Mathematical Systems & Inductive Reasoning in Geometry

Geometry Worksheet · Grade 7–9

Name: _____ Date: _____

Learning Objectives

- Use inductive reasoning to identify and extend patterns in sequences of numbers and figures
- Make and test conjectures based on observed patterns
- Understand the foundational vocabulary of mathematical systems in geometry

Problems

1. The word 'geometry' comes from the Greek language. What does the word geometry literally mean?

2. Look at the number sequence and find the next term: 3, 6, 12, 24, ___.

3, 6, 12, 24, ?

3. Using inductive reasoning, identify the next number in the sequence: 5, 10, 20, 40, ___.

5, 10, 20, 40, ?

4. A sequence of figures shows a small circle moving clockwise to each corner of a square (top-left, top-right, bottom-right, bottom-left). If the circle is currently at the bottom-right corner, where will it be in the next figure?

5. Using the sequence from the video, identify the missing number: 2, 10, 50, 250, ___.

2, 10, 50, 250, ?

6. What type of reasoning is used when you observe a pattern in specific examples and use it to make a general conclusion?

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7. A student notices that 2, 4, 8, and 16 are all even numbers and conjectures that all numbers in the sequence 2^{n} are even. Test this conjecture for n = 5.

$$2^n,\ n = 5$$

8. Find the next two terms in the sequence using inductive reasoning: 1, 4, 9, 16, 25, ___, ___.

$$1,\ 4,\ 9,\ 16,\ 25,\ ?,\ ?$$

9. A student makes the conjecture that every odd number greater than 1 is prime. Find a counterexample to disprove this conjecture.

10. Using inductive reasoning, find the next term and write a general formula for the sequence: 3, 7, 11, 15, 19, ___.

$$a_n = 3 + (n - 1) \cdot 4$$

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Mathematical Systems & Inductive Reasoning in Geometry — Answer Key

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Answer Key

1. Answer: To measure the earth
- The word 'geometry' is derived from two Greek words: 'geo' meaning earth and 'metron' meaning measure.
- Therefore, geometry literally means 'to measure the earth.'

2. Answer: 48
- Observe the pattern: each term is multiplied by 2 to get the next term (3×2=6, 6×2=12, 12×2=24).
- Apply the pattern: 24 × 2 = 48.

3. Answer: 80
- Each term is multiplied by 2: 5×2=10, 10×2=20, 20×2=40.
- Following the pattern: 40 × 2 = 80.

4. Answer: Bottom-left corner
- Observe the pattern: the circle moves clockwise — top-left → top-right → bottom-right → bottom-left.
- Since the circle is at bottom-right, the next position following the clockwise pattern is bottom-left.

5. Answer: 1250
- Identify the pattern: each term is multiplied by 5 (2×5=10, 10×5=50, 50×5=250).
- Apply the pattern: 250 × 5 = 1250.

6. Answer: Inductive reasoning
- Inductive reasoning involves observing specific cases and identifying a pattern.
- A general conclusion (conjecture) is then drawn from those specific observations.

7. Answer: 32, conjecture holds
- Calculate 2^5 = 32.
- 32 is an even number, so the conjecture that all terms of 2^n are even is supported for n = 5.

8. Answer: 36, 49
- Observe that each term is a perfect square: 1^2, 2^2, 3^2, 4^2, 5^2.
- The next two terms are 6^2 = 36 and 7^2 = 49.

9. Answer: 9 (since 9 = 3 × 3, it is odd but not prime)
- A counterexample is a single case where the conjecture fails.
- The number 9 is odd and greater than 1, but 9 = 3 × 3, so it is not prime — this disproves the conjecture.

10. Answer: 23; general term is a_n = 3 + (n–1)·4
- Observe the pattern: each term increases by 4 (common difference = 4), making this an arithmetic sequence.

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- The next term is 19 + 4 = 23, and the general formula is a_n = 3 + (n–1) \cdot 4.

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