

31

Tessellation

After studying this lesson, you can get a good understanding of

- ★ constructing semi-pure tessellations using triangles and quadrilaterals.

You may have seen how the walls and floors are tiled in houses. In covering surfaces with tiles, there are certain facts that you have to consider.

- ★ There should be no gaps between the tiles
- ★ The tiles should not overlap

These principles are based on the theory of tessellations. As you have learned in grade 7,

Tessellation is the arrangement of a certain shape or several shapes, on a surface, to form a pattern, without overlapping or without leaving any gaps in between them.

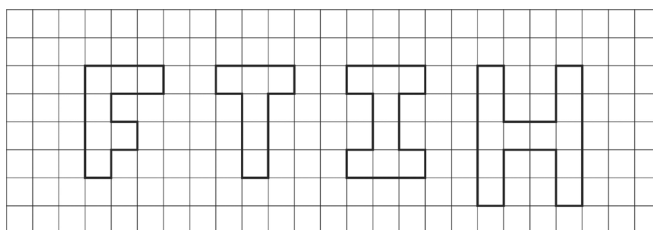
Theory of tessellation is applied in making ceilings, carpets, cloth, clay pots and also in architecture etc., by using different shapes.

31.1 Pure tessellation

A tessellation done by using only one shape is called a pure tessellation. Here a regular or an irregular shape can be used.

Activity 31.1

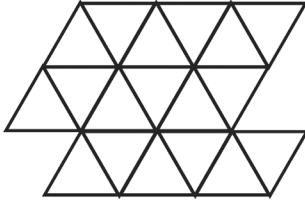
- (1) Copy the English letters given below on to a square ruled paper to the same scale and construct a tessellation with them.



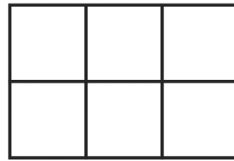
- (2) Obtain the letters given above using a computer and make a tessellation with them. (A software such as microsoft word can be used)

31.2 Regular tessellation

A tessellation done using one regular shape is called a regular tessellation. As sides and angles of a regular shape are equal, this tessellation can be done easily. Given below are some sections of such tessellations.



A section of a tessellation done using an equilateral triangles



A section of a tessellation done using squares



A section of a tessellation done using regular hexagons.

Activity 31.1

When making tessellations using only one regular shape, the only regular shapes that can be used are equilateral triangle, square and a regular hexagon.

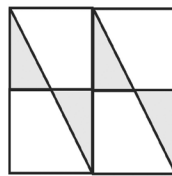
- (i) Construct regular tessellations using equilateral triangles, squares and regular hexagons
- (ii) See whether regular tessellations can be constructed using other regular shapes

31.3 Semi-pure tessellation

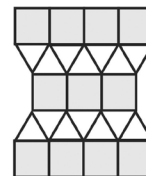
Study the tessellations given below.



(i)



(ii)



(iii)

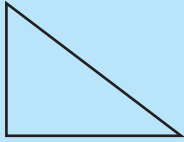
More than one shape is used in these tessellations. They are called semi-pure tessellations.

Diagram	Number of shapes used	Shapes used
(i)	2	Trapezium, right angled triangle
(ii)	2	Right angled triangle, trapezium
(iii)	2	Squares, triangles

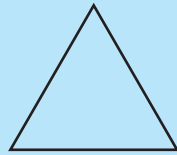
Semi-pure tessellations can be made using different polygons. But here we have to consider tessellations done using triangles and quadrilaterals only.

Exercise 31.2

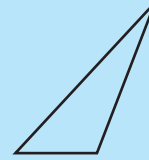
Different types of triangles and quadrilaterals are given below. Make tessellation using two or more of these shapes.



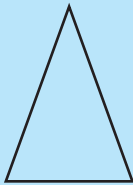
Right angled triangle
(One angle is 90°)



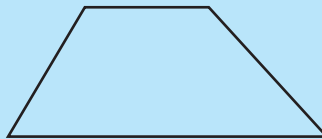
Equilateral triangle
(All three sides are of the same length)



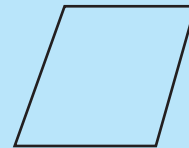
Scalene triangle
(The three sides are of different lengths)



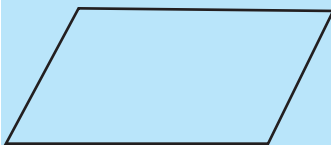
Isosceles triangle
(At least two sides are equal in length)



