LESSON 1.1

NAME _____ DATE _____

Practice with Examples

For use with pages 3–9

GOAL **Find and describe patterns and use inductive reasoning**

VOCABULARY

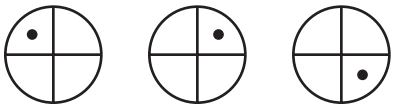
A **conjecture** is an unproven statement that is based on observations.

Inductive reasoning is a process that involves looking for patterns and making conjectures.

A **counterexample** is an example that shows a conjecture is false.

EXAMPLE 1 Describing a Visual Pattern

Sketch the next figure in the pattern.

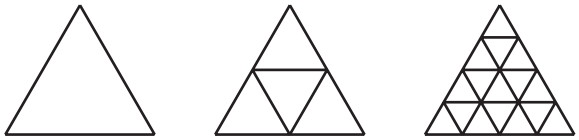


SOLUTION

Each figure looks like the one before it except that it has rotated 90°. The next figure will have the smaller circle in the lower-left quarter of the bigger circle.

Exercise for Example 1

1. Sketch the next figure in the pattern.



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EXAMPLE 2 Describing a Number Pattern

Describe a pattern in the sequence of numbers. Predict the next number.

a. 5, 3, 1, −1, . . . **b.** 1, −4, 9, −16, . . . **c.** $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \ldots$

SOLUTION

a. These are consecutive odd numbers, but listed backwards starting with 5. The next number is −3.

b. These numbers look like consecutive perfect squares, except that every other one is negative. The next number is 25.

c. Each number is $\frac{1}{2}$ times the previous number. The next number is $\frac{1}{16}$.

Exercises for Example 2

Describe a pattern in the sequence of numbers. Predict the next number.

2. 1, 2, 6, 24, . . . **3.** 0, 3, 8, 15, 24, . . .

EXAMPLE 3 Making a Conjecture

Complete the conjecture.

Conjecture: The product of two consecutive even integers is divisible by ___?___.

SOLUTION

List some specific examples and look for a pattern.

Examples:

$2 \times 4 = 8 = 8 \times 1$ $6 \times 8 = 48 = 8 \times 6$ $10 \times 12 = 120 = 8 \times 15$

$4 \times 6 = 24 = 8 \times 3$ $8 \times 10 = 80 = 8 \times 10$ $12 \times 14 = 168 = 8 \times 21$

Conjecture: The product of two consecutive even integers is divisible by 8.

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Exercises for Example 3

Complete the conjecture based on the pattern you observe in the specific cases.

4. Conjecture: For any two numbers a and b, the product of $(a + b)$ and $(a - b)$ is always equal to ____?____.

$(2 + 1) \times (2 - 1) = 3 = 2^2 - 1^2$ $\quad$ $(4 + 2) \times (4 - 2) = 12 = 4^2 - 2^2$

$(3 + 2) \times (3 - 2) = 5 = 3^2 - 2^2$ $\quad$ $(6 + 3) \times (6 - 3) = 27 = 6^2 - 3^2$

EXAMPLE 4 Finding a Counterexample

Show the conjecture is false by finding a counterexample.

Conjecture: All odd numbers are prime.

SOLUTION

The conjecture is false. Here is a counterexample: The number 9 is odd and is a composite number, not a prime number.

Exercise for Example 4

Show the conjecture is false by finding a counterexample.

5. The square of the sum of two numbers is equal to the sum of the squares of the two numbers. That is, $(a + b)^2 = a^2 + b^2$.