

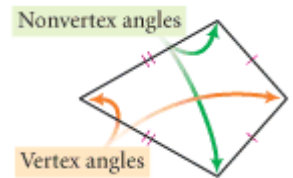
## Lesson 5.3: Kite and Trapezoid Properties

In this lesson you will:

- investigate the properties of kites
- investigate properties of trapezoids and isosceles trapezoids

In this lesson you will look at two special types of quadrilaterals, kites and trapezoids. Recall that a kite is a quadrilateral with two distinct \_\_\_\_\_ of \_\_\_\_\_ consecutive sides.

You can make a kite by constructing two different isosceles triangles on opposite sides of a common base and then removing the base. In an isosceles triangle, the angle between the two congruent sides is called the \_\_\_\_\_ angle. For this reason, we'll call angles between the pairs of congruent sides of a kite vertex angles. We'll refer to the other two angles as \_\_\_\_\_ angles. (Label these angles on your example in your vocabulary list under "kite" like they are in the diagram to the right.)

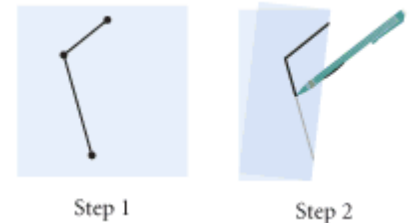


A kite has one line of \_\_\_\_\_ symmetry, just like an isosceles triangle. You can use this property to discover other properties of kites.

### Investigation 5.3.1: "What Are Some Properties of Kites?"

In this investigation you will look at angles and diagonals in a kite to see what special properties they have.

- A.) On patty paper, draw two connected segments of different lengths, as shown. Fold through the endpoints and trace the two segments on the back of the patty paper.
- B.) Compare the size of each pair of opposite angles in your kite by folding an angle onto the opposite angle. Are the vertex angles congruent? \_\_\_\_\_ Are the nonvertex angles congruent? \_\_\_\_\_ Complete the conjecture below based on your observations. (Don't forget to add all conjectures to your conjecture list!)



#### Kite Angles Conjecture (C-34)

The \_\_\_\_\_ angles of a kite are \_\_\_\_\_.

- C.) Draw the diagonals of your kite on the patty paper. How are the diagonals related?

Share your observations with others in your group and complete the conjecture below.

#### Kite Diagonals Conjecture (C-35)

The diagonals of a kite are \_\_\_\_\_.

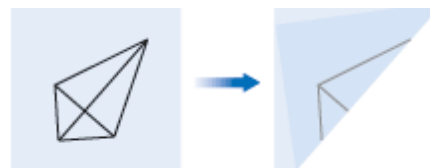
What else seems to be true about the diagonals of kites?

- D.) Compare the lengths of the segments on both diagonals. Does the diagonal created by connecting the vertex angles bisect the diagonal created by connecting the nonvertex angles? \_\_\_\_\_ Does the diagonal created by connecting the nonvertex angles bisect the diagonal created by connecting the vertex angles? \_\_\_\_\_ Based on your observations, complete the conjecture below.

### Kite Diagonal Bisector Conjecture (C-36)

The diagonal connecting the \_\_\_\_\_ angles of a kite is the perpendicular \_\_\_\_\_ of the other diagonal.

- E.) Fold along both diagonals. Does the diagonal created by connecting the vertex angles bisect the vertex angles? \_\_\_\_\_ Does the diagonal created by connecting the nonvertex angles bisect the nonvertex angles? \_\_\_\_\_ Based on your observations, complete the conjecture below.

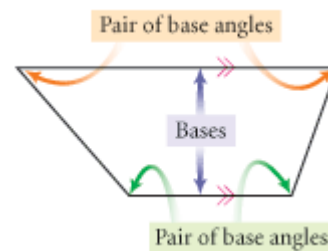


### Kite Angle Bisector Conjecture (C-37)

The \_\_\_\_\_ angles of a kite are bisected by a diagonal.

You will prove the Kite Diagonal Bisector Conjecture and the Kite Angle Bisector Conjecture as part of your assignment.

Let's move on to trapezoids. Recall that a trapezoid is a quadrilateral with exactly one pair of \_\_\_\_\_ sides. In a trapezoid the parallel sides are called \_\_\_\_\_. A pair of angles that share a base as a common side are called \_\_\_\_\_ angles. (Label these angles on your example in your vocabulary list under "trapezoid" like they are in the diagram to the right.)



### Investigation 5.3.2: "What Are Some Properties of Trapezoids?"

- A.) Use the two edges of your ruler to draw parallel segments of unequal length. Draw two nonparallel sides connecting them to make a trapezoid.

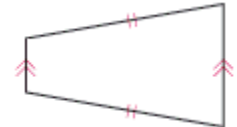
B.) Use your protractor to find the sum of the measures of each pair of consecutive angles between the parallel bases. What is the sum of each pair? \_\_\_\_\_ Based on your observations, complete the conjecture below.



**Trapezoid Consecutive Angles Conjecture (C-38)**

The consecutive angles between the bases of a trapezoid are \_\_\_\_\_.

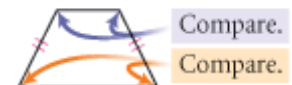
A trapezoid whose nonparallel sides are the same length is called an **isosceles trapezoid**. Next, you will discover a few properties of isosceles trapezoids.



Like kites, isosceles trapezoids have one line of reflectional symmetry. The line of symmetry for an isosceles trapezoid passes through the midpoints of the bases of the trapezoid.

C.) Use both edges of your ruler to draw parallel lines. Using your compass, construct two congruent, nonparallel sides between the parallel lines to make an isosceles trapezoid.

D.) Measure each pair of base angles. Are they congruent? \_\_\_\_\_ Based on your observations, complete the conjecture below.



**Isosceles Trapezoid Conjecture (C-39)**

The base angles of an isosceles trapezoid are \_\_\_\_\_.

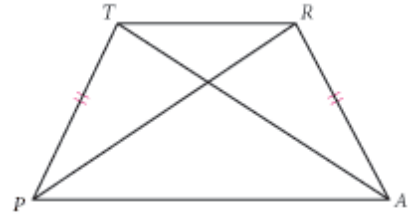
E.) Draw both diagonals on your isosceles trapezoid in part C. Compare their lengths. Based on your observations, complete the conjecture below.



**Isosceles Trapezoid Diagonals Conjecture (C-40)**

The diagonals of an isosceles trapezoid are \_\_\_\_\_.

•Example 1: Write a flowchart proof that shows how the Isosceles Trapezoid Diagonals Conjecture follows logically from the Isosceles Trapezoid Conjecture. Use the diagram at right.



⇒ASSIGNMENT: \_\_\_\_\_