Activity 21

Objective

To obtain angle bisector of an angle by paper folding

Material Required

Thick paper, pencil/pen, ruler, scissors.

Method of Construction

1. Take a thick paper and make an $\angle ABC$ by paper folding (or by drawing) and cut it out.
2. Fold $\angle ABC$ through the vertex B such that ray BA falls along ray BC.
3. Now, unfold it. Mark a point D anywhere on the crease as shown in Fig. 1.

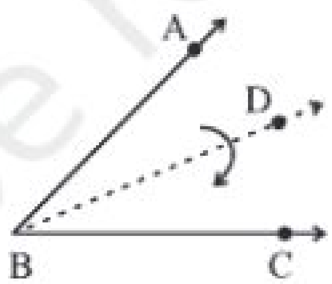

Fig. 1

4. Make cut outs of $\angle ABD$ and $\angle DBC$.

Demonstration

1. Place the cut out of $\angle ABD$ on $\angle DBC$ or the cut out of $\angle DBC$ on $\angle ABD$.
2. $\angle ABD$ exactly covers $\angle DBC$.
3. So, $\angle ABD$ is equal to $\angle DBC$.

   i.e., BD is the angle bisector of $\angle ABC$.

Observation

On actual measurement:

Measure of $\angle ABC$ = _______.

Measure of $\angle ABD$ = _______.

Measure of $\angle DBC$ = _______.

$$\angle ABD = \frac{1}{2}\angle \text{\_\_\_\_\_\_\_}.$$

$$\angle DBC = \angle \text{\_\_\_\_\_\_\_}.$$

$$\angle ABD = \angle \text{\_\_\_\_\_\_\_}.$$

BD is _____ of $\angle ABC$.

Application

1. This activity may be used in explaining the meaning of bisector of an angle.

2. This activity can also be used in finding bisectors of angles of a triangle and to show that they meet at a point.

Activity 22

Objective

To make a parallelogram, rectangle, square and trapezium using set squares.

Material Required

Four pieces of 30° - 90° - 60° set squares and four pieces of 45° - 90° - 45° set squares, cardboard, white paper, pen/pencil, paper, eraser.

Method of Construction

1. Take a piece of cardboard of a convenient size and paste a white paper on it.

2. Arrange different sets of set squares as shown in Figures 1 to 5 and trace the boundary of the figure using pen/pencil.

