



A shape with several properties &  
possible definitions!!

-- Julie Maness

Samples from students' work  
on The Project  
"To Me a Kite is..."

# GEOMETRY

## Kite Project

By Julie Maness



### Terms to know:

**Adjacent** – Lines that are adjacent are lines that are connected to each other.

**Bisect** – A line that bisects is a line that cuts another line in half.

**Congruent** – Same

**Diagonals** – A diagonal line starts at one angle and ends at the opposite angle.

**Line of Symmetry** – A line of symmetry divides a shape into two identical parts.



**Perpendicular** – Lines that are perpendicular are lines that cross to make a right angle.

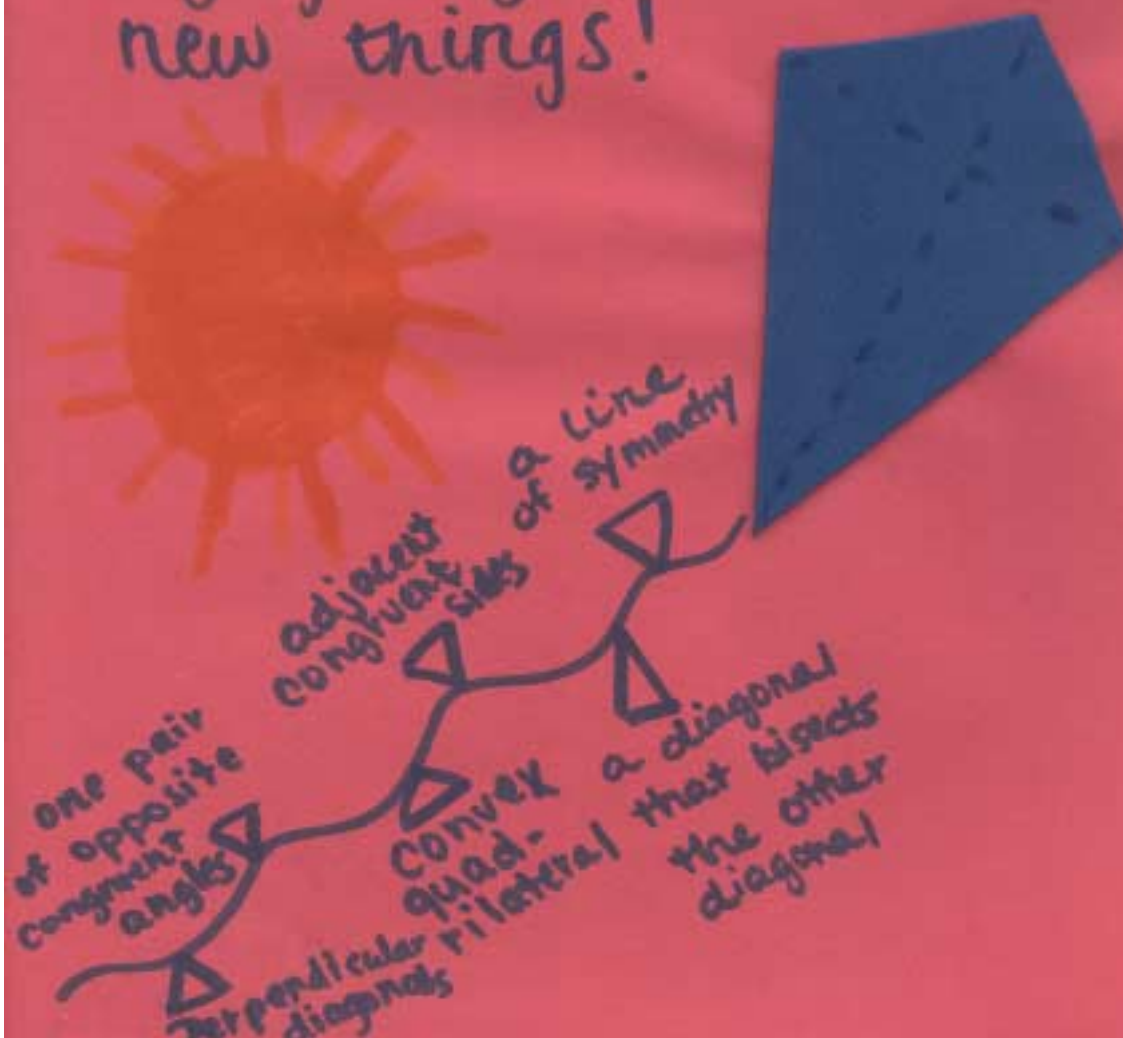
**Properties** – Characteristics

**Quadrilateral** – A shape with four sides



-- Julie Maness

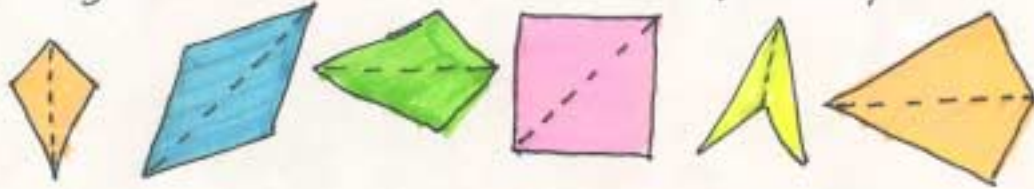
As a child, I would see  
Kites flying high in the  
sky. Now, however, when I  
see those quadrilaterals  
flying high I will see  
new things!



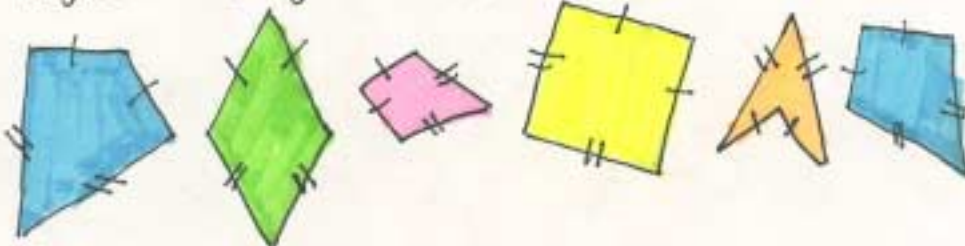
-- Marianne Elsbery

## Possible Definitions of Kites....

A kite is a quadrilateral with at least one diagonal that is a line of symmetry.



A kite is a quadrilateral that has two pairs of adjacent congruent sides.



These are good definitions of kites because kites always satisfy these descriptions. Note also that rhombuses and squares are special cases of kites. The other quadrilateral is a more general case of kite. This quadrilateral proves that although kites are usually convex, they can be concave ( $\triangle$ ).

-- Amy Henard

# Definition of a Kite:

A Kite is a convex quadrilateral with 2 pairs of adjacent congruent sides, but with opposite sides not congruent.



This means that 2 sides by each are the same length. The side opposite of one side, however, is not the same length.

■ -- Marianne Elsberry

Note this definition rules out both the square and rhombus as kites.

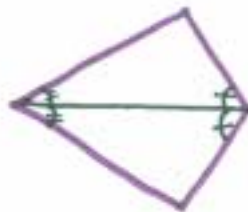
# Definitions of a Kite:

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- A kite is a quadrilateral that has two pairs of adjacent congruent sides and diagonals which are perpendicular.



- A kite is a quadrilateral in which one of the diagonals bisects a pair of opposite angles.

