

Test: constructions

Geometry 2.1

Make conjectures based on inductive reasoning

Find counterexamples

inductive reasoning *looking for pattern*

conjecture *prediction*

counterexample (exception)

1. Find the pattern (conjecture)  
"Here's what I think is going on..."
2. Extend the pattern to answer the question...

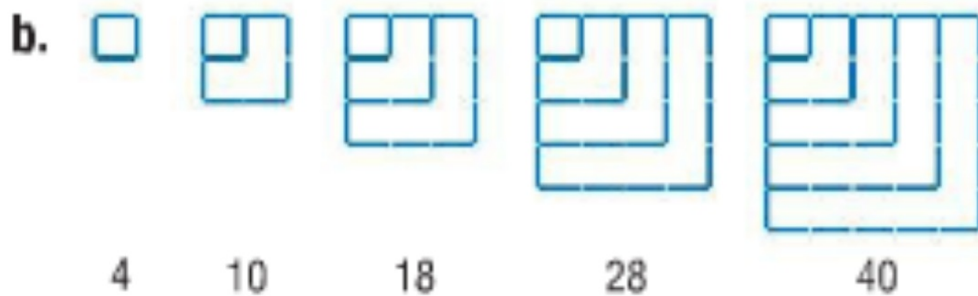


### Example 1 Patterns and Conjecture

Write a conjecture that describes the pattern in each sequence. Then use your conjecture to find the next item in the sequence.

- a. Movie show times: 8:30 A.M., 9:45 A.M., 11:00 A.M., 12:15 P.M., ...

Movie every 1:15  
next 1:30



Visit every 5 mo., next visit Aug.

Guided Practice

Write a conjecture that describes the pattern in each sequence. Then use your conjecture to find the next item in the sequence.

1A Follow-up visits: Dec., May, Oct., Mar., ...

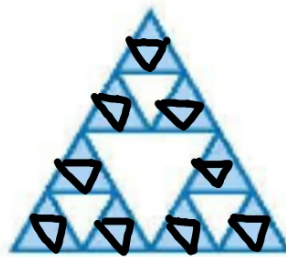
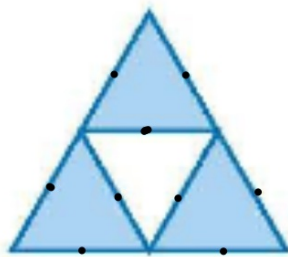
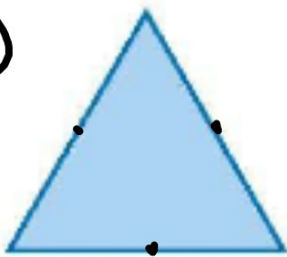
Find the pattern: conjecture

Extend the pattern: prediction

1B. 10, 4, -2, -8, ...

Subtract 6 every time  
 $-8 - 6 = -14$

1C.



## Example 2 Algebraic and Geometric Conjectures



Make a conjecture about each value or geometric relationship. List or draw some examples that support your conjecture.

a. the sum of two odd numbers *is always even*

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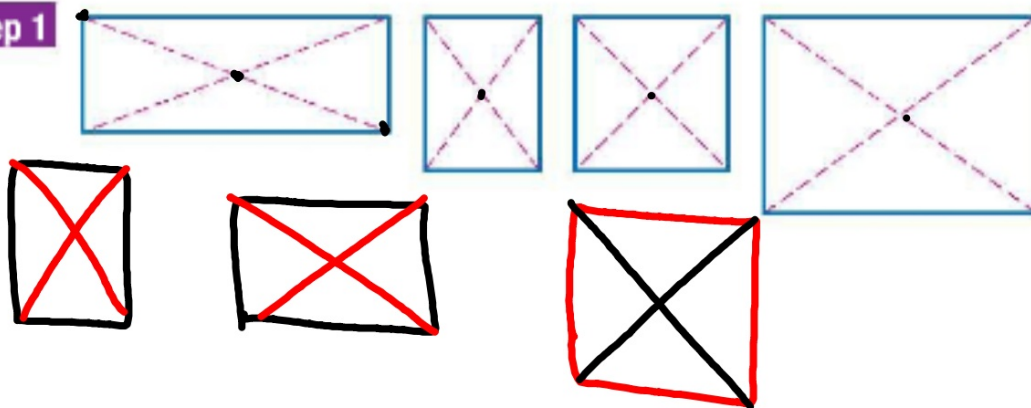
$$3 + 5 = 8 \quad 21 + 5 = 26$$

$$11 + 7 = 18$$

Examples are not the same as proving it...but it's a start.