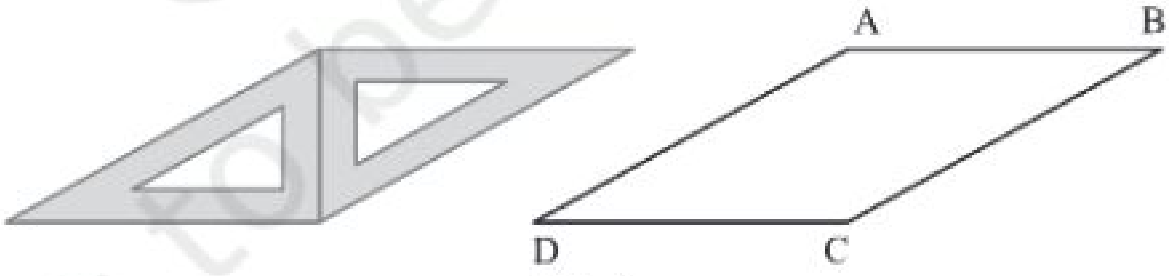

Fig. 1

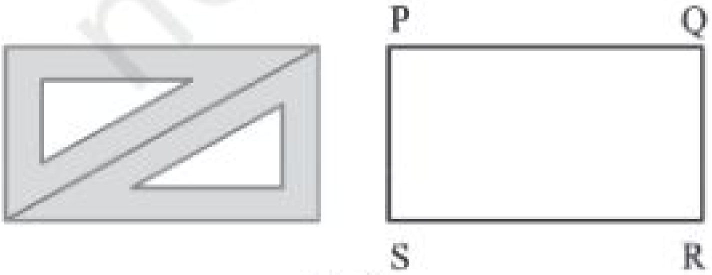

Fig. 2

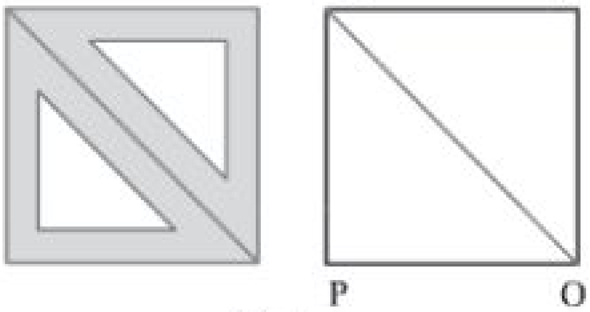

Fig. 3

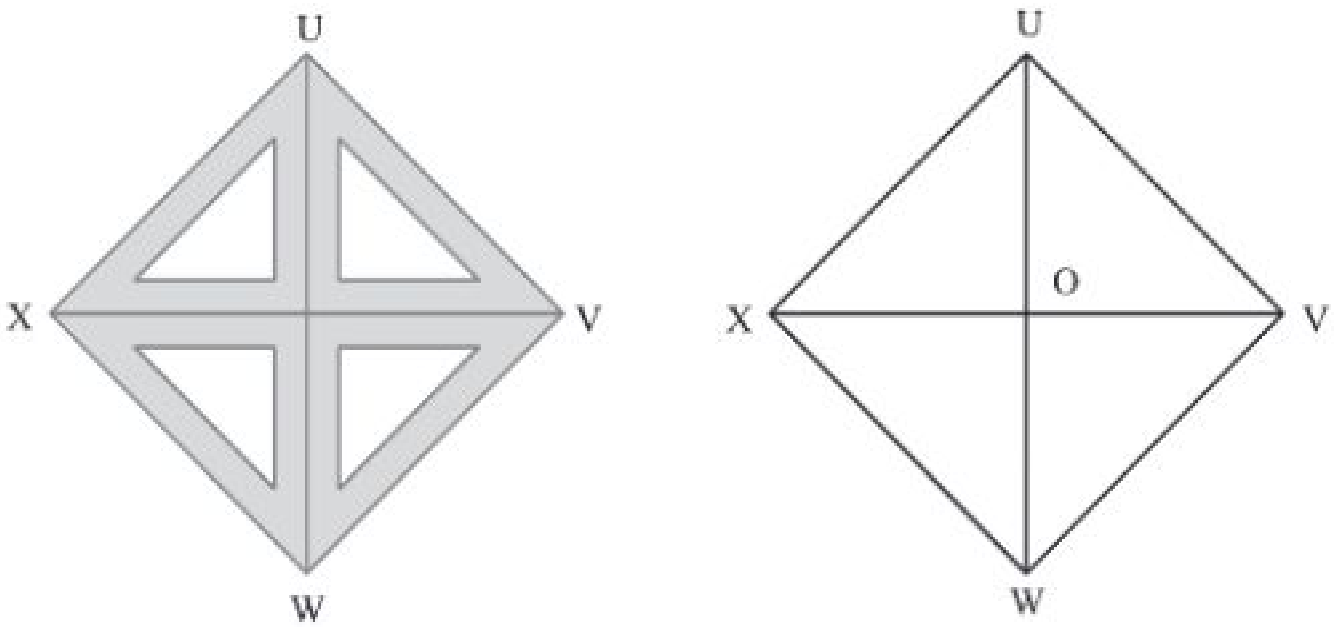

Fig. 4

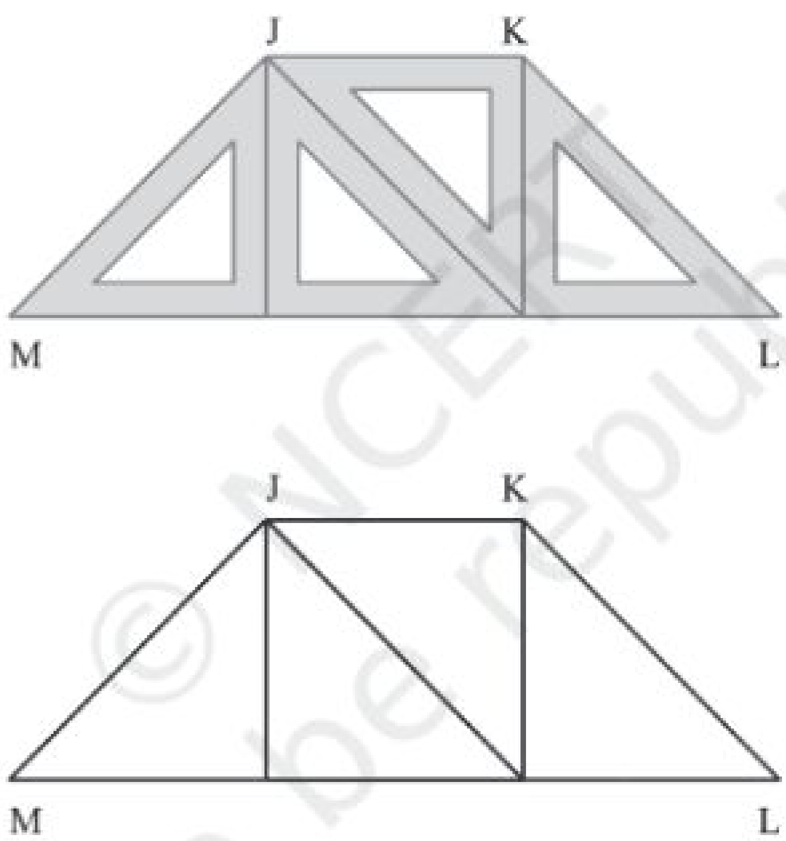

Fig. 5

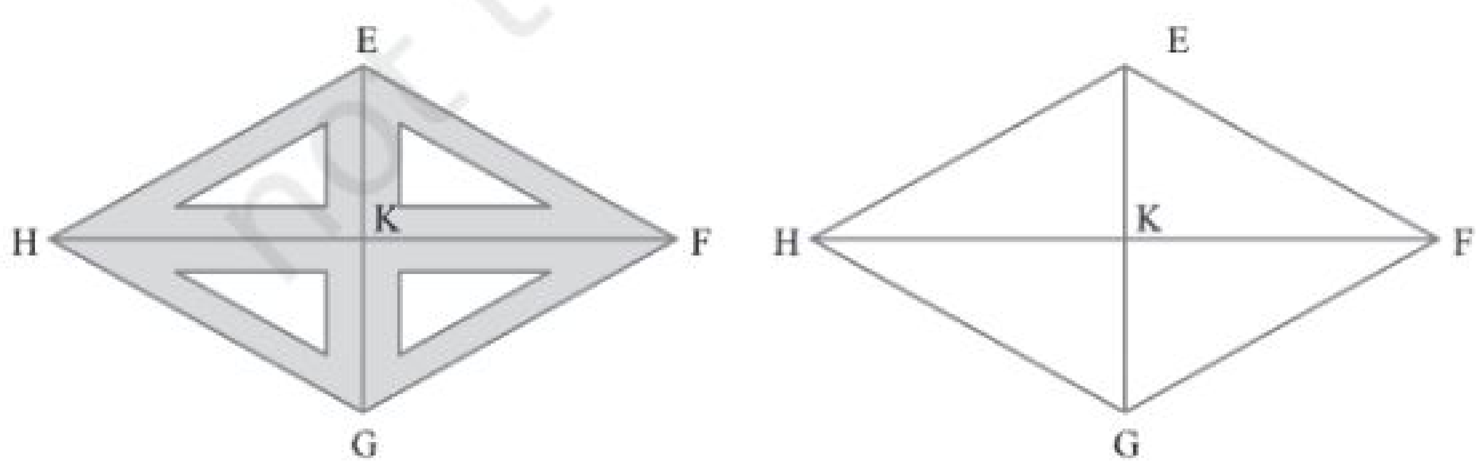

Fig. 6

Demonstration

1. Shape in Fig. 1 is a parallelogram.

   Its opposite sides are equal.

   Its opposite angles are equal.

2. Shape in Fig. 2 is a rectangle.

   Its opposite sides are equal.

   Its each angle is 90°.

3. Shapes in Figures 3 and 4 are squares.

   All its sides are equal.

   Its diagonals bisect at 90° (Fig. 4).

   Its diagonals are equal (Fig. 4).

4. Shape in Fig. 5 is a trapezium with sides JK and ML parallel.

5. Shape in Fig. 6 is a rhombus. All its sides are equal.

   Its diagonals bisect at 90°.

Observation

In Fig 1:

AB = _______ cm.

CD = _______ cm.

AD = _______ cm.

BC = _______ cm, so, AB = CD and AD = _______.

So, ABCD is a _______.

In Fig 2:

PQ = _____ cm, SR = _____ cm, PS = _____ cm, QR = _____ cm.

So, PQ = SR and PS = _____.

Therefore, PQRS is a _____.

In Fig 3:

MN = _____ cm, PO = _____ cm, NO = _____ cm, MP = _____ cm.

So, MN = PO = _____ = _____.

$\angle P = 90^\circ = \angle$ _____ $= \angle$ _____ $= \angle$ _____.

Therefore, MNOP is a _____.

In Fig 4:

UV = ______ cm, VW = ______ cm, WX = ______ cm, XU = ______ cm.

So, UV = VW = ______ = ______.

$\angle U = 45° + 45° = 90°$.

$\angle V$ = ______, $\angle W$ = ______, $\angle X$ = ______,

Diagonals intersect at ______.

Each angle at O = ______.

So, diagonal ______ each other at ______.

Thus, UVWX is a ______.

In Fig 5:

$\angle JML$ = ______.

Measure of $\angle KJM$ = ______ + ______ + ______ = ______.

$\angle KJM + \angle JML$ = ______.

