



## INTERSECTING LINES

In this set of investigations you will explore what happens when two lines intersect. You will be introduced to two special pairs of angles—vertical angles and adjacent angles. You will also discover how to measure the distance between a point and a line. In this set are some very basic constructions that you will use in many of the investigations that follow.

**Definition:** A **conjecture** is an educated guess about what you think is true based on observations.

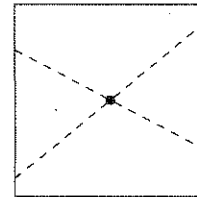
In many of the investigations, you will be asked to make a conjecture about something you observe. Later, in your study of geometry, you may be asked to prove some of your conjectures. When you prove a conjecture you must give a logical argument to show why it will always be true.



### Guided Investigation 1.1

#### THE INTERSECTION OF TWO LINES

- Step 1:** Fold a line on a patty paper. Unfold. Fold a second line. Unfold.
- Step 2:** Repeat step 1 on several pieces of patty paper. How many times can two lines cross each other? (If the lines don't intersect on the patty paper, think about what would happen if the lines were extended indefinitely.)



The first patty paper conjecture (PPC) could be:



**1** Two distinct lines can intersect in exactly \_\_\_\_\_ point(s).

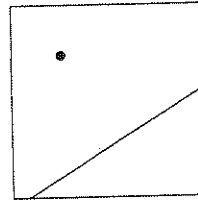


## Guided Investigation 1.2

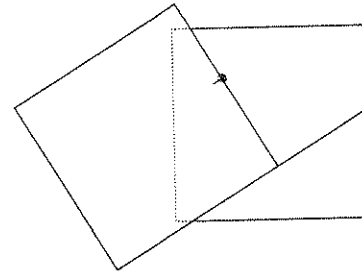
### FINDING THE SHORTEST DISTANCE BETWEEN A POINT AND A LINE

You can use the edge of a patty paper to measure and compare distances and lengths by making marks along the edge of the paper.

**Step 1:** Use your straightedge to draw a line on a patty paper. Draw a point that is not on the line.



**Step 2:** Use another patty paper and experiment to find the shortest distance from the point to the line.



Your next patty paper conjecture might be:



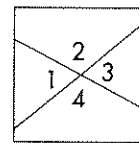
The shortest distance from a point to a line is \_\_\_\_\_



## Guided Investigation 1.3

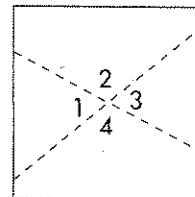
### VERTICAL ANGLES

**Definition:** The pairs of opposite angles formed by two intersecting lines are called **vertical angles**. For example, in the diagram on the right,  $\angle 1$  and  $\angle 3$  are a pair of vertical angles, and  $\angle 2$  and  $\angle 4$  are a pair of vertical angles.



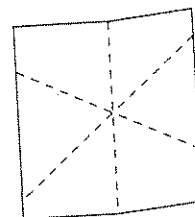
**Step 1:** Fold a line on a patty paper.  
Unfold. Fold a second line intersecting the first line. Unfold.

**Step 2:** Label the angles as in the diagram.

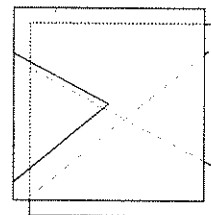


What seems to be true of vertical angles?

**Step 3:** Fold the paper to see if the sides of one angle of a pair of vertical angles can be made to fit over the sides of the other angle of the pair.



Or, place a second patty paper over the first and copy one angle of a pair of vertical angles. Rotate the copy to see how well it fits over the second angle of the vertical angle pair.



Your next patty paper conjecture could be:



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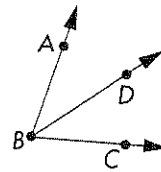
If two lines intersect, then each pair of vertical angles formed is \_\_\_\_\_.



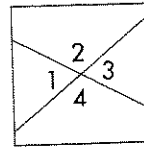
## Guided Investigation 1.4

### ADJACENT ANGLES AND LINEAR PAIRS

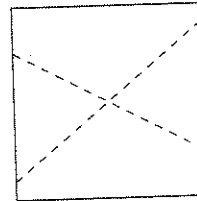
**Definition:** Two angles are called **adjacent angles** if they share a common vertex and a common side but no common interior points. In the diagram to the far right,  $\angle ABD$  is adjacent to  $\angle DBC$ .



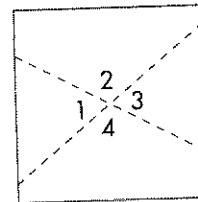
**Definition:** A pair of adjacent angles formed by two intersecting lines is called a **linear pair**. For example, in the diagram on the right,  $\angle 1$  and  $\angle 2$  are a linear pair of angles, and  $\angle 3$  and  $\angle 4$  are a linear pair of angles.



- Step 1:** Fold a line on a patty paper.  
Unfold. Fold a second line intersecting the first line. Unfold.



- Step 2:** Label the angles as in the diagram.



- Step 3:** Name each pair of adjacent angles on your patty paper. ( $\angle 1$  and  $\angle 2$ , etc.)

- Step 4:** What seems to be true about each linear pair of angles? Use your protractor, if necessary, to find the sum of the measures of a linear pair of angles.

Your next patty paper conjecture could be:



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If two lines intersect forming a linear pair of angles, then the sum of the measures of the linear pair of angles is \_\_\_\_\_.