

## Appendix C

### Polynomials

Retail companies must keep close track of their operations to maintain profitability. Often, the sales data of each individual product is analyzed separately, which can be used to help set pricing and other sales strategies.

#### Application Practice

Answer the following questions. Use Equation Editor to write mathematical expressions and equations. First, save this file to your hard drive by selecting **Save As** from the File menu. Click the white space below each question to maintain proper formatting.

1. In this problem, we analyze the profit found for sales of decorative tiles. A **demand equation** (sometimes called a demand curve) shows how much money people would pay for a product depending on how much of that product is available on the open market. Often, the demand equation is found empirically (through experiment, or market research).
  - a. Suppose a market research company finds that at a price of  $p = \$20$ , they would sell  $x = 42$  tiles each month. If they lower the price to  $p = \$10$ , then more people would purchase the tile, and they can expect to sell  $x = 52$  tiles in a month's time. Find the equation of the line for the demand equation. Write your answer in the form  $p = mx + b$ . Hint: Write an equation using two points in the form  $(x,p)$ .

A company's **revenue** is the amount of money that comes in from sales, before business costs are subtracted. For a single product, you can find the revenue by multiplying the quantity of the product sold,  $x$ , by the demand equation,  $p$ .

- b. Substitute the result you found from part a. into the equation  $R = xp$  to find the revenue equation. Provide your answer in simplified form.

The **costs** of doing business for a company can be found by adding **fixed costs**, such as rent, insurance, and wages, and **variable costs**, which are the costs to purchase the product you are selling. The portion of the company's fixed costs allotted to this product is \$300, and the supplier's cost for a set of tile is \$6 each. Let  $x$  represent the number of tile sets.

- c. If  $b$  represents a fixed cost, what value would represent  $b$ ?
  - d. Find the cost equation for the tile. Write your answer in the form  $C = mx + b$ .

The **profit** made from the sale of tiles is found by subtracting the costs from the revenue.

- e. Find the Profit Equation by substituting your equations for  $R$  and  $C$  in the equation  $P = R - C$ . Simplify the equation.
  - f. What is the profit made from selling 20 tile sets per month?
  - g. What is the profit made from selling 25 tile sets each month?
  - h. What is the profit made from selling no tile sets each month? Interpret your answer.

- i. Use trial and error to find the quantity of tile sets per month that yields the highest profit.
  - j. How much profit would you earn from the number you found in part i?
  - k. What price would you sell the tile sets at to realize this profit? Hint: Use the demand equation from part a.
2. The **break even** values for a profit model are the values for which you earn \$0 in profit. Use the equation you created in question one to solve  $P = 0$ , and find your break even values.
3. In 2002, Home Depot's sales amounted to \$58,200,000,000. In 2006, its sales were \$90,800,000,000.
  - a. Write Home Depot's 2002 sales and 2006 sales in scientific notation.

You can find the percent of growth in Home Depot's sales from 2002 to 2006 by following these steps:

- Find the increase in sales from 2002 to 2006.
  - Find what percent that increase is of the 2002 sales.
- b. What was the percent growth in Home Depot's sales from 2002 to 2006? Do all your work by using scientific notation.

The Home Depot, Inc. (2007, March 29). 2006 Annual Report. Retrieved from <http://www6.homedepot.com/annualreport/index.html>

4. A customer wants to make a teepee in his backyard for his children. He plans to use lengths of PVC plumbing pipe for the supports on the teepee, and he wants the teepee to be 12 feet across and 8 feet tall (see figure). How long should the pieces of PVC plumbing pipe be?