So, JK is ______ to ML.

Hence, JKLM is a ______.

In Fig 6:

EF = ___ cm, FG = ____cm.

GH = ___ cm, HE = ____cm.

So, EF = ___ cm, GH = ____cm.

Diagonals intersect at K.

Each angle at K = ____.

EK = ____ cm.

GK = ____ cm.

HK = ____ cm.

FK = ____ cm.

So, diagonals ____ each other ______.

Thus, EFGH is a rhombus.

APPLICATION

This activity may be used to explain different types of quadrilaterals and their properties.

Activity 23

Objective

To draw a perpendicular to a line from a point not on it, by paper folding

Material Required

Thick paper, pencil/pen.

Method of Construction

1. Fold the paper and get a line AB through folding. Mark a point C on the paper such that C is not on AB as shown in Fig. 1.

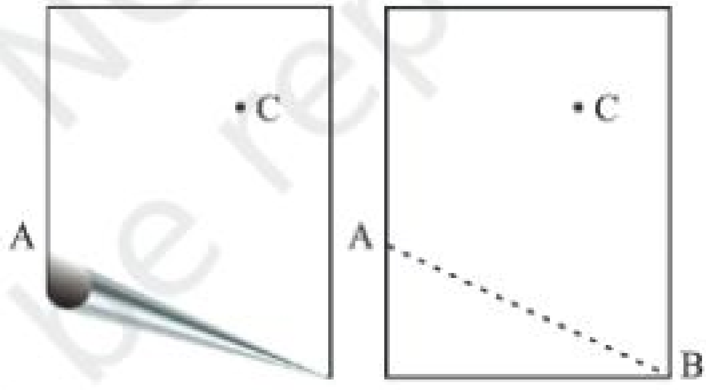

Fig. 1

2. Through C, fold the paper such that A falls on B along AB.

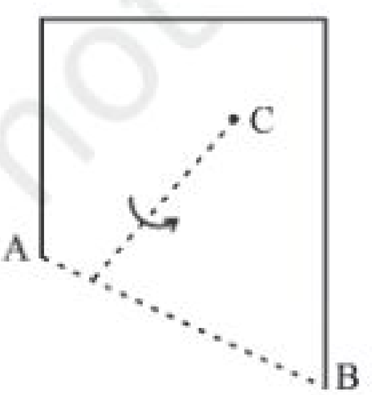

Fig. 2

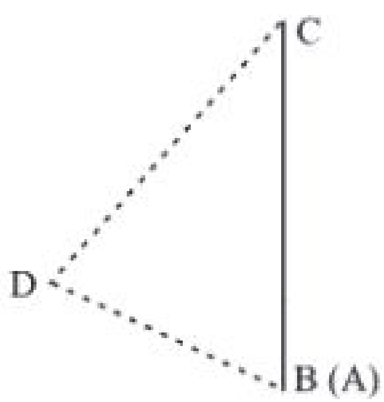

Fig. 3

3. Unfold the sheet.

Demonstration

1. As ∠ADC is equal to ∠BDC so, CD is angle bisector of ∠ADB.
2. ∠ADC and ∠BDC form a linear pair. So, each angle is equal to 90°.
3. Thus, DC is perpendicular from C on AB.

Observation

On actual measurement:

∠ADC = ____.

∠BDC = ____.

So, CD is ______ to AB.

Application

1. This activity may be helpful in explaining the meaning of a perpendicular on the line.
2. This activity can also be used in drawing three altitudes of a triangle which meet at a point.

NOTE

1. Repeat this activity taking some more points other than C not lying on AB. It can be seen that there may be infinitely many perpendiculars to a line but there is only one perpendicular to a line through a point not on it.
2. Through the same activity, drawing a line parallel to a given line can also be demonstrated.

Activity 24

Objective

To obtain formula for the area of a rectangle

Material Required

Cardboard, ruler, pencil/pen, colours, adhesive, glaze paper.

Method of Construction

1. Take a cardboard and paste a light glaze paper on it.
2. Draw a rectangle of length a and breadth b (say a = 6 cm and b = 4 cm) (Fig. 1).
3. Paste it on the cardboard and draw lines parallel to breadth of the rectangle at a distance of 1cm each (Fig. 2).