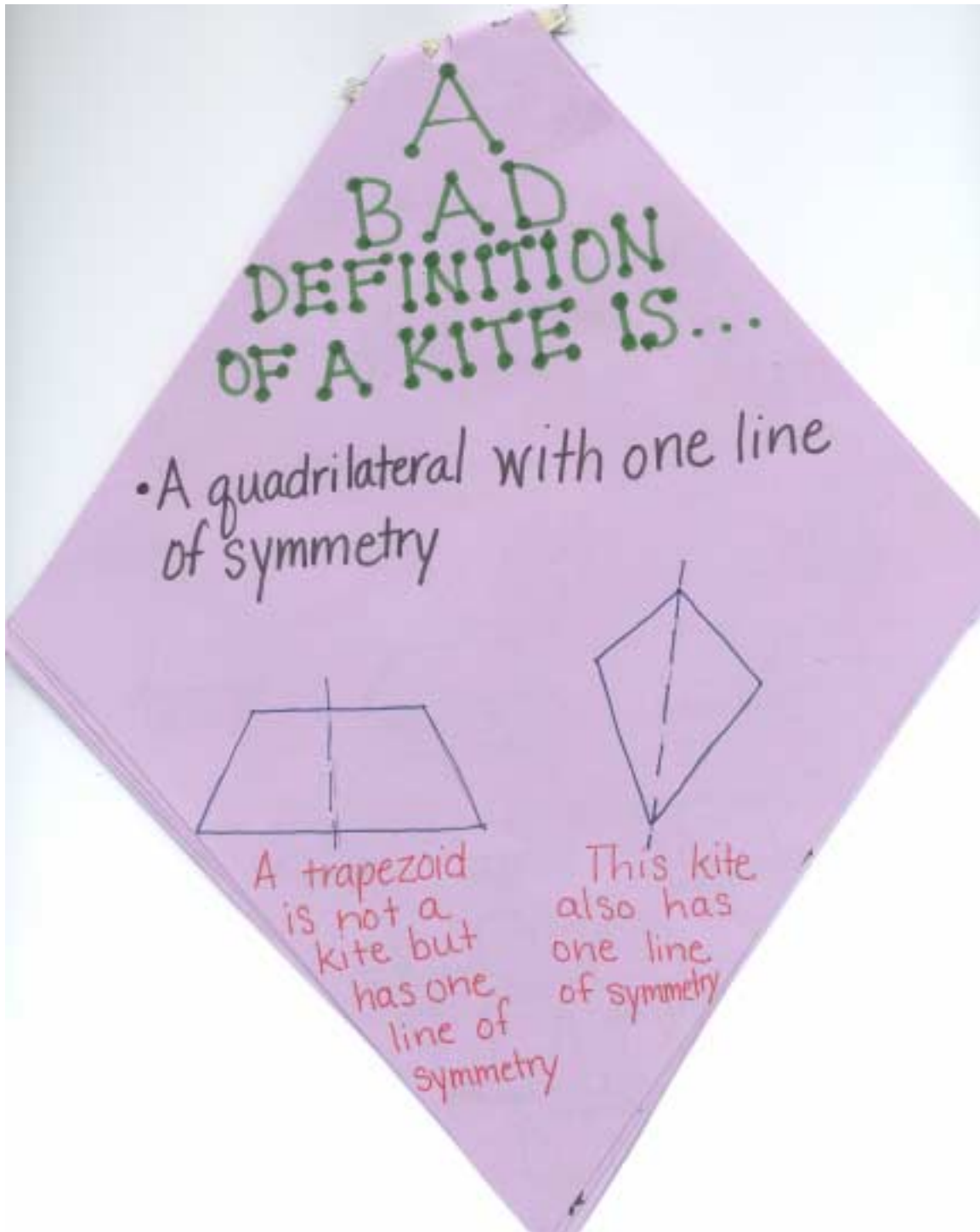


- A kite is a quadrilateral in which at least one diagonal is a line of symmetry and has one pair of opposite congruent angles.



-- Christine Ramey

## Bad Definitions of a Kite....



-- Jaque Wiles

# A Kite Is Not...

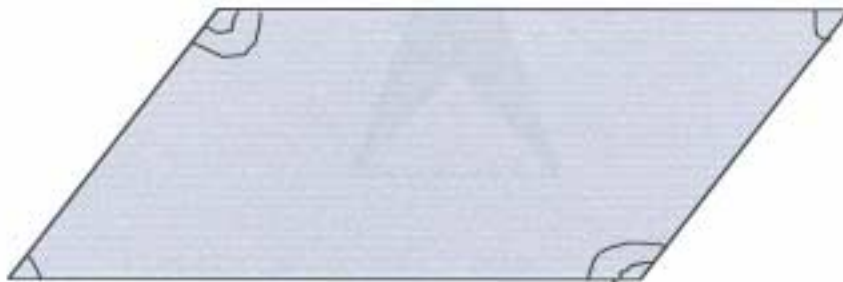
A kite cannot be defined simply as a convex quadrilateral that has perpendicular diagonals. This is one property of a kite, but it does not define a kite.



- Liberty Bell

## Another Bad Definition....

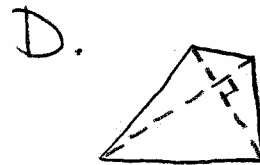
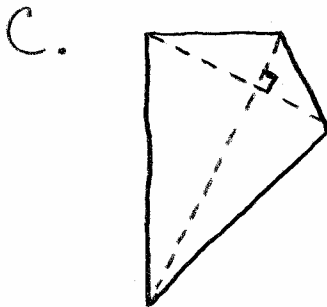
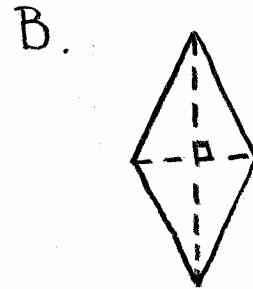
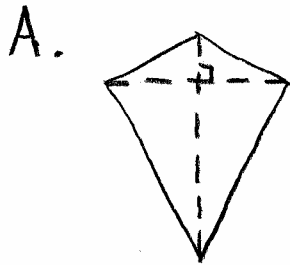
A kite is a quadrilateral that has at least one pair of congruent opposite angles.



