Verify that the Sum Of the Angles Of a Quadrilateral Is 360°

OBJECTIVE

To verify experimentally that the sum of the angles of a quadrilateral is 360°.

Materials Required

1. Cardboard
2. White paper
3. Tracing paper
4. Cutter/scissors
5. Coloured drawing sheets
6. Geometry box
7. Adhesive
8. Sketch pens

Prerequisite Knowledge

Concept of quadrilateral and its properties.

Theory

1. **Quadrilateral:** A closed figure having four sides, four angles and four vertices is called a quadrilateral.
   Here, the term 'Quad' means 'Four' and term 'Lateral' means 'Sides', so that the term 'Quadrilateral' means 'a figure bounded by four sides'.
   In a quadrilateral ABCD, AB, BC, CD and DA are the four sides; A, B, C and D are the four vertices and ∠A, ∠B, ∠C and ∠D are the four angles formed at the vertices, (see Fig. 18.1).

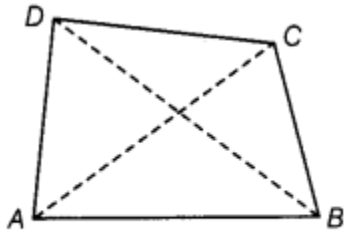

Fig. 18.1

2. **Terms Related to Quadrilateral**

   1. **Opposite Sides:** Two sides of a quadrilateral which do not intersect, i.e. have no common end point (vertex) are called opposite sides. In quadrilateral ABCD, AB, CD and BC, AD are two pairs of opposite sides.

2. **Consecutive or Adjacent Sides:** Two sides of a quadrilateral which have a common point, i.e. intersect each other are called consecutive sides. In quadrilateral ABCD, AB, BC; BC, CD;
CD, DA and DA, AB are four pairs of consecutive sides.

3. **Opposite Angles:** Two angles of a quadrilateral are said to be opposite angles, if they do not have common arm. In quadrilateral ABCD, ∠A, ∠C and ∠B, ∠D are two pairs of opposite angles.

4. **Consecutive or Adjacent Angles:** Two angles of a quadrilateral are said to be consecutive or adjacent angles, if they have a common arm. In quadrilateral ABCD, ∠A, ∠B; ∠B, ∠C; ∠C, ∠D and ∠D, ∠A are four pairs of consecutive angles.

5. **Diagonal:** In a quadrilateral, the line segment joining the opposite vertices is called a diagonal of the quadrilateral. In quadrilateral ABCD, AC and BD are two diagonals.

3. The sum of the four angles of a quadrilateral is 360°.

Procedure

1. Take a piece of rectangular cardboard of suitable size and by using adhesive, paste a white paper on it.

2. Cut out a quadrilateral from a drawing sheet and name it as ABCD. Now, using adhesive, paste it on cardboard, (see Fig. 18.2).