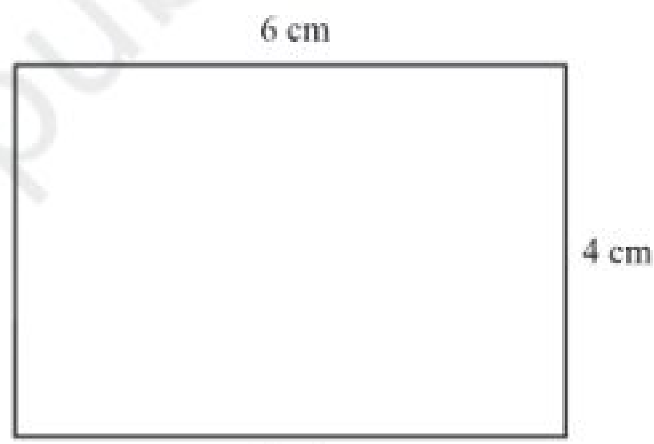

Fig. 1

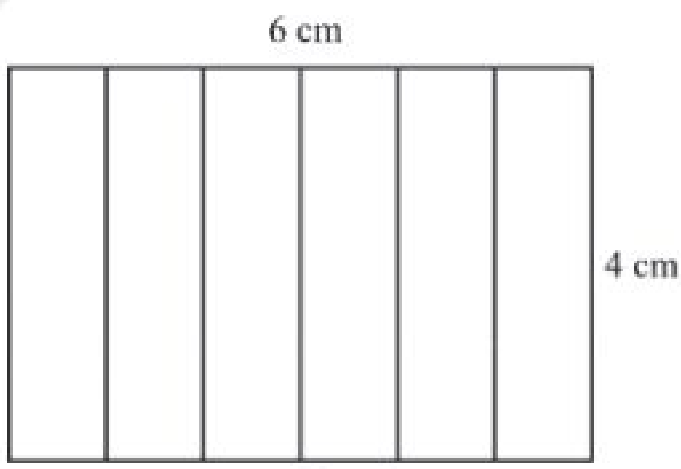

Fig. 2

4. Draw lines parallel to length of the rectangle at a distance of 1 cm each (Fig. 3).

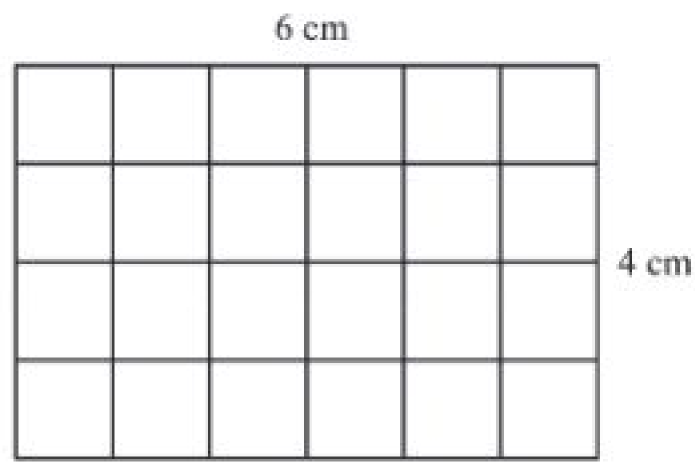

Fig. 3

Demonstration

1. The number of unit squares (1cm × 1cm) in Fig. 3 is 24.

2. $24 = 6 \times 4 = l \times b$.

3. So, area of the rectangle = $l \times b$.

This activity can be repeated by taking rectangles of different lengths and breadths.

Observation

In Fig. 3, the number of unit squares in first row = _______.

The number of unit squares in second row = ________.

The number of unit squares in third row = ________.

The number of unit squares in fourth row = ________.

Total number of unit squares =______ = _______ × ______.

Area of the rectangle = ______ × ______.

Application

This activity can be used to explain meaning of area of a rectangle and also to obtain area of a square.

Activity 25

Objective

To obtain the perpendicular bisector of a line segment by paper folding

Material Required

Thick paper, ruler, pen/pencil.

Method of Construction

1. Take a sheet of thick paper. Fold it in any way. Get a crease by unfolding it. This crease will give a line as shown in Fig.1.

