Verify that the Parallelograms On the Same Base

OBJECTIVE

To verify experimentally that the parallelograms on the same base and between same parallel lines are equal I in area.

Materials Required

1. Graph paper
2. Two wooden strips
3. Nails
4. Elastic strings
5. A plywood piece
6. Adhesive

Prerequisite Knowledge

1. Concept of parallelogram
2. Area of a parallelogram.

Theory

1. **Parallelogram:** A quadrilateral in which both pairs of opposite sides are parallel, is called parallelogram and it is written as || gm.

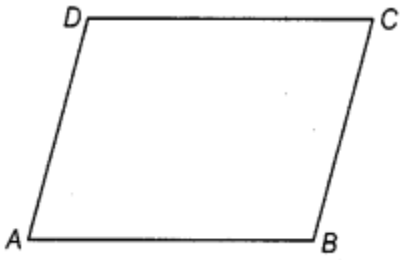

Fig. 20.1

In Fig. 20.1, ABCD is a parallelogram in which AB||CD and BO||AD.
Different properties of parallelograms are given below:

1. A diagonal of a parallelogram divides it into two congruent triangles.
2. In a parallelogram opposite angles are equal.
3. In a parallelogram opposite sides are equal.
4. Diagonals of a parallelogram bisect each other.

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. Now, fix two horizontal wooden strips (parallel to each other) on it. (see Fig. 20.2)
3. Fix two nails V_1 and V_2 on one of the strips, (see Fig. 20.2)
4. On the other strip, fix nails at equal distances ($B_1B_2 = B_2B_3 = \ldots = B_8B_9$). (see Fig. 20.2)

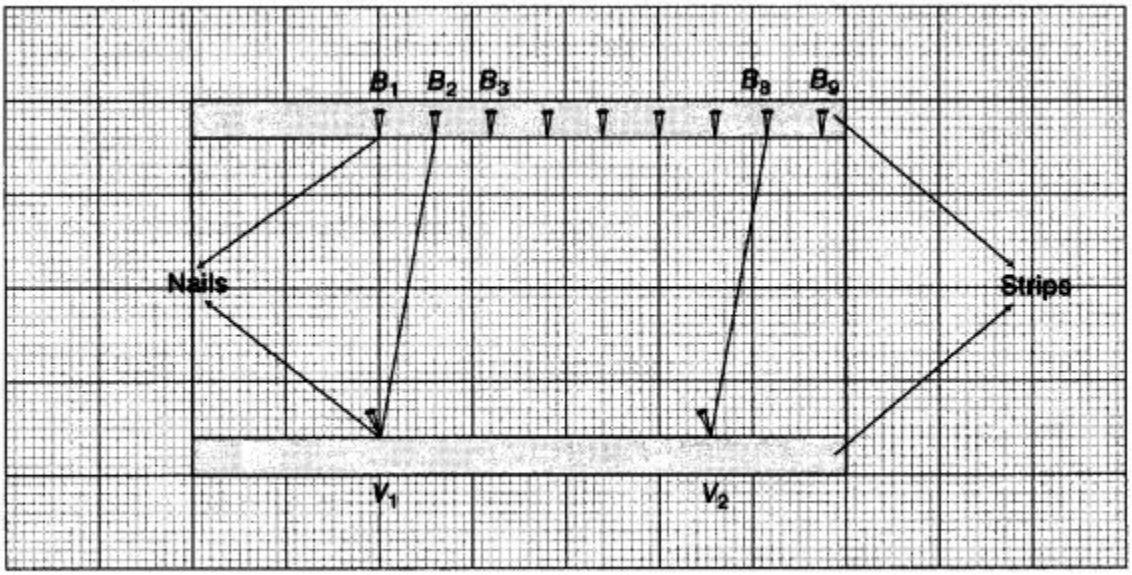

Fig. 20.2

Demonstration

1. We get a parallelogram $V_1V_2B_8B_2$ by putting a string along $V_1V_2B_8$ and B_2. We can find the area of parallelogram by counting the total number of squares.
2. With same base V_1V_2 we get a parallelogram $V_1V_2B_9B_3$ by putting a string along $V_1V_2B_9$ and B_3. We can find the area of parallelogram by counting the total number of squares.
3. We can conclude that area of parallelogram obtained in point 1, i.e. $V_1V_2B_8B_2$= area of parallelogram obtained in point 2, i.e. $V_1V_2B_9B_3$.

Observation

Total number of squares in 1 st parallelogram = …… ,
Total number of squares in 2nd parallelogram = …… ,
Total number of squares in 1 st parallelogram=Total number of squares in 2nd parallelogram Hence, area of 1st parallelogram = …… of 2nd parallelogram

Result

We have verified that the parallelograms lying on the same base and between the same parallel lines are equal in area.

Application

The result is useful in

1. many geometrical problems.
2. deriving the formula for the area of a parallelogram.

Note: We can get the area of a parallelogram by counting squares.
For this, find the number of complete squares, half squares and more than half squares. Less than half squares may be ignored.

Viva Voce

Question 1:
What is the relationship between the areas of the parallelograms on the same base (or equal bases) and between the same parallel lines?
Answer:
Both areas are same.

Question 2:
What are the types of parallelogram?
Answer:
Parallelograms are of three types, Le. rectangle, square and rhombus.

Question 3:
How would you define the area of a parallelogram?
Answer:
Area of parallelogram Is the product of its base and the corresponding altitude.

Question 4:
What is the altitude of a parallelogram?
Answer:
Altitude of parallelogram is perpendicular distance between two parallel sides.

Question 5:
Does the diagonals of a parallelogram divide it into two triangles of equal base?
Answer:
No, the diagonals of a parallelogram divide it into four triangles of equal base.

Question 6:
Is it correct that every square and rhombus are parallelogram?
Answer:
Yes, because opposite sides of there figures are parallel and equal.

Question 7:
In which quadrilateral figure diagonals are not equal other than parallelogram?
Answer:
Rhombus

Question 8:
Is it correct that the diagonals of a parallelogram bisects the angles?
Answer:
Yes

Suggested Activity

Using the above activity, find the area of an isosceles trapezium, if one of its non-parallel side is 5 cm and lengths of two parallel sides are 4 cm and 10 cm.