

## Pick Patterns and Reveal Relationships

### A. Fill in the Blanks

1. A list of numbers that follow a specific rule is called a \_\_\_\_\_.
2. In an arithmetic sequence, the constant number added to each term is called the common \_\_\_\_\_.
3. The relationship that allows you to find any term in a sequence is often written as an \_\_\_\_\_ expression.
4. In the rule  $t = 4n - 1$ , the variable 'n' typically represents the \_\_\_\_\_ number.
5. A geometric sequence is created by \_\_\_\_\_ the previous term by a constant value.

### B. Match the sequence in Column A with its correct relationship (nth term rule) in Column B.

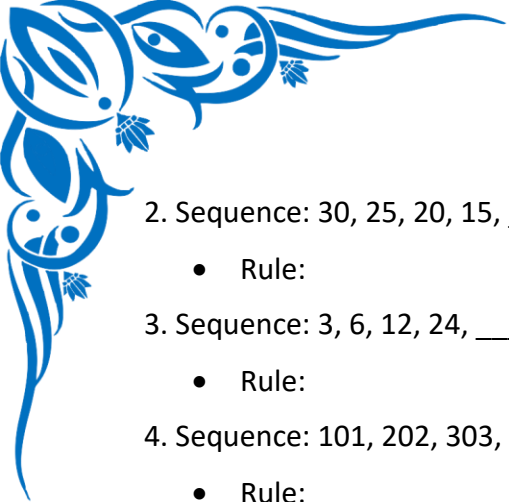
Column A (Sequence)	Column B (Relationship)
1. 7, 8, 9, 10, ...	A. $t = n^2$
2. 5, 10, 15, 20, ...	B. $t = 2n + 5$
3. 1, 4, 9, 16, ...	C. $t = n + 6$
4. 7, 9, 11, 13, ...	D. $t = 3n - 2$
5. 1, 4, 7, 10, ...	E. $t = 5n$

### C. For each sequence, find the next term, describe the rule, and write an algebraic expression for the nth term (the relationship).

1. Sequence: 6, 11, 16, 21, ...
  - Next Term:
  - Relationship (nth term):
2. Sequence: 2, 9, 16, 23, ...
  - Next Term:
  - Relationship (nth term):
3. Sequence: 10, 8, 6, 4, ...
  - Next Term:
  - Relationship (nth term):
4. Sequence: -5, -3, -1, 1, ...
  - Next Term:
  - Relationship (nth term):
5. Input/Output Table: | Input (n) | 1 | 2 | 3 | 4 | 5 | | :--- | :-: | :-: | :-: | :-: | :-: | | Output (t) | 4 | 8 | 12 | 16 | ? |
  - Missing Output:
  - Relationship (t in terms of n):

### D. For each sequence, find the next two terms and describe the rule in words.

1. Sequence: 4, 8, 12, 16, \_\_\_\_\_, \_\_\_\_\_
  - Rule:
  - Next two terms:



2. Sequence: 30, 25, 20, 15, \_\_\_\_\_, \_\_\_\_\_

- Rule:

- Next two terms:

3. Sequence: 3, 6, 12, 24, \_\_\_\_\_, \_\_\_\_\_

- Rule:

- Next two terms:

4. Sequence: 101, 202, 303, 404, \_\_\_\_\_, \_\_\_\_\_

- Rule:

- Next two terms:

5. Visual Pattern: Term 1 (1 dot), Term 2 (3 dots), Term 3 (5 dots)

- Rule:

- Dots in Term 4: \_\_\_\_\_

- Dots in Term 5: \_\_\_\_\_

### E. These problems require a deeper level of thinking. Show your work.

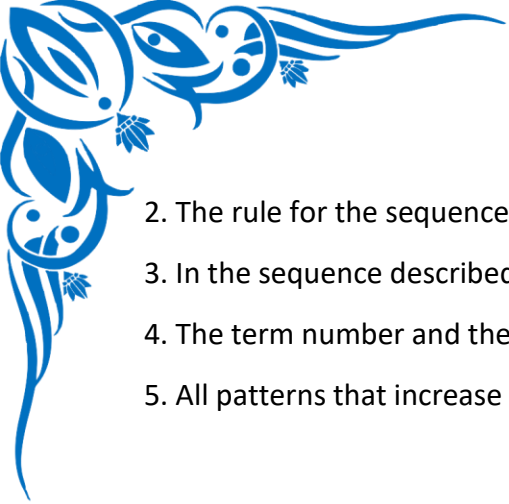
1. A sequence is generated by the rule  $t = n^2 + 3$ . Is the number 147 a term in this sequence? Explain why or why not.
2. The 4th term of an arithmetic sequence is 19, and the 9th term is 44. What is the first term of this sequence? (Hint: Find the common difference first.)
3. Consider the sequence: 2, 3, 5, 9, 17, ... What is the rule connecting the terms? What is the next term?
4. A visual pattern is made of squares. Term 1 has 1 square. Term 2 has 5 squares. Term 3 has 9 squares. How many squares will be in the 15th term? Write a rule for the nth term.
5. Find the next two terms in this sequence: 1, 1, 2, 3, 5, 8, \_\_\_\_\_, \_\_\_\_\_. What is the special name for this sequence?

### F. Read each problem carefully and use your pattern-finding skills to solve it.

1. **Savings Plan:** Maria decides to save money for a new bike. She starts with 20 in her piggy bank. Each week, she adds 20 in her piggy bank. Each week, she adds 8. How much money will she have after 12 weeks? Write a rule for the amount of money she has after 'w' weeks.
2. **Theater Seating:** The first row of a theater has 10 seats. Each subsequent row has 2 more seats than the row in front of it. How many seats are in the 18th row?
3. **Pizza Party:** A pizza place charges 12 for a plain cheese pizza and 12 for a plain cheese pizza and 1.50 for each additional topping. Create a table showing the cost for 1, 2, 3, and 4 toppings. What is the cost for a pizza with 7 toppings?
4. **Bacterial Growth:** A scientist observes that a certain type of bacteria doubles its population every hour. If she starts with 50 bacteria, how many will there be after 6 hours?
5. **Training Schedule:** A runner is training for a marathon. On Day 1, she runs 3 km. Each day, she increases her distance by 1.5 km. On which day will she first run a distance of at least 15 km?

### G. True or False

1. The next term in the sequence 50, 45, 40, 35 is 25. \_\_\_\_\_



2. The rule for the sequence 2, 4, 8, 16 is "add 2".

\_\_\_\_\_

3. In the sequence described by  $t = 3n + 5$ , the 5th term is 20.

\_\_\_\_\_

4. The term number and the term value are always the same.

\_\_\_\_\_

5. All patterns that increase must be arithmetic sequences.

\_\_\_\_\_