Verify that the Ratio Of the Areas Of a Parallelogram

OBJECTIVE

To verify that the ratio of the areas of a parallelogram and a triangle on the same base and between the same parallels is 2: 1.

Materials Required

1. A plywood piece
2. Graph paper
3. Colour box
4. Two wooden strips
5. Cutter
6. Adhesive
7. Geometry box

Prerequisite Knowledge

1. Area of a triangle.
2. Area of a parallelogram.

Theory

1. For area of triangle refer to Activity 21.
2. For area of parallelogram refer to Activity 19.

Procedure

1. Take a rectangular plywood piece of suitable size and by using adhesive, paste a graph paper on it.
2. Take two wooden strips or wooden scale and fix these two horizontally so that they are parallel.
3. Fix a pair of points P and Q on the base strip and take a pair of points R and S on the another
   strip such that PQ = PS. (see Fig. 22.1)

4. Take any point T on the second strip and join it to P and Q. (see Fig. 22.1)

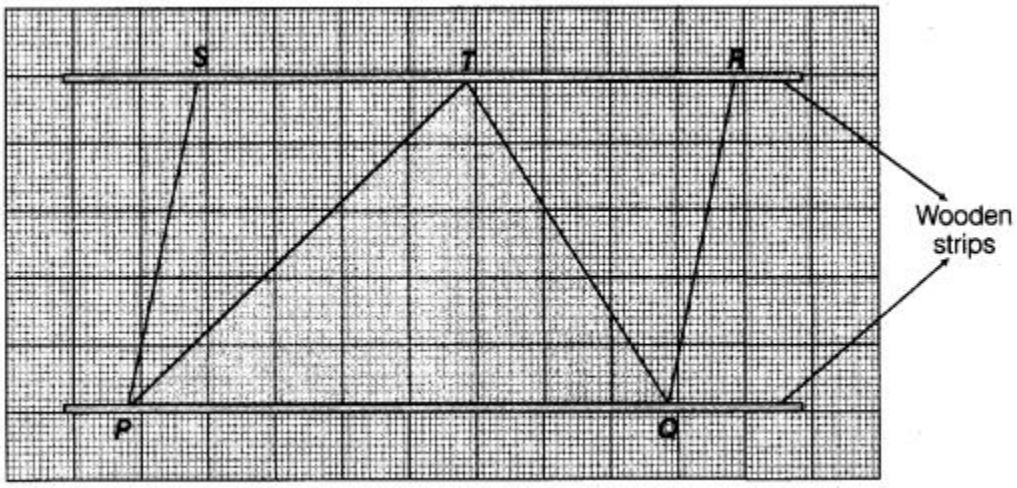

Fig. 22.1

5. T is any point on RS and PQ is parallel to RS.
6. We find that ΔTPQ and parallelogram PQRS lie on the same base PQ and between the same parallels, (see Fig. 22.1)
   Note:
   We may take different triangles TPQ by taking different positions of point T and the two parallel strips, (see Fig. 22.2)

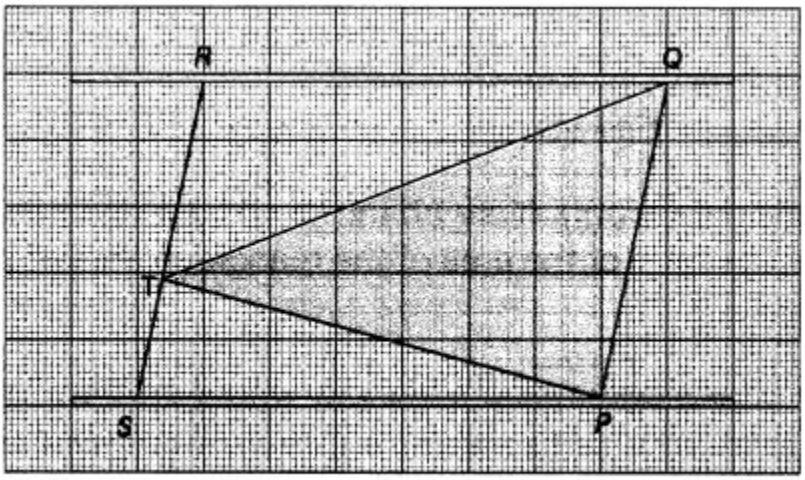

Fig. 22.2

Demonstration

1. Count the number of squares contained in each of the above ΔTPQ and parallelogram PQRS, keeping half square as ½ and more than half square as 1, leaving those squares which are less than half square.

2. We can conclude that the area of the ΔTPQ is half of the area of parallelogram PQRS.

Observation

1. The number of squares in ΔTPQ = …….. ,
2. The number of squares in parallelogram PQRS = ……. ,
   Then, the area of parallelogram PQRS = 2 (area of ΔTPQ).
   Hence, area of parallelogram PQRS: area of ΔTPQ = ……. ,

Result

We find that the ratio of the area of a parallelogram and the area of a triangle on the same base and between the same parallels is 2: 1.

Application

This activity can be used in

1. Deriving formula of the area of a triangle.
2. Solving some problems of mensuration.

Viva Voce

Question 1:

If a triangle and a parallelogram are on the same base and between the same parallels, then how can we relate the area of triangle and parallelogram?

Answer:

Area of the triangle is half the area of parallelogram.

Question 2:

If a triangle and a parallelogram are on the same base and having the equal area, then will they have same altitudes?

Answer:

No, they will not have same altitudes.

Question 3:

If a triangle and a parallelogram are on the same base and between same parallels, then what would be ratio of the area of the triangle to area of parallelogram?

Answer:

Required ratio = 1:2

Question 4:

Do we obtain a parallelogram and a triangle, whose area are in ratio 2:1?

Answer:

Yes, when a parallelogram and a triangle should be on the same base and between same parallels.

Question 5:
How can we find the area of a parallelogram with the help of a triangle?
Answer:
Area of a parallelogram = 2 x Area of a triangle
(which made by one of the diagonal of parallelogram)

Question 6:
How can we find the altitude of a parallelogram?
Answer:
Altitude of a parallelogram is the perpendicular drawn from one line to the another parallel line.

Question 7:
A triangle and a parallelogram on the same base and between the same parallels, will have same altitudes?
Answer:
Yes, they will have same altitudes because distance between two parallel lines remain same at all the points.

Suggested Activity

To verify experimentally the relationship between the areas of a parallelogram and a triangle on the same base and between the same parallels by cut out method.