Quiz Practice

Do the Math

When we use a linear model to describe the relationships between two variables, the model's equation often reveals important details about that relationship. Take for example the cost of a pizza in dollars, c, modeled by the equation, $\hat{c} = 8 + 1.5t$, where t is the number of toppings. This intercept suggests that the cost of a pizza with no toppings is $8 (the intercept of the graph). And the slope reveals that the cost increases by $1.50 for each additional topping.

9. For each model described below, explain what the slope and intercept mean (in context, as always!).

   a) $\hat{c} = 25 + 2w$, where c is the cost of shipping a package (in dollars) and w is the weight of the package (in pounds).

   b) $\hat{F} = 40 + \frac{1}{4}c$, where F is temperature in degrees Fahrenheit and c is the number of chirps a cricket makes in 1 minute. (Believe it or not, this generally is true for crickets in temperatures between 55°F and 100°F.)

   c) $\hat{P} = 15 + 0.1m$, where P is your cell phone plan's monthly charge (in dollars) and m is the number of minutes you used.

   d) $\hat{C} = 11 - 0.5h$, where C is how tall a candle is (in inches) after it has been burning for h hours.

10. For each of the following situations, create a linear equation that models the relationship between the variables. (Be sure to define your explanatory and response variables.)

   a) Renting a car costs $19.99 plus 25 cents for each mile you drive the car. Write an equation that models your rental cost.

   b) A football player breaks free and has an open field to the goal line 80 yards away. He can run 9 yards per second. Write an equation that models how far he has left to run for the touchdown.

   c) On Tuesdays a family restaurant hosts "Kid's Night" where an adult who purchases a full-price meal for $12 can buy children's dinners for an additional $2.50 per kid. Write an equation that models the total cost for an adult who brings several children to Kid's Night.

   d) You invest $500 to purchase supplies to bake pies. You sell each pie you bake for $8. Write an equation to model your profit.

(Check your answers on page 193.)

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9. a) Shipping a package costs $25 plus $2 per pound.
   b) Intercept is 40°, the temperature when there's no chirping; temperature increases 1/4°F for each additional chirp per minute.
   c) The monthly plan has a base charge of $15, plus an additional 10 cents for each minute of call time.
   d) The intercept is 11 inches, the original height of the candle; as it burns it shortens 1/2 inch per hour.

10. a) $C = 19.99 + 0.25m$ (C = cost in dollars; m = number of miles driven)
    b) $D = 80 - 9s$ (D = yards to the goal line; s = number of seconds running)
    c) $C = 12 + 2.50k$ (C = cost in dollars; k = number of kids who came)
    d) $P = 8s - 500$ (P = profit in dollars; s = number of pies sold)

Statistics Chapter 7: Regression Practice – KEY

For each problem:
a. List the variables in (x,y) order where x is the explanatory variable and y is the response variable.
b. Plot the data on your calculator and check the *Outlier* and *Straight Enough Conditions*.
c. If data does not meet these conditions, do not proceed for that question. Otherwise, use your calculator to find the best fit linear model and make the prediction requested.

Blocks	5	0	4	2	1	7
Price	132	310	204	238	275	60.8

1. A real estate agent collected prices of vacation cottages (in thousands of dollars) and how many blocks they are from the beach.

    (Blocks , Price)

Conditions met? yes

Model: $\widehat{Price} = 313.31 - 34.74\,Blocks$

Predict the price of a house 3 blocks from the

beach: $\widehat{Price} = 313.31 - 34.74(3) = \$209,090.$

Price/gal	\$1.345	\$1.408	\$1.537	\$1.580
year since 2000	1	2	3	4

2. The New York State average of price of gasoline for 2001 through 2004. We are interested in how the price is changing.

    (Year, Price/gal)

Conditions met? yes

Model: $\widehat{Price/gal} = 1.259 + 0.0834\,Year$

What does this model predict for the price of gas for this year? How accurate is this model compared to reality?

$\widehat{Price/gal} = 1.259 + 0.0834(15) = \$2.51/gal.$ This model is not accurate as it attempts to extrapolate well beyond the provided data.

Price	\$8	\$9	\$10	\$11	\$12	\$13
Profit	\$501	\$852	\$910	\$765	\$452	\$210

3. A T-shirt shop experiments with different prices of their shirts each week to find the price that maximizes their profit.

    (Price , Profit)

Conditions met? No!

Model: _____

Predict the profit when charging a price of \$15

per shirt. _____

Percent	37.1	34.1	32.1	28.8	25.7	25.5
Year	1980	1984	1989	1993	1997	2000

4. The percent of adults married before the age of 25 in the US over several years. We are interested in how this percent is changing.

    (Year, Percent)

Conditions met? yes

Model: $\widehat{Percent} = 1238.07479 - 0.60664\,Year$

What percent of adults married before 25 years old does this model predict for 2001?

$\widehat{Percent} = 1238.07479 - 0.60664(2001) = 24.2\%$