Pattern Detectives

Sort eight patterns, explain two choices, then create your own.

8A.AF.I.26.a "Show that linear functions grow by equal differences over equal intervals, while exponential functions grow by equal factors over equal intervals."

NAME _____ DATE _____

LINEAR

Over equal intervals, a linear pattern changes by the same difference each time. Add or subtract the same number to get the next value.

A mosaic has 41, 47, 53, 59 tiles after turns 0, 1, 2, 3. It gains 6 tiles each turn.

EXPONENTIAL

Over equal intervals, an exponential pattern changes by the same factor each time. Multiply by the same number to get the next value.

A pond has 7, 21, 63, 189 lily pads after weeks 0, 1, 2, 3. The number of pads triples each week.

1 SORT

8 items

For each pattern, circle Linear or Exponential, then choose two numbered items and explain how you classified each one.

1.	Lab cells at equal time steps: 2, 6, 18, 54	DIFFERENCE FACTOR
2.	A robot's distance in meters at equal time steps: 8, 13, 18, 23	DIFFERENCE FACTOR
3.	Water in a tank, in liters, at equal time steps: 12, 19, 26, 33	DIFFERENCE FACTOR
4.	A prize in dollars after equal rounds: 4, 8, 16, 32	DIFFERENCE FACTOR
5.	Riders on a bus after equal stops: 3, 12, 21, 30	DIFFERENCE FACTOR
6.	Video views at equal time steps: 5, 20, 80, 320	DIFFERENCE FACTOR
7.	A tower's height in blocks after equal building steps: 30, 32, 34, 36	DIFFERENCE FACTOR
8.	A game score after equal rounds: 14, 18, 22, 26	DIFFERENCE FACTOR

2 PROVE IT

Explain your thinking

Pick two items from Part 1. For each one, tell how you knew where it belonged.

ITEM # _____ **HOW I KNEW** _____

ITEM # _____ **HOW I KNEW** _____

3 MAKE YOUR OWN

One of each

Write one new four-value Linear pattern and one new four-value Exponential pattern. Make the intervals equal for each pattern.

DIFFERENCE _____

FACTOR _____

CHALLENGE

Write a four-value exponential pattern whose first two values could also start a linear pattern. State its factor and explain why all four values are not linear.

ANSWER KEY # Pattern Detectives

GRADE 8 · 8A.AF.I.26.a

PART 1 · SORT

#	ITEM	CATEGORY	WHY
1	Lab cells at equal time steps: 2, 6, 18, 54	**FACTOR**	Each value is 3 times the previous value.
2	A robot's distance in meters at equal time steps: 8, 13, 18, 23	**DIFFERENCE**	Each value is 5 more than the previous value.
3	Water in a tank, in liters, at equal time steps: 12, 19, 26, 33	**DIFFERENCE**	Each value is 7 more than the previous value.
4	A prize in dollars after equal rounds: 4, 8, 16, 32	**FACTOR**	Each value is 2 times the previous value.
5	Riders on a bus after equal stops: 3, 12, 21, 30	**DIFFERENCE**	Each value is 9 more than the previous value.
6	Video views at equal time steps: 5, 20, 80, 320	**FACTOR**	Each value is 4 times the previous value.
7	A tower's height in blocks after equal building steps: 30, 32, 34, 36	**DIFFERENCE**	Each value is 2 more than the previous value.
8	A game score after equal rounds: 14, 18, 22, 26	**DIFFERENCE**	Each value is 4 more than the previous value.

PART 2 · PROVE IT

Accept any explanation that names the deciding feature from the rule box for the chosen item.

PART 3 · MAKE YOUR OWN (SAMPLE ANSWERS)

- **DIFFERENCE**: Linear: A plant's height at equal weekly checks is 10, 13, 16, 19 cm.
- **FACTOR**: Exponential: A rumor reaches 6, 12, 24, 48 people at equal hourly checks.

Challenge: 2, 4, 8, 16 has a factor of 2. Its differences are 2, 4, and 8, so the four values are not linear.

For Part 2, accept explanations that identify the repeated difference or factor for each chosen item. Comparing only the first two values is not enough to classify a pattern.