NAME ______________________________

Module 13 Solving Quadratic Equations of One Variable

Lesson 3 Solving Quadratic Equations by Factoring

independent practice

Solve by the factoring method.

1. $(x - 3)(x + 1) = 0$

$\{3, -1\}$

2. $(x + 5)(x + 7) = 0$

$\{-5, -7\}$

3. $y(y + 4) = 0$

$\{0, -4\}$

4. $4z(z - 3) = 0$

$\{0, 3\}$

5. $(2x - 3)(x + 4) = 0$

$\left\{\frac{3}{2}, -4\right\}$

6. $(2x + 3)(5x - 8) = 0$

$\left\{-\frac{3}{2}, \frac{8}{5}\right\}$

7. $n^2 + 7n + 10 = 0$

$\{-5, -2\}$

8. $m^2 - 3m - 40 = 0$

$\{8, -5\}$

9. $x^2 - 7x = 0$

$\{0, 7\}$

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

$\{0, -5\}$

11. $r^2 - 8r + 15 = 0$

$\{5, 3\}$

12. $p^2 + 13p + 36 = 0$

$\{-9, -4\}$

13. $x^2 + 5x + 9 = -3x + 29$

$\{2, -10\}$

14. $x^2 + 5x - 22 = 8x + 32$

$\{9, -6\}$

15. $d^2 + 4d + 24 = 14d + 24$

$\{0, 10\}$

16. $x^2 + 12x + 31 = 31$

$\{-12, 0\}$

17. $T^2 + 2T + 6 = 7T + 2$

$\{4, 1\}$

18. $K^2 - 3K + 11 = -16K - 29$

$\{-8, -5\}$

19. $25x^2 - 3x - 12 = -18x - 12$

$\left\{0, -\frac{3}{5}\right\}$

20. $3x^2 - 8x = -x^2$

$\{0, 2\}$

21. $5w^2 - 3w + 4 = 8w + 2$

$\left\{\frac{1}{5}, 2\right\}$

22. $-V^2 + 2V - 3 = -4V^2 + V + 1$

$\left\{-\frac{4}{3}, 1\right\}$

23. $9y^2 + 3y + 28 = -7y^2 - 53y - 21$

$\left\{-\frac{7}{4}\right\}$

24. $2x^2 + x + 49 = -2x^2 + 29x$

$\left\{\frac{7}{2}\right\}$

Journal

1. State the Zero Product Property and give a numerical example.
2. What are the steps used to solve a quadratic equation by factoring?
3. Is it possible to solve the equation $(x - 6)(x + 3) = 4$ by setting each factor equal to four and solving each equation? Why or why not?
4. Explain how to solve the equation $x^2 + 9x = -20$.
5. Solve $x^2 - 4 = 21$ by evaluating square roots and then again by factoring. Which method do you prefer? Why do you prefer this method?
6. A quadratic equation in one variable has the following roots: {–1, 5}. Using the variable *x*, write a quadratic equation in factored form that has these solutions. Then rewrite the equation in standard form. Why did you need to write the equation first in factored form?

Cumulative Review

Simplify.

1. $\dfrac{6x^2y^5z^8}{3xy^{-2}z^4}$

$2xy^7z^4$

2. $(6x + 3y)(2x - y)$

$12x^2 + 3y^2$

3. $(2a + 4b - c) - (3a + 2b + 5c)$

$-a + 2b - 6c$

4. $(6x^2 + 5x + 3) \div (2x + 1)$

$3x + 1 + \dfrac{2}{2x + 1}$

Factor, if possible.

5. $3a^2 + 4a + 6ab + 8b$

$(a + 2b)(3a + 4)$

6. $3a^3b + 6a^2b^2 - 12ab^3$

$3ab(a^2 + 2ab - 4b^2)$

7. $c^2 - 13c + 36$

$(c - 9)(c - 4)$

8. $3d^2 - 10d - 8$

$(3d + 2)(d - 4)$

9. Is $4(a + 2)^2 - 3 = 3a^2 + 1$ a quadratic equation, a linear equation, or neither?

Quadratic

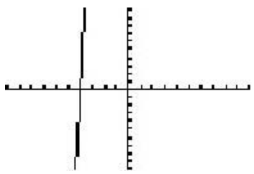
10. Solve $(x - 4)^2 + 2 = 38$ by evaluating square roots.