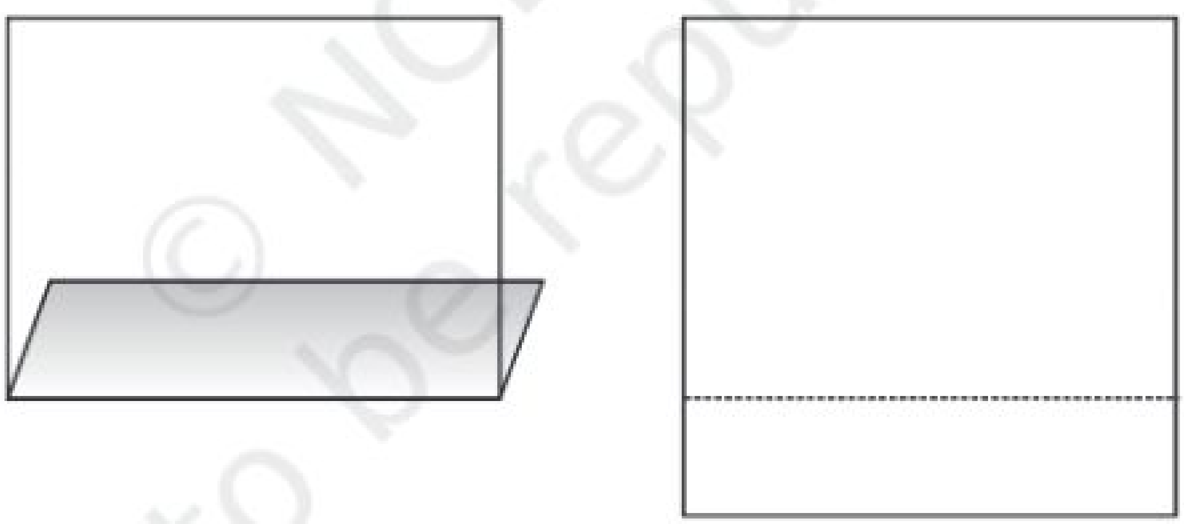

Fig. 1

2. Mark points A and B on this line to get a line segment AB as shown in Fig.2.

3. Fold the paper such that A falls on B. Unfold it and get a crease mark CD on the crease as shown in Fig.3.

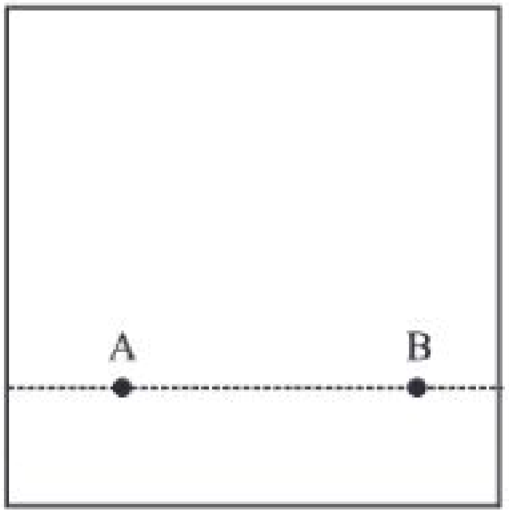

Fig. 2

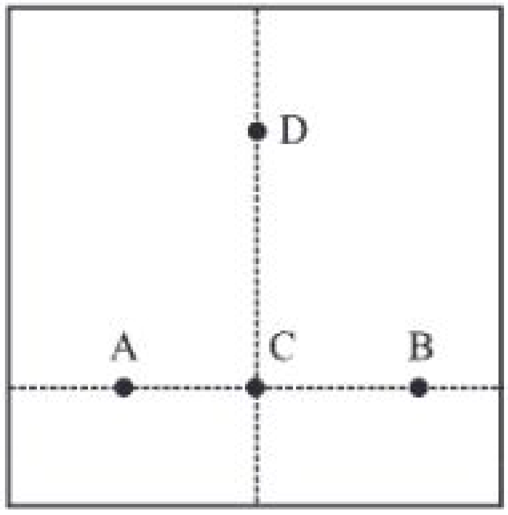

Fig. 3

Demonstration

1. AC is equal to CB as AC exactly covers BC.
2. Since the two rays CA and CB of $\angle$ACB fall on each other, CD is the angle bisector of $\angle$ACB.

   $\angle$ACD exactly covers $\angle$DCB. So, $\angle ACD = \angle DCB = 90°$.
3. CD is perpendicular bisector of AB.

Observation

On actual measurement:

AC = ______, BC = _______.

$\angle$ACD = _____, $\angle$BCD = _______.

Perpendicular bisector of AB is _______.

Application

This activity may be used in obtaining perpendicular bisector of sides of a triangle and to show that the three perpendicular bisectors of a triangle meet at a point.

Activity 26

Objective

To find the lines of symmetry of a figure (say, a rectangle) by paper folding

Material Required

White sheet, tracing paper, scissors, pen/pencil and geometry box.

Method of Construction

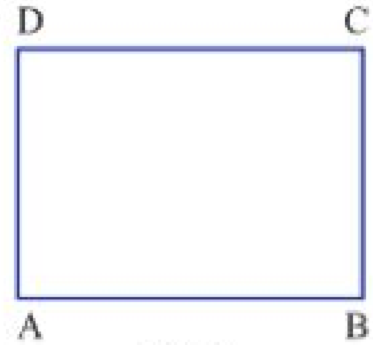

Fig. 1

1. Draw a rectangle ABCD on a white sheet of paper (Fig. 1).
2. Make a trace copy of the rectangle ABCD and cut it out.
3. Try to fold this cut out of the rectangle along its width into two halves (Fig. 2).

