LESSON MAKER PRO

Pattern Model Match

Use differences and ratios to choose a function model.

HIGH SCHOOL · MA.912.F.1.8

MA.912.F.1.8 "Determine whether a linear, quadratic or exponential function best models a given real-world situation."

NAME _____ DATE _____

SPOT THE PATTERN

When x increases by equal amounts, a linear function has constant first differences. A quadratic function has constant second differences. An exponential function has a constant ratio between consecutive outputs.

WORKED EXAMPLE

For x = 0, 1, and 2, the outputs are 5, 20, and 80. Which type of function best models the data?

1. Find first differences: 20 - 5 = 15 and 80 - 20 = 60.
2. The first differences are not constant.
3. Find ratios: 20/5 = 4 and 80/20 = 4.
4. The constant ratio shows an exponential model.

Answer: Exponential

PRACTICE 6 problems

1 For x = 0, 1, 2, and 3, the outputs are 7, 13, 19, and 25. Which type of function best models the data?

ANSWER _____

2 Which type of function is represented by $y = 6x^2 - 1$?

ANSWER _____

3 A game account has 12 coins. The account gains 8 coins after each completed level. Which type of function models the total number of coins as a function of completed levels?

ANSWER _____

4 For x = 0, 1, 2, and 3, the outputs are 2, 10, 26, and 50. Which type of function best models the data?

ANSWER _____

5 Which type of function is represented by $y = 9(2)^x$?

ANSWER _____

6 The height h, in feet, of a basketball after x seconds is $h = -16x^2 + 24x + 3$. Which type of function models the height?

ANSWER _____

APPLY IT Show your work

1 A student tracks total reward points earned from workouts. Which type of function best models total points as a function of workouts completed? Use the table pattern.

WORKOUT REWARD POINTS

Workouts completed	Total points
0	110
1	185
2	260
3	335

ANSWER _____

2 A student posts a short video and records its views at the end of each day. Which type of function best models views as a function of day? Use the table pattern.

VIDEO VIEWS

Day	Views
0	6
1	18
2	54
3	162

ANSWER _____

CHALLENGE One step up

For x = 0, 1, 2, and 3, the outputs are 2, 9, 28, and 59. Determine the function type and write an equation that models the data. Explain using differences.

WORK SPACE AND ANSWER

ANSWER KEY

Pattern Model Match

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	For x = 0, 1, 2, and 3, the outputs are 7, 13, 19, and 25. Which type of function best models the data?	**Linear**
2	Which type of function is represented by $y = 6x^2 - 1$?	**Quadratic**
3	A game account has 12 coins. The account gains 8 coins after each completed level. Which type of function models the total number of coins as a function of completed levels?	**Linear**
4	For x = 0, 1, 2, and 3, the outputs are 2, 10, 26, and 50. Which type of function best models the data?	**Quadratic**
5	Which type of function is represented by $y = 9(2)^x$?	**Exponential**
6	The height h, in feet, of a basketball after x seconds is $h = -16x^2 + 24x + 3$. Which type of function models the height?	**Quadratic**

PART 2 · APPLY IT

1. **Linear** The total increases by 75 points for each additional workout, so the first differences are constant.
2. **Exponential** Each view total is multiplied by 3 from one day to the next, so the ratios are constant.

CHALLENGE

Quadratic; first differences are 7, 19, and 31, so the second differences are 12. An equation is $y = 6x^2 + x + 2$.

Accept the labels linear, quadratic, and exponential in any capitalization. For the challenge, accept an equivalent equation and an explanation that identifies constant second differences of 12.