

9.5 Start Thinking

The Quadratic Formula is another way to solve quadratic equations. The Quadratic Formula is $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ for any quadratic equation of the form $ax^2 + bx + c = 0$.

What value(s) of a make the Quadratic Formula undefined? Explain what a function of this form would look like. Are there any other situations that could make the Quadratic Formula undefined? Explain.

9.5 Warm Up

Evaluate.

- $17 - 14 \div (-2) + (-1)$
- $-1 - 3[15(4 + 4)]$
- $97 \cdot 1[13 - (5 + 3)] - 2^3$
- $17(10 + 1^4) - (-4)$
- $\frac{(-48) - (-3)}{-7 + 22} \cdot (10 + 3)$
- $1.2(2.6 + 5.7) - (2.1)^3$

9.5 Cumulative Review Warm Up

Solve the inequality. Graph the solution, if possible.

- $3|2w - 9| - 11 \geq 4$
- $-4|3 + 3u| - 6 > -14$
- $7|-f - 2| - 8 < 6$
- $\frac{3}{2}|5v - 5| + 3 \geq 9$
- $|x - 5| < 12$
- $|n + 6| < 0$

9.5**Practice A**

In Exercises 1–3, write the equation in standard form. Then identify the values of a , b , and c that you would use to solve the equation using the Quadratic Formula.

1. $x^2 = -5x$

2. $x^2 + 3x = -10$

3. $-5x^2 + 2 = 7x$

In Exercises 4–11, solve the equation using the Quadratic Formula. Round your solutions to the nearest tenth, if necessary.

4. $x^2 + 6x + 9 = 0$

5. $x^2 + 5x + 14 = 0$

6. $x^2 + 9x - 10 = 0$

7. $3x^2 - 2x - 1 = 0$

8. $3x^2 - 5x + 4 = 0$

9. $4x^2 + 4x + 1 = 0$

10. $6x^2 + 5x = 6$

11. $-5x^2 + 9x = -3$

12. Your friend competes in a high-jump competition at a track meet. The function $h = -16t^2 + 18t$ models the height h (in feet) of your friend after t seconds.

a. After how many seconds is your friend at a height of 4 feet?

b. After how many seconds does your friend land on the ground?

In Exercises 13–15, determine the number of real solutions of the equation.

13. $x^2 + 2x + 1 = 0$

14. $x^2 - 4x - 7 = 0$

15. $3x^2 - 2x = -6$

In Exercises 16–18, find the number of x -intercepts of the graph of the function.

16. $y = -x^2 + 3x + 5$

17. $y = 3x^2 - 7x + 8$

18. $y = 5x^2 - 10x + 1$

In Exercise 19–24, solve the equation using any method. Explain your choice of method.

19. $3x^2 = 12$

20. $3x^2 - 7x + 8 = 0$

21. $x^2 + 8x = 3$

22. $x^2 = 8 - x$

23. $x^2 - 14x + 49 = 0$

24. $4x^2 = 20x$

25. Consider the equation $3x^2 + 5x + 6 = 0$.

a. Use the discriminant to determine the number of solutions.

b. Change the sign of b in the equation. Write the new equation.

c. Use the discriminant to determine the number of solutions of the new equation. Did your answer change? Explain.

9.5 Practice B

In Exercises 1–3, write the equation in standard form. Then identify the values of a , b , and c that you would use to solve the equation using the Quadratic Formula.

1. $x^2 + 2x = 9$ 2. $6x - 1 = 7x^2$ 3. $-10x + 2 = -4x^2 + 9$

In Exercises 4–11, solve the equation using the Quadratic Formula. Round your solutions to the nearest tenth, if necessary.

4. $x^2 - 8x + 16 = 0$ 5. $x^2 + 10x - 11 = 0$

6. $2x^2 - 7x + 3 = 0$ 7. $5x^2 + 3x - 1 = 0$

8. $5x^2 - 3x + 4 = 0$ 9. $x^2 = -2x - 1$

10. $8x^2 + 9x = 3$ 11. $-5x^2 + 2x = 4$

12. You launch a water balloon. The function $h = -0.08t^2 + 1.6t + 2$ models the height h (in feet) of the water balloon after t seconds.

- After how many seconds is the water balloon at a height of 9 feet?
- After how many seconds does the water balloon hit the ground?

In Exercises 13–15, determine the number of real solutions of the equation.

13. $4x^2 = -3x - 8$ 14. $-2x^2 - 4x + 7 = 0$ 15. $x^2 + 6x + 9 = 0$

In Exercises 16–18, find the number of x -intercepts of the graph of the function.

16. $y = 3x^2 - 6x + 3$ 17. $y = 4x^2 + 3x + 9$ 18. $y = -2x^2 - 3x + 1$

In Exercise 19–24, solve the equation using any method. Explain your choice of method.

19. $x^2 - 20x = 13$ 20. $-7x^2 = 21x$

21. $-9x^2 = 72$ 22. $7x^2 + 7 = 8 - 9x$

23. $5x^2 = 4x + 10$ 24. $x^2 - 12x + 36 = 0$

25. Consider the equation $3x^2 + 5x + 6 = 0$.

- Use the discriminant to determine the number of solutions.
- Change the sign of c in the equation. Write the new equation.
- Use the discriminant to determine the number of solutions of the new equation. Did your answer change? Explain.

9.5 Enrichment and Extension**Quadratic Functions and Geometry**Area of a rectangle: $A = \ell w$ Area of a triangle: $A = \frac{1}{2}bh$ Pythagorean Theorem: $a^2 + b^2 = c^2$ Area of a Parallelogram: $A = bh$ **Solve the quadratic equation using the method of your choice.**

1. The hypotenuse of a right triangle is 6 inches longer than the shorter leg. The longer leg is 3 inches longer than the shorter leg. Find the length of the shorter leg.
2. The width of a rectangle is 6 kilometers less than twice its length. If its area is 108 square kilometers, find the dimensions of the rectangle.
3. A picture has a height that is $\frac{4}{3}$ its width. It is to be enlarged to have an area of 192 square inches. What will be the dimensions of the enlargement?
4. The height of a triangle is three times the length of its base. If the area of the triangle is 33 square inches, what are the dimensions of the triangle's base and height?
5. The ratio of the measures of the base and height of a parallelogram is 4 : 5. The area of the parallelogram is 800 square centimeters. Find the measure of both the base and height of the parallelogram.

9.5 Puzzle Time

What Do Elephants Take When They Go Away On A Long Trip?

Write the letter of each answer in the box containing the exercise number.

Determine the number of real solutions of the equation.

1. $6x^2 = 6x - 11$

- C. One D. Two E. None

2. $-\frac{1}{3}x^2 + 5x = -12$

- T. One U. Two V. None

Find the number of x-intercepts of the graph of the function.

3. $y = -x^2 + 7x + 15$

- G. One H. Two I. None

4. $y = 3x^2 - 18x + 27$

- S. One T. Two U. None

Solve the equation using the Quadratic Formula. Round your solutions to the nearest tenth, if necessary.

5. $x^2 - 9x + 20 = 0$

6. $x^2 + 6x + 5 = 0$

7. $x^2 - 12x + 32 = 0$

8. $3x^2 - 5x + 2 = 0$

9. $1 - 10x = -25x^2$

10. $x^2 + 4x = 7$

11. $8x^2 - 9 = -3x$

Answers	
T.	-5, -1
R.	$\frac{1}{5}$
K.	$\frac{2}{3}, 1$
T.	4, 5
I.	0.9, -1.3
N.	-5.3, 1.3
R.	4, 8

6	3	1	11	7		5	9	2	10	8	4
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