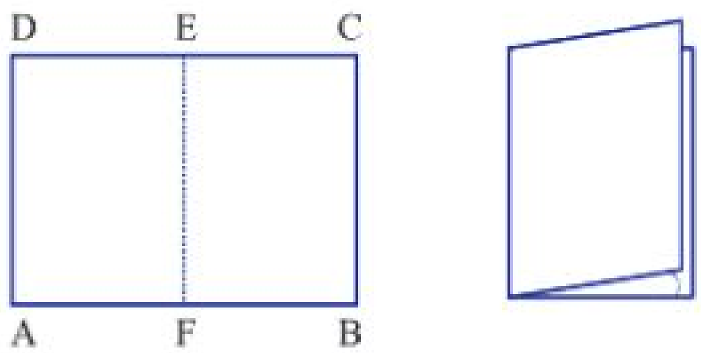

Fig. 2

4. Try to fold this cut out of the rectangle along its length into two halves.
5. Open the fold and try to fold it along some other line say the diagonal BD (Fig. 3).
6. Try to fold the cut out of the rectangle along the other diagonal AC.

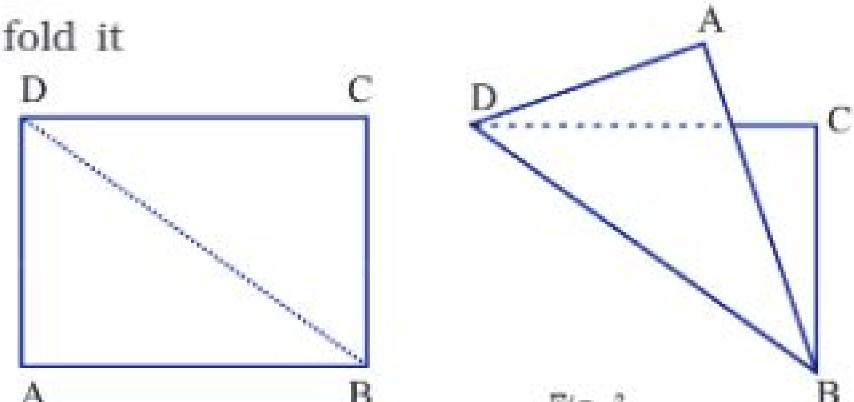

Fig. 3

7. In Steps 3 and 4, one part of the rectangle exactly covers the other part.

   So, crease gives a line of symmetry in each case.

   Thus, the line segments EF and GH (say) obtained in Steps 3 and 4 respectively, passing through the mid points of opposite sides of the rectangle are two lines of symmetry.

8. In Steps 5 and 6, one part of the rectangle does not cover exactly the other part.

   So, crease along the diagonal is not a line of symmetry.

   Thus, there are only two lines of symmetry for a rectangle.

Observation

Complete the following table:

Fold	Two parts coincide/ Not coincide	Line of Symmetry
Along the width	Coincide	Yes
Along the diagonal AC	Do not coincide	No
Along the length	—	—
Along the diagonal BD	—	—

Thus, there are ___ lines of symmetry for a rectangle.

They are the lines passing through ___ points of the opposite ____ of the rectangle.

Application

The activity is useful in finding the lines of symmetry of a figure, if they exist.

Activity 27

Objective

To see that shapes having equal areas may not have equal perimeters

Material Required

Cardboard, white sheet of paper, pencil, ruler, eraser, adhesive, colours.

Method of Construction

1. Take a cardboard of a convenient size and paste a white paper on it.
2. Draw a 10×10 square grid on it.
3. Make 30 square cardboard pieces of side 1cm each.

Demonstration

1. Divide the class into groups of 5 children each.
2. Ask one child to arrange 7 square pieces adjacent to each other to get a shape as shown below (Fig.1).

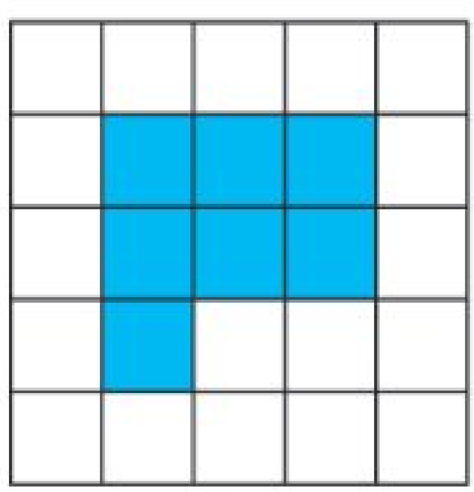

Fig. 1

3. Each child of the group will arrange 7 other square pieces to make a shape different from her/his group members (as shown in Fig. 2 to Fig. 5).

