LESSON MAKER PRO

Model the Moment

Use linear models to predict costs, totals, and trends.

HIGH SCHOOL · GDA.DSP.F.15

GDA.DSP.F.15 "Evaluate possible solutions to real-life problems by developing linear models of contextual situations and using them to predict unknown values. a. Use the linear model to solve problems in the context of the given data. b..."

NAME _____ **DATE** _____

FROM DATA TO MODEL

For a linear pattern, divide the change in the output by the change in the input to find the slope. Use a data point to find the intercept in y = mx + b, then use the model to predict values and explain what its slope and intercept mean.

WORKED EXAMPLE

A print shop charges a setup fee plus a cost for each poster. An order of 14 posters costs $209, and an order of 18 posters costs $261. Build a linear model for the cost y of x posters, then predict the cost of 22 posters.

1. Find the slope: (261 - 209)/(18 - 14) = 13 dollars per poster.
2. Find the intercept: 209 = 13(14) + b, so b = 27.
3. Write the model: y = 13x + 27.
4. Predict: y = 13(22) + 27 = 313.

Answer: The model is y = 13x + 27. An order of 22 posters costs $313.

PRACTICE 6 problems

1 A student tracks the number of songs in a playlist. Find the slope and explain what it means.

PLAYLIST GROWTH

Weeks	Songs
0	5
4	17
8	29

ANSWER _____

2 A scooter rental costs $9 to start and $4 per hour. Write a linear model for the total cost y after x hours. What does the intercept mean?

ANSWER _____

3 A player has 15 points after 1 round and 35 points after 5 rounds. If points increase at a constant rate, write a linear model for the total points y after x rounds.

ANSWER _____

4 A water bottle holds 45 ounces at the start. A student drinks 3 ounces from it each hour. Write a linear model for the water left, y, after x hours. How much is left after 8 hours?

ANSWER _____

5 The table shows the cost of gym training sessions. If the cost follows a linear model, how many sessions cost $61?

TRAINING COST

Sessions	Cost ($)
2	25
6	41

ANSWER _____

6 Bike share A costs $y = 2x + 5$ dollars for x hours. Bike share B costs $y = 3x + 1$ dollars. For 6 hours, which costs less, and by how much?

ANSWER _____

APPLY IT Show your work

1 A tutor charges a booking fee plus an hourly rate. The table shows two total costs. Build a linear model for the cost y of x hours, predict the cost of 9 hours, and explain what the slope and intercept mean.

TUTORING COSTS

Hours	Cost ($)
2	37
6	81

ANSWER _____

2 A school club pays an upfront cost to sell custom shirts. The table shows its profit after selling two different numbers of shirts. Build a linear model for profit y after selling x shirts, find how many shirts the club must sell to break even, and explain the slope and intercept.

SHIRT SALE PROFIT

Shirts sold	Profit ($)
20	20
40	100

ANSWER _____

CHALLENGE One step up

Two transit passes charge a signup fee and a cost per trip. Pass A charges $24 plus $2 per trip. Pass B charges $8 plus $4 per trip. Write a model for each pass. At how many trips do they cost the same? Which pass costs less for 11 trips, and by how much? Show how your models support your choice.

WORK SPACE AND ANSWER

ANSWER KEY # Model the Moment

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A student tracks the number of songs in a playlist. Find the slope and explain what it means.	**The slope is 3 songs per week. The playlist gains 3 songs each week.**
2	A scooter rental costs $9 to start and $4 per hour. Write a linear model for the total cost y after x hours. What does the intercept mean?	**y = 4x + 9. The intercept is the $9 starting charge.**
3	A player has 15 points after 1 round and 35 points after 5 rounds. If points increase at a constant rate, write a linear model for the total points y after x rounds.	**y = 5x + 10**
4	A water bottle holds 45 ounces at the start. A student drinks 3 ounces from it each hour. Write a linear model for the water left, y, after x hours. How much is left after 8 hours?	**y = 45 - 3x. After 8 hours, 21 ounces remain.**
5	The table shows the cost of gym training sessions. If the cost follows a linear model, how many sessions cost $61?	**11 sessions**
6	Bike share A costs y = 2x + 5 dollars for x hours. Bike share B costs y = 3x + 1 dollars. For 6 hours, which costs less, and by how much?	**Bike share A costs less by $2. It costs $17, while bike share B costs $19.**

PART 2 · APPLY IT

1. **y = 11x + 15; 9 hours cost $114. The slope is $11 per hour, and the intercept is the $15 booking fee.** The hourly rate is (81 - 37)/(6 - 2) = 11, and the booking fee is 37 - 11(2) = 15. Substitute x = 9 to get y = 114.
2. **y = 4x - 60; the club breaks even after selling 15 shirts. The slope is $4 of profit per shirt, and the intercept represents a $60 upfront cost.** The slope is (100 - 20)/(40 - 20) = 4, and the intercept is 20 - 4(20) = -60. Set profit to zero: 0 = 4x - 60, so x = 15.

CHALLENGE

Pass A: y = 24 + 2x. Pass B: y = 8 + 4x. Setting the costs equal gives x = 8 trips. At 11 trips, A costs $46 and B costs $52, so A costs $6 less.

Accept equivalent forms of each linear equation. In context explanations, look for the correct units and a distinction between a per-unit rate and a starting amount.