

**1.3 Maximum or Minimum of a Quadratic Function****BLM 1-4**

1. A car rental agency rents 40 cars per week at a rental fee of \$49 per vehicle. Market research shows that for every \$3 increase in rental price, 2 fewer cars per week will be rented.
  - a) What should be the rental price if revenue is to be maximized?
  - b) How many cars must be rented each week to maximize the revenue?
  - c) What is the maximum weekly revenue?
2. A skate-sharpening service sharpens 60 pairs of skates per day, at a price of \$2.50 per pair. For every increase in price of \$0.25, the service will sharpen 5 fewer pairs of skates per day. What price will maximize revenue?
3. Use partial factoring to find the coordinates of the vertex for each function.
  - a)  $y = 3x^2 + 12x - 8$
  - b)  $y = 2x^2 + 5x + 1$
  - c)  $y = \frac{1}{2}x^2 + x + 4$
  - d)  $y = \frac{2}{3}x^2 + 4x - 5$
4. To conduct an experiment, Jennifer throws a water balloon from the roof of a building. The path that the balloon follows is given by the function  $h(t) = -4.9t^2 + 2t + 45$ , where  $t$  is the time, in seconds, after the balloon is thrown and  $h$  is the balloon's height, in metres, above the sidewalk below.
  - a) How tall is the building?
  - b) How long does it take the balloon to fall to the sidewalk?
  - c) Determine the maximum height of the balloon, to the nearest tenth of a metre.
5. The sum of two numbers is 12. Find the two numbers if the sum of their squares is to be a maximum.
6. Two functions are given by the equations  $y = 20x - 2x^2$  and  $y = x^2 - 10x$ , with both  $x$  and  $y$  measured in centimetres. What is the distance between their optimal values (their maximum or minimum values)?
7. The power,  $P$ , measured in watts (W), that can be supplied to a circuit by a 9-volt battery is given by the function  $P(A) = -0.5A^2 + 7A$ , where  $A$  is the strength of the current, in amps.
  - a) Determine the current required to produce the maximum power.
  - b) What is the maximum power produced?
8. A new office building is being planned for a large city. The expected yearly income,  $I$ , in thousands of dollars, for the building owner can be modelled by the function  $I(x) = -40x^2 + 4000x - 1000$ , where  $x$  is the number of floors in the building.
  - a) How many floors should the building have to maximize the owner's yearly income?
  - b) What is the maximum income?

