


## 2.3 Tree Top Fun

### Equations for Linear Functions

-  Tree Top Fun (TTF, for short) runs adventure sites with zip lines, swings, rope ladders, bridges, and trapezes. The company uses mathematical models to relate the number of customers, prices, costs, income, and profit at its many locations.



### Problem 2.3

When finding an equation, it may help to calculate values of the dependent variable for some specific values of the independent variable. Then you can look for a pattern in those calculations. You can use the information given in words, tables of data, and graphs.

- A** Use what you know about linear equations to work out models for the Tree Top Fun business. Find an equation for each of the linear functions described below.
1. The standard charge per customer at TTF is \$25. Write an equation that relates the daily income  $I$  to the number  $n$  of customers.
  2. Each TTF site has operating costs of \$500 per day. Write an equation that relates daily profit  $P$  to the number  $n$  of customers.
  3. One TTF site bought a new rope bridge for \$4,500. TTF will make monthly payments of \$350 until the bill is paid. Write an equation for the unpaid balance  $B$  after  $m$  monthly payments.

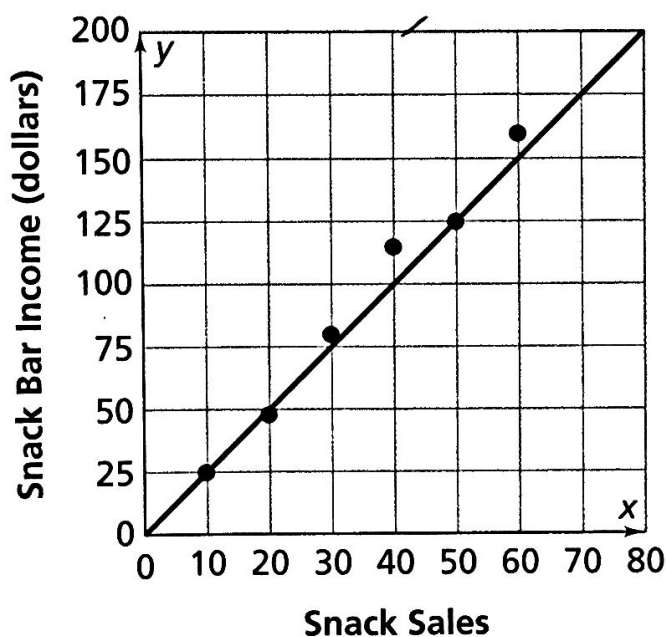
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## Problem 2.3 *continued*

- B** One operator of a Tree Top Fun franchise suggested the group admission fees in the table below.

<b>Number in Group</b>	1	2	3	4	5	10	15	20
<b>Admission (dollars)</b>	75	90	105	120	135	210	285	360

1. Explain how you know the relationship between the admission fee for a group and the number of people in the group is linear.
  2. What are the slope and  $y$ -intercept of the graph of the data?
  3. What equation relates admission fee  $A$  to the number  $n$  in the group?
- C** The owners of Tree Top Adventures opened a snack bar at one site. The graph below shows the income from snack sales for six different days. What is the equation of the linear model on the graph?



- D** Suppose you are asked to write an equation of the form  $y = mx + b$  to represent a linear function. What is your strategy for each situation?
1. You are given a description of the function in words.
  2. You are given two or more  $(x, y)$  values or a table of  $(x, y)$  values.
  3. You are given a graph showing points with coordinates.

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**Problem 2.3***continued*

**E** A state mathematics test asked students to find equations for linear functions. Two students, Dana and Chris, gave the answers below.

1. To find an equation for the line with slope  $-3$  that passes through the point  $(4, 3)$ , Dana wrote the following steps. Is he correct? Explain.

$$y = -3x + b, \text{ so } 3 = -3(4) + b$$

$$\text{This means } b = 15 \text{ and } y = -3x + 15.$$

2. To find an equation for the line that passes through points  $(4, 5)$  and  $(6, 9)$ , Chris wrote the following steps. Is she correct? Explain.

$$m = \frac{6-4}{9-5}, \text{ so } y = \frac{1}{2}x + b$$

$$\text{This means } 5 = \frac{1}{2}(4) + b, b = 3, \text{ and } y = \frac{1}{2}x + 3.$$