-- Jason Brakhage



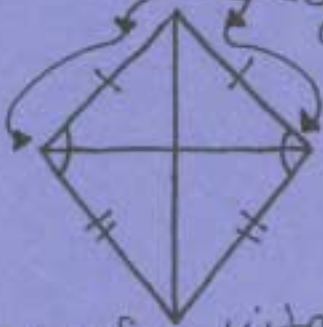
Maybe we could say that a kite is a convex quadrilateral that has perpendicular diagonals. In some cases this is a suitable property, but far from a good definition. Examples A and B are kites that follow this definition, but C and D also follow this definition, but are not kites.



-- Justin P


# Properties of Kites....

1. A kite has one pair of opposite congruent angles.




opposite congruent angles

2. One diagonal of a kite must be the kite's line of symmetry.



line of Symmetry.

3. One diagonal of the kite must be a perpendicular bisector of the other diagonal.



bisected perpendicular

The image contains three hand-drawn diagrams of a kite, each illustrating a different property. The first diagram shows a kite with two pairs of adjacent sides marked as congruent (one pair with single tick marks, the other with double tick marks). The top and bottom angles are marked with arcs and labeled 'opposite congruent angles'. The second diagram shows the same kite with a vertical diagonal line drawn from the top vertex to the bottom vertex, labeled 'line of Symmetry'. The third diagram shows the same kite with a vertical diagonal line and a horizontal diagonal line. The vertical diagonal is labeled 'bisected perpendicular' and has small tick marks on the horizontal diagonal indicating it is bisected. A right-angle symbol is shown at the intersection of the diagonals.

-- Amanda Collins

# Various Properties of a Kite:

- Kites have four sides.



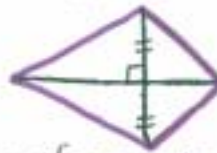
- Kites have at least one diagonal as a line of symmetry.



- Kites have two pairs of adjacent congruent sides.

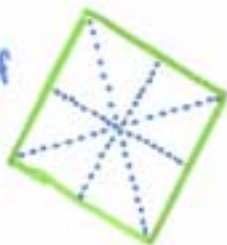


- Kites have at least one diagonal, which is a perpendicular bisector of the other.



- Kites have at least one line of symmetry.

4 lines of symmetry



line of symmetry



2 lines of symmetry

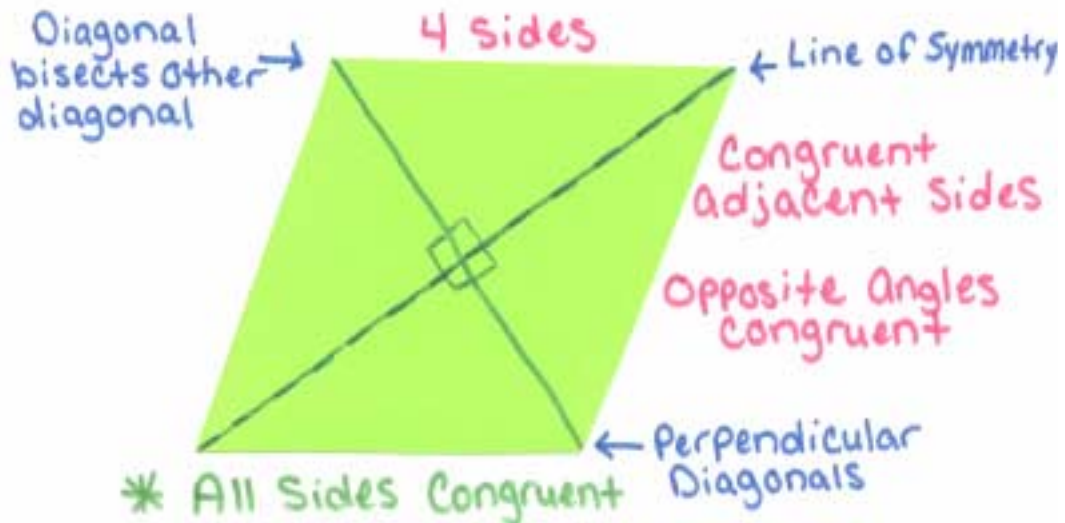
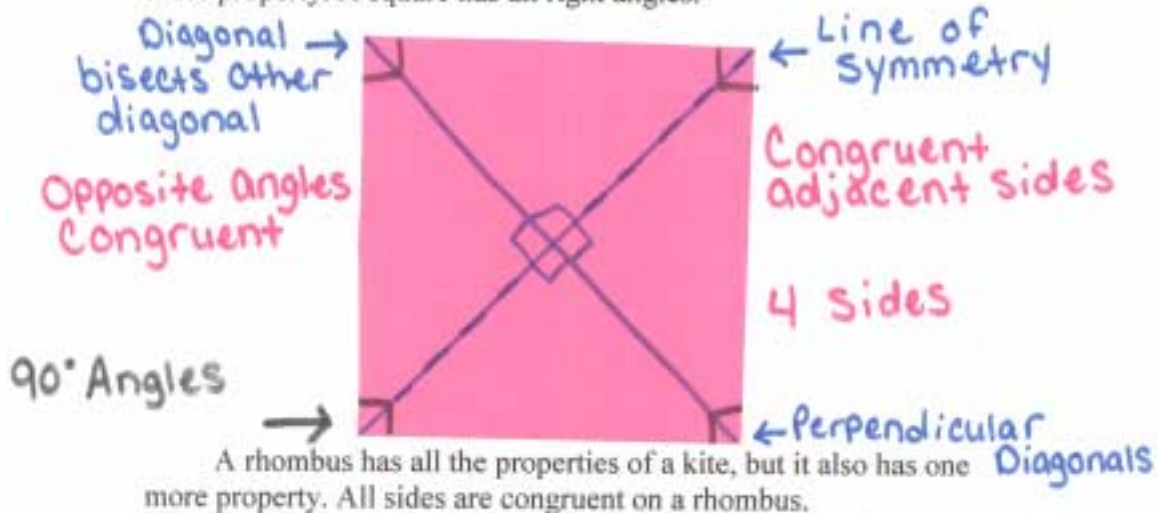


