2.2 Predicting Profit
Substituting Expressions

The manager of the Water Town amusement park uses data collected over the past several years to write equations that will help her make predictions about the daily operations of the park.

The daily concession-stand profit in dollars P depends on the number of visitors V. The manager writes the equation below to model this relationship:

$$P = 2.50V - 500$$

She uses the equation below to predict the number of visitors V based on the probability of rain R.

$$V = 600 - 500R$$

- What information might each of the numbers in the equations represent?
- What units should you use with the expression $-500R$? The expression $600 - 500R$?

Can you write an equation to represent profit in terms of the probability of rain? What units would you use with this equation? Explain.

Problem 2.2

A **1.** Suppose the probability of rain is 25%. What profit can the concession stand expect? Explain.

2. What is the probability of rain if the profit expected is \$625? Explain your reasoning.

B **1.** Write an equation you can use to predict the concession-stand profit P based on the probability of rain R.

2. Use your equation to predict profit when the probability of rain is 25%. Compare your answer with your result in Question A, part (1).

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Problem 2.2 continued

C 1. Write an equivalent expression for the profit in Question B. Explain why the two expressions are equivalent.

2. What probability of rain predicts a profit of $625? Compare your answer with your result in Question A, part (2).

3. Predict the profit when the probability of rain is 0%. Does your answer make sense? Explain.

4. Predict the profit when the probability of rain is 100%. Does your answer make sense?

D Do the equations in Questions B and C represent a linear or nonlinear function? Explain.

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Did You Know?

The calculation of the quarterback rating in the National Football League (NFL™) uses a series of equations:

Completion Rating: $CR = 5\left(\frac{\text{completions}}{\text{attempts}}\right) - 1.5$

Yards Rating: $YR = \frac{\frac{\text{yards}}{\text{attempts}} - 3}{4}$

Touchdown Rating: $TR = 20\left(\frac{\text{touchdowns}}{\text{attempts}}\right)$

Interception Rating: $IR = \frac{19 - 2\left(\frac{\text{interceptions}}{\text{attempts}}\right)}{8}$

OVERALL RATING $= 100\left(\frac{CR + YR + TR + IR}{6}\right)$