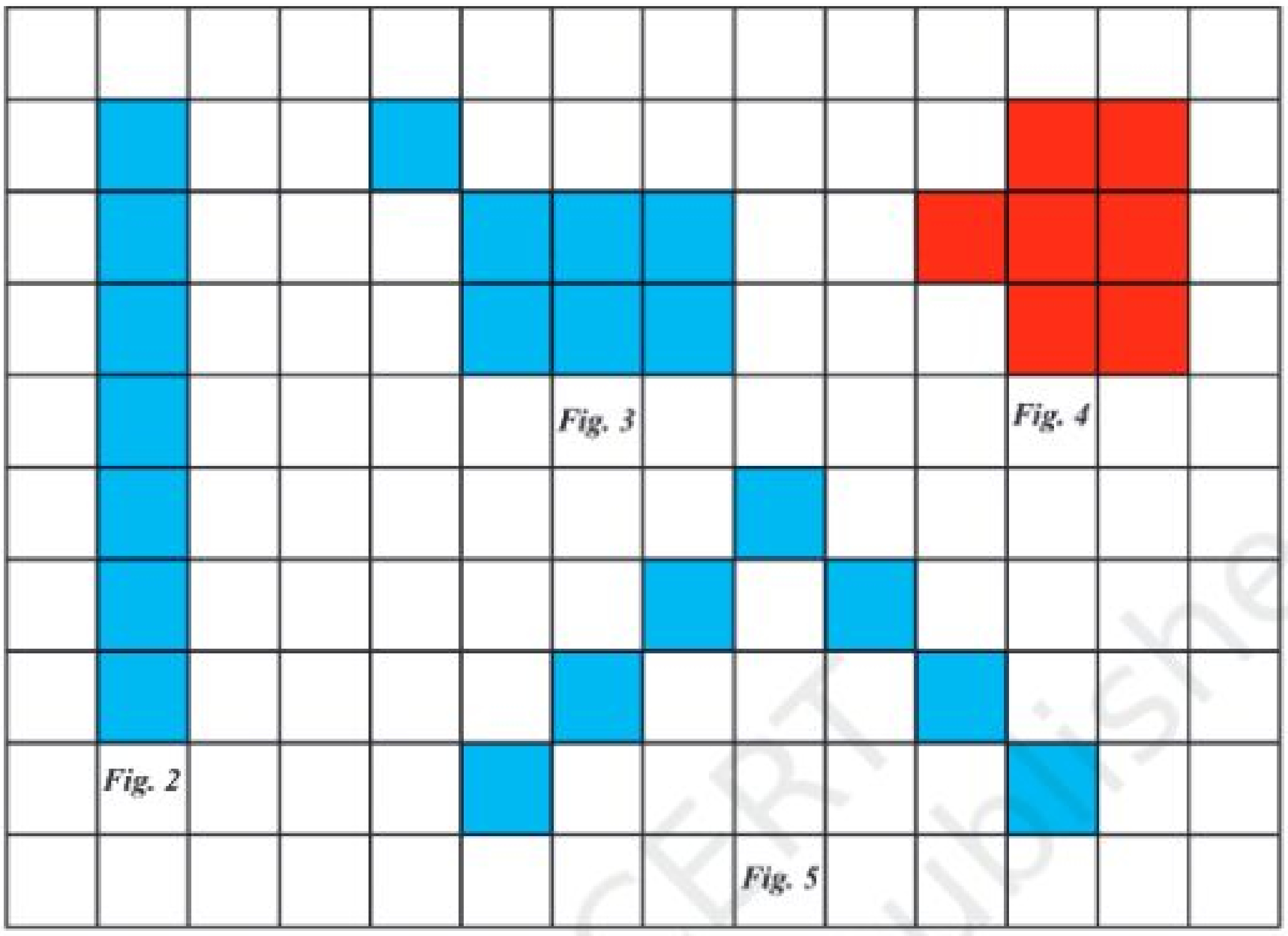

Fig. 2 to 5

4. The children will find the perimeter of each shape so formed and compare their perimeters.

5. Children will find that areas of all the shapes are the same but their perimeters are not the same.

Observation

Complete the table:

Child	Figure	Area (Square units)	Perimeter
1	1	7	12 cm
2	2	–	–
3	3	–	–
4	4	–	–
5	5	–	–

Therefore, if the areas of two or more shapes are same then it is not necessary that their perimeters are also equal.

APPLICATION

1. The activity can also be extended to see if the perimeters of two or more shapes are equal, then their areas are also equal or not?
2. The same activity can be performed using different number of square pieces.
3. This activity can be used to make different packing boxes of the same areas but with minimum perimeter and for tiling the floors and walls in different designs.