-- Christine Ramey

## Special Case Kites

A special case kite is a shape that fits under the definition of a kite, but it has additional properties. For example:

A square has all the properties of a kite, but it also has one more property. A square has all right angles.



-- Julie Maness

# Convex or Not?

A kite must be convex. If it were concave then it would not satisfy the definition that one of the diagonals is a perpendicular bisector of the other.



-- Jason Brakhage

**Are Kites Convex or Not?**

If you can draw a rectangle around the outside of the kite that touches all four points of the kite, then it is convex. If the rectangle does not touch all four points, then it is a concave figure.

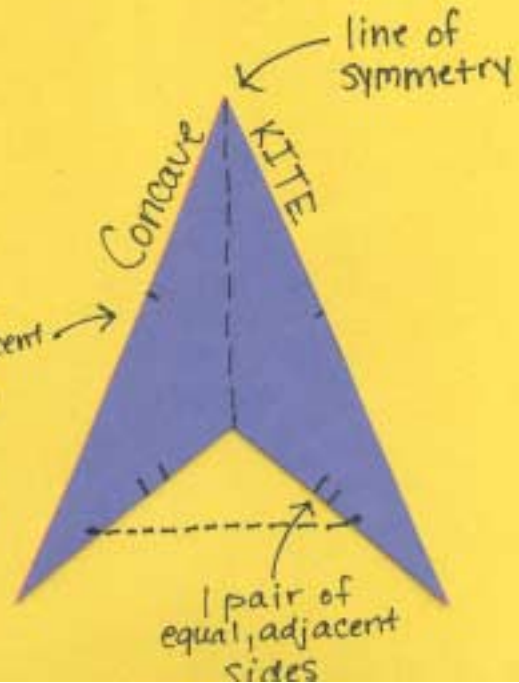
A diagram illustrating a convex kite. The kite is shaded with red and white horizontal stripes. It is enclosed within a solid orange rectangle. The four vertices of the kite touch the four sides of the rectangle, demonstrating that it is a convex figure.

-- Amber Knight

# TO ME A KITE CAN BE... CONVEX or CONCAVE



A convex figure is if every line segment drawn between any two points inside the figure lies inside the figure.



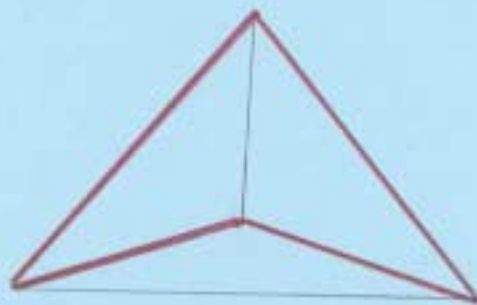
A concave figure is if a line segment drawn between points inside the figure lies outside the figure.

-- J'Mae Randolph

Question:  
Are kites convex?

Answer:

Yes. When a quadrilateral is concave, its diagonals do not cross. An important property of kites is the fact that their diagonals are perpendicular.



-- Natalie Hawthorne