LESSON MAKER PRO

Model the Data

Use a linear model to predict and check.

HIGH SCHOOL · GDA.DSP.F

GDA.DSP.F "Data analysis techniques can be used to develop models of contextual situations and to generate and evaluate possible solutions to real problems involving those contexts."

NAME _____ DATE _____

FROM DATA TO MODEL

If a quantity changes at a constant rate, model it with y = mx + b. Find m by dividing the change in y by the change in x, then use a data pair to find b. Check a prediction by subtracting it from the actual value.

WORKED EXAMPLE

The data follow a linear pattern. Predict y when x = 25.

DATA PAIRS

x	y
11	65
19	97

1. m = (97 - 65)/(19 - 11) = 32/8 = 4
2. 65 = 4(11) + b, so b = 21
3. At x = 25, y = 4(25) + 21 = 121

Answer: 121

PRACTICE 4 problems

1 A linear model contains (1, 8) and (4, 20). Predict y when x = 6.

ANSWER _____

2 A linear model contains (2, 16) and (6, 24). Predict y when x = 8.

ANSWER _____

3 A linear model contains (1, 7) and (5, 23). Find x when y = 35.

ANSWER _____

4 A linear model contains (2, 14) and (6, 26). At x = 8, the actual y is 29. Find the prediction and the residual, actual minus predicted.

ANSWER _____

APPLY IT Show your work

1 A skate park charges an entry fee plus an hourly fee. Two hours cost $14, and five hours cost $23. Predict the cost of seven hours. Is $28 enough?

WORK SPACE

ANSWER _____

2 Two music studios charge by the hour. Each plan has a linear cost. Which plan costs less for 6 hours, and by how much?

STUDIO COSTS IN DOLLARS

Hours	Plan A	Plan B
1	9	13
4	21	19

ANSWER _____

CHALLENGE One step up

Use the first two rows to model quiz points from study hours. Find the total absolute error for the last two rows. Is it at most 2 points?

STUDY TIME AND QUIZ POINTS

Hours	Points
1	8
2	11
4	18
6	22

WORK SPACE AND ANSWER

ANSWER KEY

Model the Data

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A linear model contains (1, 8) and (4, 20). Predict y when x = 6.	**28**
2	A linear model contains (2, 16) and (6, 24). Predict y when x = 8.	**28**
3	A linear model contains (1, 7) and (5, 23). Find x when y = 35.	**8**
4	A linear model contains (2, 14) and (6, 26). At x = 8, the actual y is 29. Find the prediction and the residual, actual minus predicted.	**Prediction: 32; residual: -3**

PART 2 · APPLY IT

1. **$29; no, $28 is $1 short.** The hourly fee is (23 - 14)/(5 - 2) = $3, and the entry fee is $8. Seven hours cost 8 + 3(7) = $29.
2. **Plan B costs $6 less.** Plan A costs $4 per hour plus $5, so 6 hours cost $29. Plan B costs $2 per hour plus $11, so 6 hours cost $23.

CHALLENGE

The model is y = 3x + 5. Its predictions are 17 and 23, so the total absolute error is |18 - 17| + |22 - 23| = 2 points. Yes.

For the residual, accept -3 or 3 below the prediction. The challenge requires absolute errors, so both differences count as 1.