear plane figures from the following figures and write down the corresponding letters.



(a)



(b)



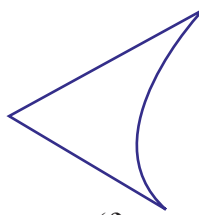
(c)



(d)



(e)



(f)

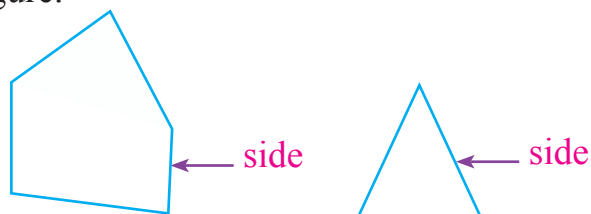


(g)



12.4 Elements of rectilinear plane figures

Any straight line segment of a rectilinear plane figure is defined as a side of the figure.



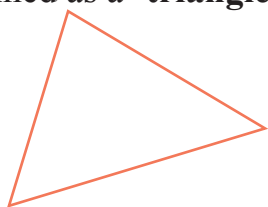
An angle formed inside a rectilinear plane figure by two sides meeting is defined as an angle of the plane figure.



12.5 Triangles and quadrilaterals

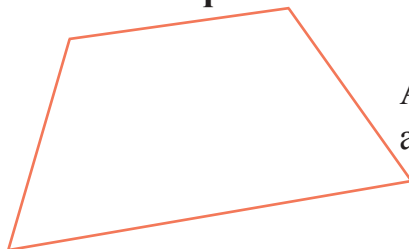
Next, let us look at closed rectilinear plane figures drawn with three straight line segments and drawn with four straight line segments in detail.

A closed rectilinear plane figure drawn with three straight line segments is defined as a "**triangle**".

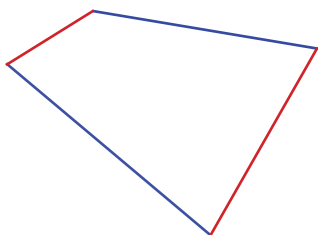


A triangle has three sides and three angles.

A closed rectilinear plane figure drawn with four straight line segments is defined as a "**quadrilateral**".



A quadrilateral has four sides and four angles.

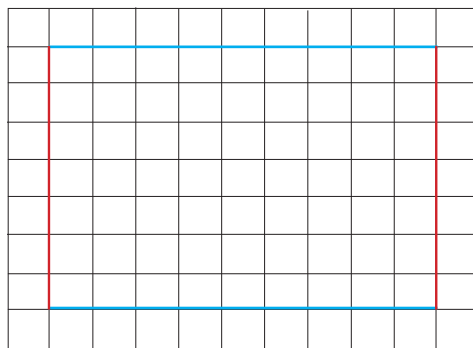


In a quadrilateral, there are two pairs of sides which do not meet each other. Such a pair of sides is defined as a pair of opposite sides.

The pair of sides in red is one pair of opposite sides. The other pair of opposite sides is shown in blue.

• Various types of quadrilaterals and their properties

It is possible to distinguish acute angles, right angles and obtuse angles by using a right angled corner. Also, when a rectilinear plane figure has been drawn on a square grid, the length of a side and the gap between opposite sides can be found by counting the number of squares (appropriately).



In the above quadrilateral,

- the length of each side in blue is 9 squares.
- the length of each side in red is 7 squares.
- all angles are right angles.
- the gap between the pair of sides in blue is 7 squares.
- the gap between the pair of sides in red is 9 squares.



Now let us engage in an activity and identify various types of quadrilaterals and their properties.



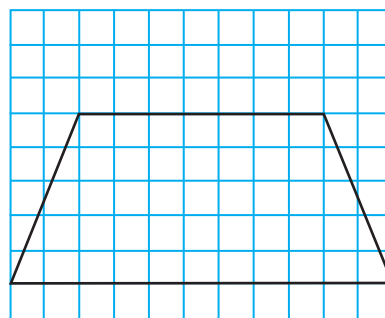
Activity 1

By using a right angled corner and by counting squares or by some other method such as using a string, establish that the given properties of the following rectilinear plane figures are correct.

(1) Trapezium

Properties:

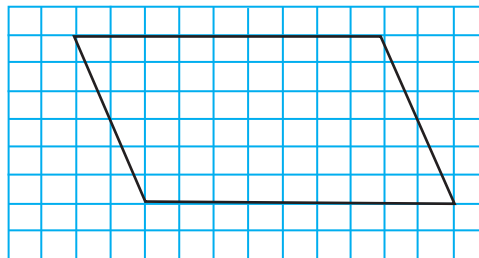
- The gap between one pair of opposite sides is constant.



(2) Parallelogram

Properties:

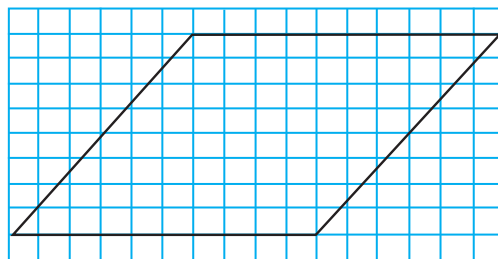
- The gap between pairs of opposite sides is constant.
- Opposite sides are equal in length.