b. segments joining opposite vertices of a rectangle

Step 1



Guided Practice

$$4 + 10 = 14$$

$$6 + 2 = 8$$

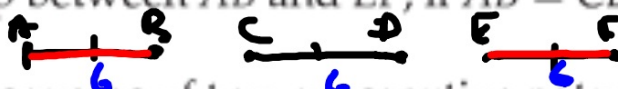
$$12 + 6 = 18$$



2A. the sum of two even numbers is even

$$\overline{AB} \cong \overline{EF}$$

2B. the relationship between  $\overline{AB}$  and  $\overline{EF}$ , if  $AB = CD$  and  $CD = EF$

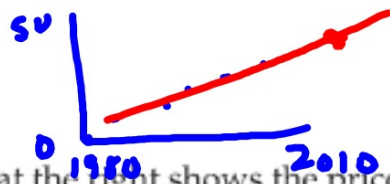


2C. the sum of the squares of two consecutive natural numbers is odd

$$\begin{aligned} (1)^2 + (2)^2 &= 5 \\ 2^2 + 3^2 &= 13 \end{aligned}$$

$$\begin{aligned} 8^2 + 9^2 &= 145 \end{aligned}$$

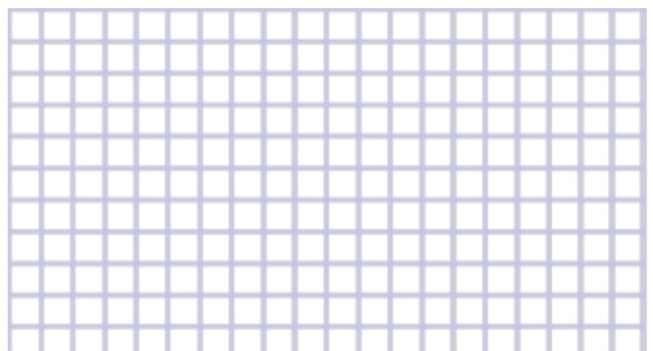
### Guided Practice



3. **POSTAGE** The table at the right shows the price of postage for the years 1982 through 2009.

- A. Make a statistical graph that best displays the data. **Scatterplot**
- B. Predict the postage rate in 2015 based on the graph.
- C. Does it make sense that the pattern of the data will continue over time? If not, how will it change? Explain your reasoning.

| <b>Year</b> | <b>Rate (cents)</b> |
|-------------|---------------------|
| 1982        | 20                  |
| 1987        | 22                  |
| 1992        | 29                  |
| 1997        | 32                  |
| 2002        | 37                  |
| 2007        | 41                  |
| 2009        | 44                  |



Examples do not prove that something is always true. But a single counterexample (*an exception*) proves that something is **not** always true. All you need is one...

→ All dogs are brown.

CE - my brother has black lab

→ Months have 31 days.

CE - Sep+ 30 days

→ The sum of two numbers is even. CE 2+1 not even

**2 Find Counterexamples** To show that a conjecture is true for all cases, you must prove it. It takes only one false example, however, to show that a conjecture is not true. This false example is called a **counterexample**, and it can be a number, a drawing, or a statement.

*What if...?*

#### Example 4 Find Counterexamples

Find a counterexample to show that each conjecture is false.

a. If  $n$  is a real number, then  $n^2 > n$ .

$$n^2 > n$$

$$1^2 = 1$$

$$\frac{1}{2} \cdot \frac{1}{2}$$

$$\frac{1}{4}$$

$$\frac{1}{2}$$

"If I square a number, it is always more than the original number."  
Can you think of an exception (counterexample)?

b. If  $JK = KL$ , then  $K$  is the midpoint of  $\overline{JL}$ .



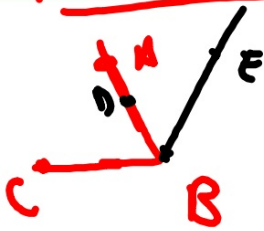
"If two lengths are equal, then  $K$  is the midpoint."  
Can you think of an exception? (counterexample)

Counterexample (exception)

**Guided Practice** if  $n = -1$   $-n = 1$

4A. If  $n$  is a real number, then  $-n$  is a negative number.

4B. If  $\angle ABC \cong \angle DBE$ , then  $\angle ABC$  and  $\angle DBE$  are vertical angles.



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