Activity **3**
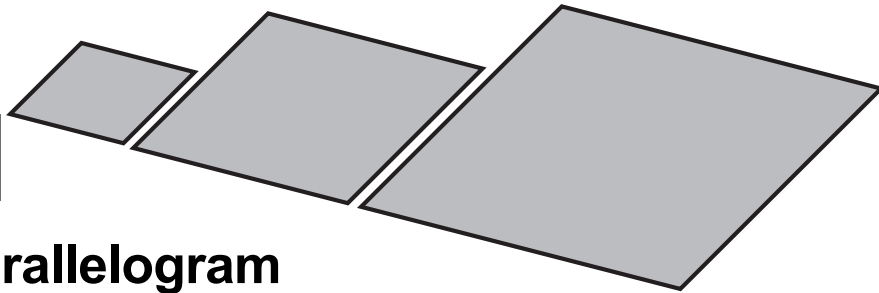
Area of a parallelogram

Objective
To show that the area of a parallelogram is product of its base and height using paper cutting and pasting.

Pre-requisite knowledge
1. Familiarity with Activity 1A and 2.
2. Formula for the area of a rectangle

Material Required
Glazed paper, pencil, a pair of scissors, gum.

Procedure
1. Make a parallelogram by paper folding. Call it ABCD.
2. Cut out the parallelogram with the help of a pair of scissors.
3. Obtain a perpendicular from D to AB meeting AB at E. [Fig 3 (a)]
4. Cut and remove the triangle AED and align AD with BC. Call the displaced segment AE as AE$'$. [Fig 3 (b)]
5. Verify using a scale that EBE$'$ are collinear.
6. Verify that CE$'$ is perpendicular to EBE$'$ and EE$'$ = CD
7. Observe that the figure obtained is a rectangle. [Fig 3 (b)]

Observations
1. Area of parallelogram ABCD = area of rectangle EE$'$CD = (length × breadth)

$$= EE' × CE'.$$

2. Area of parallelogram = base × height.

Learning Outcomes
1. The students will be able to infer that the area of parallelograms with the same base and the same height are identical. This leads to the well-known theorem: "Parallelograms between the same parallel lines and with the same base are equal in area."
2. The students will understand geometrically how the formula for the area of parallelogram (base × height) works.

Remarks
1. Teacher can ask the students to draw perpendiculars from different vertices on opposite sides and verify that the area of parallelogram is product of base and height, independent of which side is taken as the base.

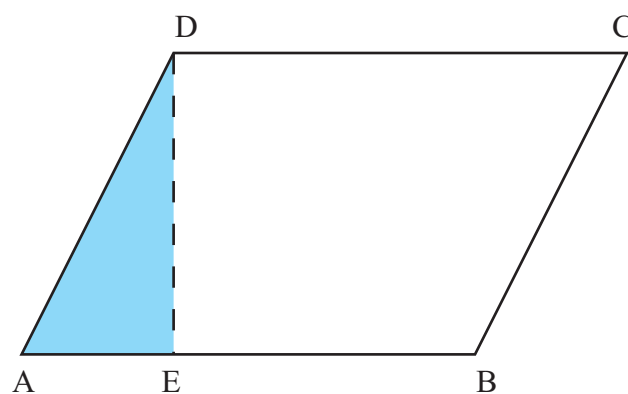2. Teacher can discuss various cases of parallelograms for verification of the formula where the perpendicular falls outside the base. [Fig 3 (c)]
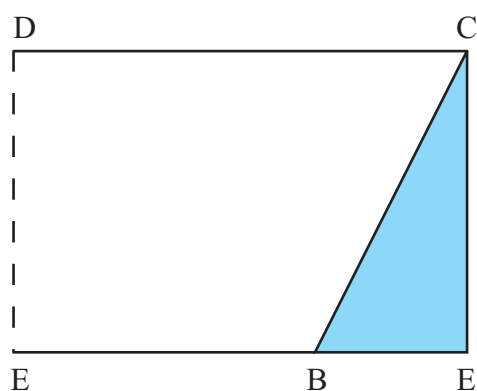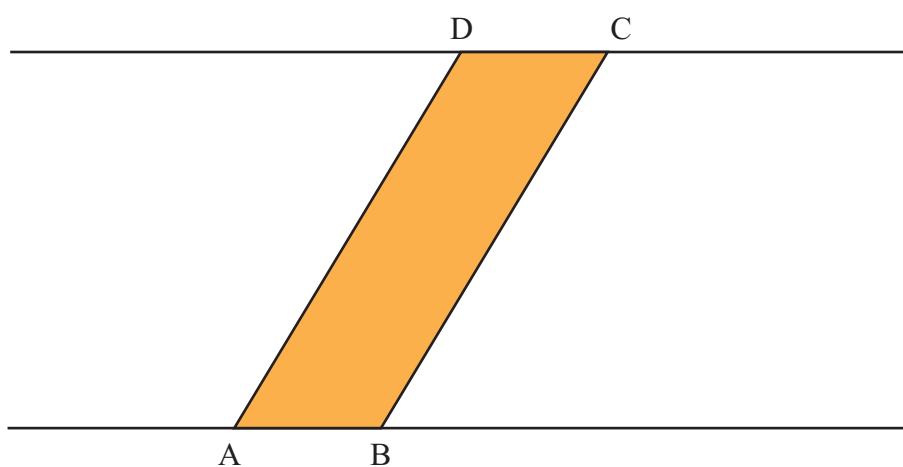
Fig 3 (a)

Fig 3 (b)

Fig 3 (c)