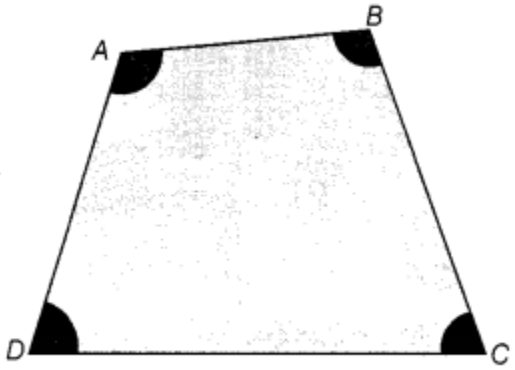

Fig. 18.2

3. Make cut outs of ∠A, ∠B, ∠C & ∠D of Quadrilateral ABCD with the help of tracing paper.(see in Fig.18.3).

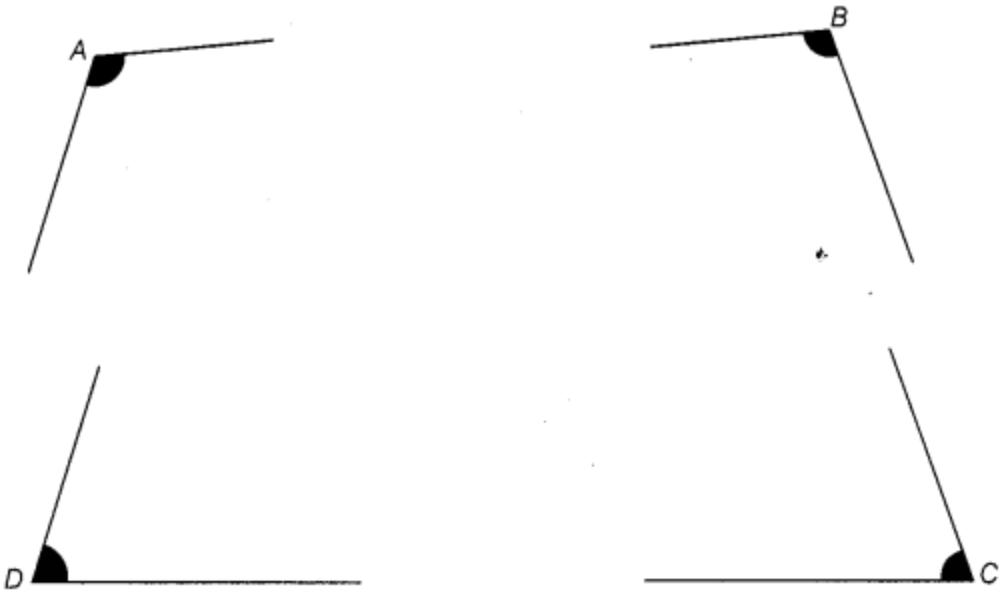

Fig. 18.3

4. Arrange the four cut out angles at a point O. (see Fig.18.4).

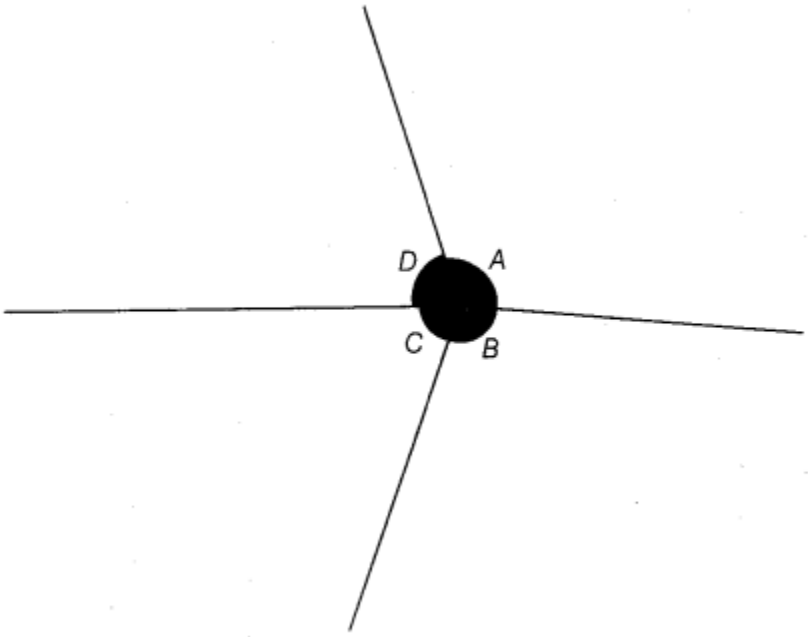

Fig. 18.4

Demonstration

1. We came to know that the vertex of each cut out angle coincides at the point O.
2. Such arrangement of cut outs indicates that the sum of the angles of a quadrilateral forms a complete angle, i.e. 360°.

Observation

Measures of ∠A = ……. ,
∠B = ……. ,
∠C = ……. ,
∠D = ……. ,
Sum of ∠A + ∠B + ∠C + ∠D = ……. .

Result

We have verified that the sum of the angles of a quadrilateral is a complete angle, i.e. 360°.

Application

This property may be useful in solving problems related to many types of quadrilaterals, such as parallelograms, trapeziums, rhombuses, squares and rectangles, etc.

Viva Voce

Question 1:
What is the angle sum property of a quadrilateral?
Answer:
The sum of all angles of a quadrilateral is a complete angle, i.e. 360°.

Question 2:
The sum of three angles of a quadrilateral is 280°. Find the measure of the fourth angle.
Answer:
Fourth angle = 360° – 280° = 80°

Question 3:
Is it true that every parallelogram is a rectangle?
Answer:
No, only those parallelogram is a rectangle whose all angles are 90°.

Question 4:
In which quadrilateral(s), diagonals are perpendicular to each other?
Answer:
Rhombus

Question 5:
Is it true that diagonals of a rhombus are equal?
Answer:
No

Question 6:
What are the conditions that any quadrilateral be a square?
Answer:

1. All four sides of a quadrilateral are equal.
2. Each angle of a quadrilateral is 90°.
3. Diagonals are equal and bisect each other.

Question 7:
Is it true that parallelogram is always a trapezium but a trapezium is not always a parallelogram?
Answer:
True

Question 8:
How many vertices a quadrilateral has?
Answer:
A quadrilateral has 4 vertices.

Question 9:
Can all the angles of a quadrilateral be right angles? Give reason.
Answer:
Yes, all the angles of a quadrilateral can be right angles, e.g. Square and rectangle.

Suggested Activity

Verify experimentally the angle sum property for other types quadrilateral.