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DATE _____

Module 13 Solving Quadratic Equations
of One Variable

Lesson 6 Solving Problems Using Quadratic
Equations of One Variable



**independent
practice**

Solve.

- The area of a rectangular porch is 105 square feet. The width of the porch is w feet, and the length is $3w - 6$ feet. What are the dimensions of the porch?

- The area of a rectangular patio is twice the width. The area of the patio is 800 square feet. What are the dimensions of the patio?

- The area of a square message board is 256 square inches. What is the length of a side of the message board?

- The area of the floor in Samantha's rectangular room is 120 square feet. The length of the room is eight feet less than twice the width. What are the dimensions of the floor?

- If the sides of a square are increased by three centimeters, its area becomes 81 square centimeters. What was the length of the side of the original square?

- The height, in feet, of a softball thrown upwards from a point one hundred feet above the ground is given by the equation $h = -16t^2 + 5t + 100$, where t is time in seconds. How many seconds will have elapsed when the softball is 25 feet above the ground?

7. The height, in feet, of a football kicked into the air is given by the equation $h = -16t^2 + 75t + 2$, where t is time in seconds. If the football is kicked, how much time will the football be in the air?

8. The height, in feet, of a football kicked into the air is given by the equation $h = -16t^2 + 75t + 2$, where t is time in seconds. How many seconds will have elapsed when the ball is 90 feet above the ground?

9. A good swimmer runs and jumps from a cliff 10 meters above the water. Her height in meters above the water t seconds after she jumps is given by $h = -4.9t^2 + 4t + 10$. How many seconds is she in the air before she reaches the water?

10. In a drop tower experiment to test durability and shock absorption, a backpack prototype is dropped from a height of 50 feet. The equation $h = -16t^2 + 50$ gives the height h of the backpack in feet, t seconds after it is dropped. Find the height of the backpack two seconds after it is dropped.

Solve the following problems by using the techniques learned in the lesson for solving word problems using quadratic equation of one variable. The scenarios, however, differ from those presented in the lesson.

11. The product of two numbers is 180. One number is five times the other number. What are the numbers?

12. The sum of a number and the square of the number is 20. What is the number and its square?

13. The revenue, R , in dollars of a tour bus is given by $R = -x^2 + 10x + 3,000$, where x is the number of unsold seats. How much revenue will the tour bus company receive when all seats are sold?

14. The revenue, R , in dollars of a tour bus is given by $R = -x^2 + 10x + 3,000$, where x is the number of unsold seats. How many unsold seats will result in \$0 revenue?

15. A political fundraiser usually sells 50 banquet tables when the price is \$2k per table, but for every \$1k increase in table price, the number of tables sold decreases by five. How much revenue will be raised when the table price is \$4k? Hint: revenue = (price per table) \times (number of tables sold). In the financial world, “k” is shorthand for “thousand”, so \$2k = \$2,000, but it is easier to work this problem without converting the k’s.

16. Use the fundraiser information of Problem 15 to find the price of a table if the desired revenue is \$175k. Also find the number of tables sold at this price.

Journal

- Rachel’s mother is making a rectangular quilt with a length that is two feet less than twice the width. The area of the quilt is 40 square feet. Explain the process for determining the dimensions of the quilt.
- The height, in feet, of an object thrown in the air is given by the equation $h = -16t^2 + 9t + 25$, where t is the time in seconds. What is the significance of the coefficients -16 and nine and the constant term 25?
- Leah wants wall-to-wall carpeting. Her room is rectangular, and one wall is five feet shorter than two and a half times the length of the adjacent wall. The area of her room is 120 square feet. Would a carpet that is 14 feet long by eight feet wide be large enough to cover her bedroom floor? Explain.
- If a ball is thrown into the air with an initial velocity of 16 feet per second from an initial height of 45 feet from the ground, how long is it before it reaches a height of 300 feet? Explain your reasoning.
- In solving real world problems which are modeled by a quadratic equation of one variable, the typical solution set contains two numbers. Do you always reject a negative solution? If possible give three real world scenarios in which a negative solution would be acceptable.

Cumulative Review

Determine if the equation is quadratic, linear or neither.

1. $(a + 2)(a - 2) = 0$

2. $d^3(d^2 + 5d) = d^5 + d^2$

3. $r^2(r + 5) = r^3 + 5r^2 + 9r$

4. $6z^2 - 2z = 5z^2 - 4z + 1$

Solve.

5. $3x^2 - 12 = 63$

6. $3(x + 3)^2 + 21 = 96$

7. $4(x + 3)^2 + 28 = 428$

8. $(x + 8)(x - 3) = 0$

9. $9x^2 - 12x - 7 = 5$

10. $6x^2 + 19x = 4x$

Complete the square.

11. $x^2 - 14x + \underline{\hspace{2cm}}$

12. $x^2 + 18x + \underline{\hspace{2cm}}$