LESSON MAKER PRO

Models That Fit

Choose a function, calculate, and check.

HIGH SCHOOL · A1P.AF.I.31

A1P.AF.I.31 "Use the mathematical modeling cycle to solve real-world problems involving linear, quadratic, exponential, absolute value, and linear piecewise functions."

NAME _____ DATE _____

CHOOSE AND CHECK

Choose a model that fits the situation. Constant change suggests a linear function, repeated multiplication suggests an exponential function, square area is quadratic, distance from a target uses absolute value, and a changing rate may need a piecewise rule. After calculating, check the units and whether the answer makes sense.

WORKED EXAMPLE

A club's funds grow at a constant rate. Use the table to write F(x), the funds after x weeks, and find F(13).

CLUB FUNDS

Weeks, x	Funds, F(x)
1	$23
5	$43
9	$63

1. Rate = (43 - 23)/(5 - 1) = 5 dollars per week.
2. F(x) = 5x + b. Since F(1) = 23, b = 18.
3. F(13) = 5(13) + 18 = 83.

Answer: F(x) = 5x + 18; $83

PRACTICE 4 problems

1 A game pass costs $14 plus $6 per ride. Write C(x) for x rides; find C(8).

ANSWER _____

2 A square sticker has side length x inches. Write A(x) for its area; find A(12).

ANSWER _____

3 A channel has 16 followers, and the count doubles each week. Write F(x) for the count after x weeks; find F(4).

ANSWER _____

4 A runner aims for a 40-minute finish. Write d(x), the difference from that goal for a time of x minutes; find d(72).

ANSWER _____

APPLY IT Show your work

1 A recording studio charges one price for up to 12 hours, then a fixed rate per extra hour. Use the table to write C(x) for x hours, where x ≥ 0. Can you book 22 hours with $60? Explain.

STUDIO PRICES

Hours	Cost
8	$24
12	$24
16	$40
20	$56

ANSWER _____

2 A foam ball is tossed from a balcony. Its height in feet after x seconds is $h(x) = -x^2 + 8x + 20$. When does it reach the ground? Is this model useful after that time? Explain.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A contest video must be within 6 seconds of 90 seconds. Write an absolute value inequality for its length x, solve it, and decide whether a 100-second video qualifies.

WORK SPACE AND ANSWER

ANSWER KEY # Models That Fit

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A game pass costs $14 plus $6 per ride. Write C(x) for x rides; find C(8).	**C(x) = 14 + 6x; C(8) = $62**
2	A square sticker has side length x inches. Write A(x) for its area; find A(12).	**$A(x) = x^2$; A(12) = 144 square inches**
3	A channel has 16 followers, and the count doubles each week. Write F(x) for the count after x weeks; find F(4).	**$F(x) = 16(2^x)$; F(4) = 256 followers**
4	A runner aims for a 40-minute finish. Write d(x), the difference from that goal for a time of x minutes; find d(72).	**d(x) = |x - 40|; d(72) = 32 minutes**

PART 2 · APPLY IT

1. **C(x) = 24 for 0 ≤ x ≤ 12; C(x) = 24 + 4(x - 12) for x > 12. No, 22 hours costs $64, which is $4 over budget.** The cost stays at $24 through 12 hours, then rises $16 over 4 hours, or $4 per extra hour. C(22) = 24 + 4(10) = 64.
2. **It reaches the ground after 10 seconds. No, the model predicts negative heights after 10 seconds.** Set h(x) = 0 and factor: 0 = -(x - 10)(x + 2). The root -2 is before the toss, so the ground time is 10 seconds.

CHALLENGE

|x - 90| ≤ 6; 84 ≤ x ≤ 96. A 100-second video does not qualify.

Accept equivalent expressions for each function, including an equivalent piecewise rule for the studio. In the ball problem, accept any explanation that rules out negative time and limits the model to before the ball lands.