(3) Rhombus

Properties:

- The gap between pairs of opposite sides is constant.
- All the sides are equal in length.

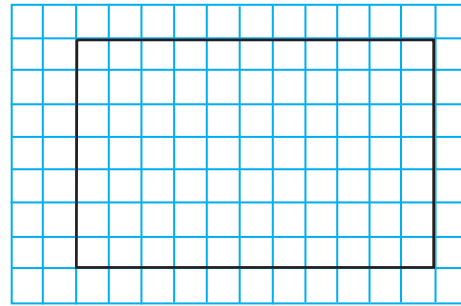




(4) Rectangle

Properties:

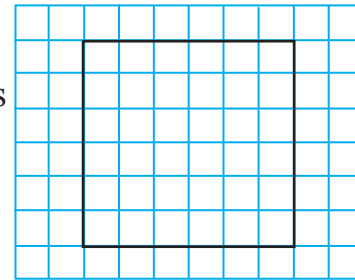
- The gap between pairs of opposite sides is constant.
- Opposite sides are equal in length.
- All the angles are right angles



(5) Square

Properties:

- The gap between pairs of opposite sides is constant.
- All the sides are equal in length.
- All the angles are right angles.



Exercise 12.3

- (1) From the plane figure names given below each figure, select the suitable name and mark $\checkmark$ or $\times$ appropriately within brackets.

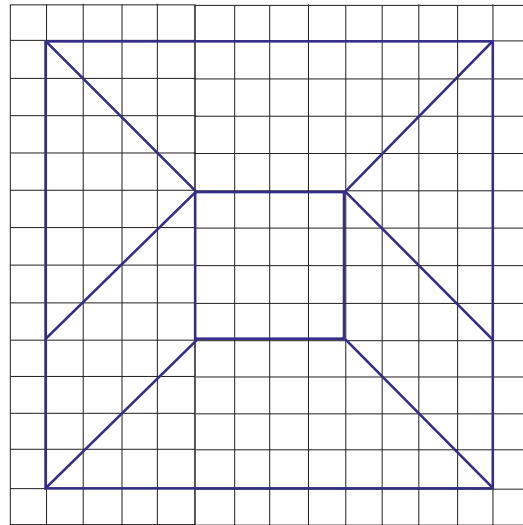
(i)	(ii)	(iii)	(iv)
Square ()	Square ()	Square ()	Square ()
Rectangle ()	Rectangle ()	Rectangle ()	Trapezium ()
Triangle ()	Triangle ()	Parallelogram ()	Triangle ()
(v)	(vi)	(vii)	(viii)
Square ()	Parallelogram ()	Trapezium ()	Square ()
Trapezium ()	Square ()	Parallelogram ()	Triangle ()
Rectangle ()	Rectangle ()	Square ()	



(2) Draw two figures of each of the following types of rectilinear plane figures on your square ruled exercise book.

(i) Square (ii) Rectangle (iii) Parallelogram (iv) Trapezium

(3) A window grill design drawn on a square ruled paper is given below.



(i) Copy this design onto your exercise book.

(ii) Identify each of the following rectilinear plane figures in the grill design you copied and using different colours for the different shapes, colour a figure of each type.

(a) Triangle (b) Square (c) Parallelogram (d) Trapezium



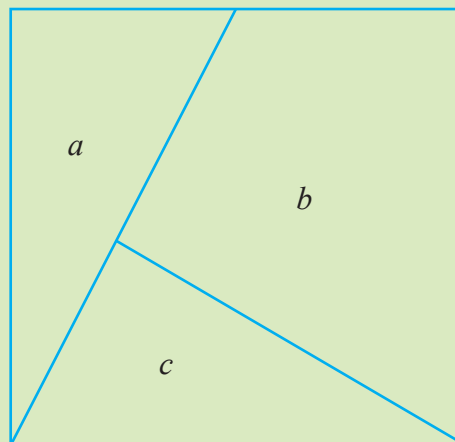
Activity 2

Copy the given figure on a cardboard.

- Cut out and separate the pieces a , b , c .
- Organize the pieces that were cut out to form the following figures.



Pieces	Plane figure
a, b	Triangle
a, b, c	Triangle
a, b	Trapezium
a, b, c	Square, Rectangle, Parallelogram



Summary

- A closed rectilinear plane figure drawn with three straight line segments is defined as a triangle.
- A closed rectilinear plane figure drawn with four straight line segments is defined as a quadrilateral.
- Trapezium – A quadrilateral with a constant gap between one pair of opposite sides.
- Parallelogram – A quadrilateral with a constant gap between each pair of opposite sides.
- Rhombus – A parallelogram with four equal sides.
- Rectangle – A parallelogram whose angles are right angles.
- Square – A rectangle with four equal sides.