Sections 8.2-8.3: Applications of Quadratic Equations

Steps for solving word problems:

- Read the problem (possibly more than once)
- Determine what equation(s) you should use
- Plug in the numbers you are given to solve for the wanted variable.
- Check your answer to make sure it makes sense in the context of the problem. Get rid of any solutions that do not make sense.

(1) A start-up company that manufactures drones projects that its annual profit, $p(t)$, in thousands of dollars, over the first 10 years of operation can be approximated by the function $p(t) = 1.2t^2 + 4t - 8$, where t is the number of full years the company has been in business.

(a) Estimate the profit or loss of the company after the first year. Interpret your answer.

(b) Estimate the profit or loss of the company after 6 years. Interpret your answer.

(c) Estimate the time needed for the company to break even.

(2) The function $N(t) = 0.0054t^2 - 1.46t + 95.11$ can be used to estimate the average number of years of life expectancy remaining for a person of age t years, where $30 \leq t \leq 100$

(a) Estimate the remaining life expectancy of a person of age 40.

(b) If a person has a remaining life expectancy of 14.3 years, estimate the age of the person.

(3) Hillary owns a business that sells designer necklaces. The revenue, $R(n)$, from selling n necklaces for $n \leq 50$, is $R(n) = n(50 - 0.2n)$.

(a) Determine the revenue when 30 necklaces are sold.

(b) How many necklaces must be sold to have a revenue of \$480?

(4) Betty is on top of a building and throws a baseball upward from an initial height of 60 feet with an initial velocity of 30 feet per second. The height h (in feet) of an object t seconds after it is projected upward can be determined by:

$$h = -16t^2 + v_0 t + h_0,$$

where v_0 is the initial velocity of the object (in feet per second) and h_0 is the initial height of the object (in feet).

(a) How long after Betty throws the ball will the ball be 25 feet above the ground?

(b) How long after Betty throws the ball will the ball hit the ground?

(c) What is the height of the ball after 2 seconds?

Key (without interpretations):

(1)	(a) -2.8	(2)	(a) 45.35	(3)	(a) \$1320	(4)	(a) ≈ 2.7
	(b) 59.2						(b) ≈ 3.1
	(c) ≈ 1.4		(b) 77.65		(b) 10		(c) 56 feet