{10, –2}

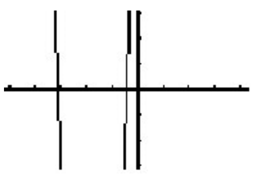
Graphing Calculator Problem

Solve $x^2 + 35x + 124 = 0$ by graphing its associated quadratic function, $y = x^2 + 35x + 124$ on a graphing calculator and by finding its x-intercepts. To graph this function on the graphing calculator, press Y= and CLEAR (if needed). Enter the expression by pressing X,T,θ,n, x^2, +, 3, 5, X,T,θ,n, +, 1, 2, and 4.

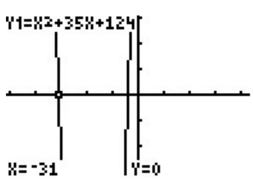
Press ZOOM. Then, move the cursor to 6 and press ENTER to set the calculator in the standard viewing window and graph the function. There is not enough information using this range.



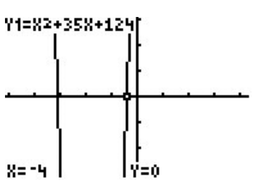
Press ZOOM. Then, move the cursor to 8 and press ENTER to view the graph in integer mode. Move the cursor to the middle of the curve on the x-axis and press ENTER.



Press TRACE. Then, press the left arrow key until the cursor is blinking at the left-most x-intercept. Find the root on the bottom of the calculator screen. There is a root at $x = -31$.



Press the right arrow key until the cursor is blinking at the other x-intercept. Find the root on the bottom of the calculator screen. There is a root at $x = -4$.



The roots are {–31, –4}.

Solve by graphing on a graphing calculator.

1. $(x - 8)(x + 2) = 0$

{8, –2}

2. $x^2 + 8x + 24 = 8$

{–4}

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

{0, 5}

4. $x^2 + 3x - 9 = -2x + 15$

{–8, 3}

Possible Journal Answers

1. If a product is zero, at least one factor is zero. If three times a number is equal to zero, the number must be zero.
2. First, put the equation in standard form. Second, factor completely. Third, set each factor equal to zero, and fourth, solve each resulting equation.
3. No, it is not possible. The Zero Product Property works only if the product is zero. If the product of two numbers is four, it is not necessary for one of the numbers to be four.
4. To solve $x^2 + 9x = -20$, first add 20 to both sides of the equation to get the equation in standard form. The result is $x^2 + 9x + 20 = 0$. Factor $x^2 + 9x + 20$ to get $(x + 4)(x + 5) = 0$. Set each factor equal to zero. The result is $x + 4 = 0$ or $x + 5 = 0$. Solve each equation. The solution is $x = -4$ or $x = -5$.
5. Square Roots

   $x^2 - 4 = 21$

   $x^2 = 25$

   $x = \sqrt{25}$ or $x = -\sqrt{25}$

   $x = 5$ or $x = -5$

   Factoring

   $x^2 - 4 = 21$

   $x^2 - 25 = 0$

   $(x + 5)(x - 5) = 0$

   $x + 5 = 0$ or $x - 5 = 0$

   $x = -5$ or $x = 5$

   Answers about preference will vary. Accept any answer that has adequate reasoning.
6. In factored form, the equation is $(x - 5)(x + 1) = 0$. In standard form, the equation is $x^2 - 4x - 5 = 0$. We need to write the equation in factored form first, because we are working backwards from a solution of a quadratic equation by the factoring method. The step just before the two solutions branch is the factored form of the equation. The step before that is the standard form of the quadratic equation.