LESSON MAKER PRO

Patterns and Predictions

Choose a model and test what it predicts.

HIGH SCHOOL · MT.PLUS.ALG.MOD.1

MT.PLUS.ALG.MOD.1 "Model situations in context with polynomial, exponential, logarithmic, and trigonometric functions. This standard should incorporate cultural context relating to Montana Indigenous Peoples and local communities by: Determining if a set of..."

NAME _____ DATE _____

SPOT THE PATTERN

At equal x steps, constant differences or second differences suggest a polynomial; constant ratios suggest an exponential function. Equal y changes when positive x values are multiplied by the same number suggest a logarithmic function. A repeating cycle suggests a trigonometric function. Real observations may fall off a model's curve.

WORKED EXAMPLE

A lab simulation records cell counts. Choose a function family and predict the count at x = 23.

LAB SIMULATION

x	Cell count
20	9
21	18
22	36

1. 18/9 = 2 and 36/18 = 2.
2. A constant ratio suggests an exponential model.
3. At x = 23, the count is 36 × 2 = 72.

Answer: Exponential; 72 cells.

PRACTICE 4 problems

1 For x = 0, 1, 2, 3, the y values are 4, 5, 8, 13. Choose a function family and give one reason.

ANSWER _____

2 For x = 0, 1, 2, 3, the y values are 5, 15, 45, 135. Choose a function family and give one reason.

ANSWER _____

3 For x = 1, 2, 4, 8, the y values are 1, 3, 5, 7. Choose a function family and give one reason.

ANSWER _____

4 For x = 0 through 7, the y values are 2, 4, 2, 0, 2, 4, 2, 0. Choose a function family and give one reason.

ANSWER _____

APPLY IT Show your work

1 A student group in a Montana tribal community shares a gaming-night poster. Model reposts for hours 0 through 3. What does the model predict for hour 4, and how does that compare with the actual count?

GAMING-NIGHT POSTER

Hour	Reposts
0	2
1	4
2	8
3	16
4	27

ANSWER _____

2 A Montana tribal community youth center records open-gym attendance for five weeks: 12, 7, 16, 16, 4. Which family is best supported: polynomial, exponential, logarithmic, trigonometric, or none? Explain.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A game club tracks weekly signups. For weeks x = 1, 2, 4, 8, the counts are 2, 5, 8, 11. Choose a function family, predict the count at x = 16, and explain why the actual count could differ.

WORK SPACE AND ANSWER

Patterns and Predictions

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	For x = 0, 1, 2, 3, the y values are 4, 5, 8, 13. Choose a function family and give one reason.	**Polynomial; the second differences are 2.**
2	For x = 0, 1, 2, 3, the y values are 5, 15, 45, 135. Choose a function family and give one reason.	**Exponential; each y value is 3 times the previous value.**
3	For x = 1, 2, 4, 8, the y values are 1, 3, 5, 7. Choose a function family and give one reason.	**Logarithmic; y increases by 2 each time x doubles.**
4	For x = 0 through 7, the y values are 2, 4, 2, 0, 2, 4, 2, 0. Choose a function family and give one reason.	**Trigonometric; the y values repeat every 4 x steps.**

PART 2 · APPLY IT

1. **An exponential model predicts 32 reposts at hour 4. The actual count is 27, which is 5 fewer.** Reposts double each hour from hour 0 through hour 3, so double 16 to predict 32. Compare 32 with the observed 27.
2. **None. These five counts show no clear growth pattern or repeating cycle.** The counts do not show a consistent difference, ratio, or cycle. A polynomial could pass through five points, but that alone would not make it a useful attendance model.

CHALLENGE

Logarithmic; the count rises by 3 each time x doubles, so the prediction is 14. Actual signups could differ because the model describes a pattern, not an exact rule for people's choices.

Accept equivalent evidence for each family. For the open-gym item, accept that a polynomial can fit the five counts if the student explains why this does not establish a useful model.