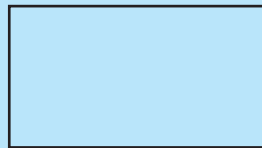
Trapezium
(One pair of opposite sides are parallel)



Rhombus
(Opposite sides are parallel and all the sides are equal in length)



Parallelogram
(Opposite sides are parallel and equal)



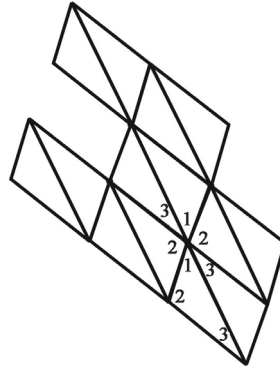
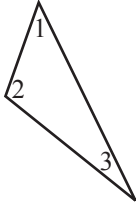
Rectangle
(Opposite sides are equal and parallel the angles are right angles)



Square
(All four sides are equal in length and all four angles are right angles)

31.4 Vertex points

Consider a pure tessellation made using a triangle. The interior angles of the triangle are denoted by 1, 2 and 3



The points at which the vertices meet in a tessellation are called vertex points. (shown in dark dots in the diagram)

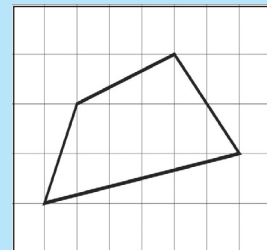
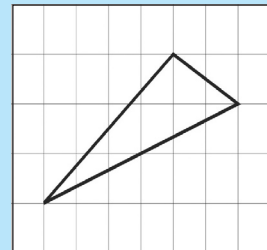
As the sum of the interior angles of a triangle is 180° , the sum of the angles at each vertex point is 360° .

Activity 31.2

Cut out a triangle, like the one shown in the above diagram out of a cardboard. Construct the tessellation shown in the diagram using the triangle. Understand the fact that, the sum of the angles at any vertex point is 360° .

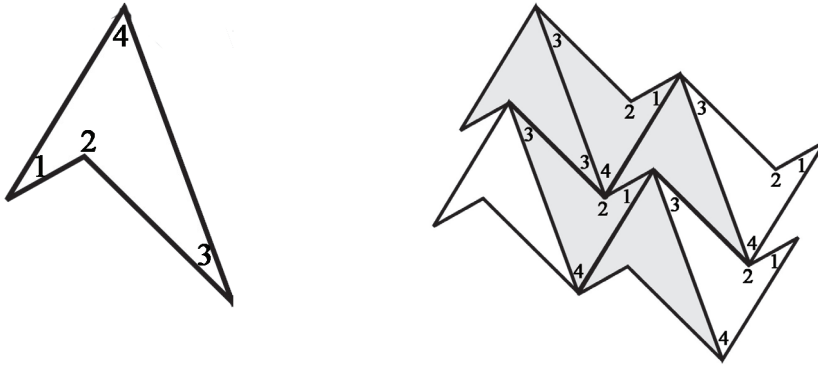
Exercise 31.2

- (1) Make a pure tessellation on a square ruled paper using the triangle given below. Explain why any triangle can be used in a pure tessellation.
- (2) Make a pure tessellation using the given quadrilateral. Explain why a pure tessellation can be made using any quadrilateral.



By considering the sum of the interior angles of a polygon, we can decide whether such a polygon can be used in a tessellation.

See how the sum of the angles at each vertex point of the tessellation gives the sum of angles of the quadrilateral used in the tessellation.



In the above tessellation, the quadrilateral used is not a convex polygon. A tessellation can be made using convex or concave polygons. But this is not true for polygons with more than 4 sides.

In a tessellation done using geometrical shapes, the point where the vertices of the shapes meet is called a **vertex point**. All the shapes used in the tessellation will meet at this point.

Summary

- ★ A tessellation is an arrangement of a shape or several shapes on a surface to form a design, without leaving gaps in between the shapes and without overlapping.
- ★ A tessellation made using only one regular figure is called a regular tessellation.
- ★ A tessellation done using more than one shape is called a semi-pure tessellation.
- ★ In a tessellation, the point at which the vertices of the shapes meet is called the vertex point.
- ★ The sum of the angles at a vertex point should be 360° .