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A=1

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9-3 Study Guide and Intervention

Factoring Trinomials: $x^2 + bx + c$

Factor $x^2 + bx + c$ To factor a trinomial of the form $x^2 + bx + c$, find two integers, m and n , whose sum is equal to b and whose product is equal to c .

Factoring $x^2 + bx + c$ $x^2 + bx + c = (x - m)(x + n)$, where $m + n = b$ and $mn = c$.

Example 1 Factor each trinomial.

a. $x^2 + 7x + 10$

In this trinomial, $b = 7$ and $c = 10$.

Factors of 10	Sum of Factors
1, 10	11
2, 5	7

Since $2 + 5 = 7$ and $2 \cdot 5 = 10$, let $m = 2$ and $n = 5$.

$$x^2 + 7x + 10 = (x + 5)(x + 2)$$

b. $x^2 - 8x + 7$

In this trinomial, $b = -8$ and $c = 7$.

Notice that $m + n$ is negative and mn is positive, so m and n are both negative. Since $-7 + (-1) = -8$ and $(-7)(-1) = 7$, $m = -7$ and $n = -1$.

$$x^2 - 8x + 7 = (x - 7)(x - 1)$$

EXERCISES

Factor each trinomial.

- | | | |
|---|--|---|
| 1. $x^2 + 4x + 3$
$(x + 3)(x + 1)$ | 2. $m^2 + 12m + 32$
$(m + 4)(m + 8)$ | 3. $r^2 - 3r + 2$
$(r - 2)(r - 1)$ |
| 4. $x^2 - x - 6$
$(x - 3)(x + 2)$ | 5. $x^2 - 4x - 21$
$(x - 7)(x + 3)$ | 6. $x^2 - 22x + 121$
$(x - 11)(x - 11)$ |
| 7. $c^2 - 4c - 12$
$(c + 2)(c - 6)$ | 8. $p^2 - 16p + 64$
$(p - 8)(p - 8)$ | 9. $9 - 10x + x^2$
$(9 - x)(1 - x)$ |
| 10. $x^2 + 6x + 5$
$(x + 5)(x + 1)$ | 11. $a^2 + 8a - 9$
$(a - 1)(a + 9)$ | 12. $y^2 - 7y - 8$
$(y - 8)(y + 1)$ |
| 13. $x^2 - 2x - 3$
$(x - 3)(x + 1)$ | 14. $y^2 + 14y + 13$
$(y + 1)(y + 13)$ | 15. $m^2 + 9m + 20$
$(m + 4)(m + 5)$ |
| 16. $x^2 + 12x + 20$
$(x + 10)(x + 2)$ | 17. $a^2 - 14a + 24$
$(a - 2)(a - 12)$ | 18. $18 + 11y + y^2$
$(9 + y)(2 + y)$ |
| 19. $x^2 + 2xy + y^2$
$(x + y)(x + y)$ | 20. $a^2 - 4ab + 4b^2$
$(a - 2b)(a - 2b)$ | 21. $x^2 + 6xy - 7y^2$
$(x + 7y)(x - y)$ |

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9-3 Study Guide and Intervention (continued)

Factoring Trinomials: $x^2 + bx + c$

Solve Equations by Factoring Factoring and the Zero Product Property from Lesson 9-2 can be used to solve many equations of the form $x^2 + bx + c = 0$.

Example 1 Solve $x^2 + 6x = 7$. Check your solutions.

- | | |
|----------------------------|---|
| $x^2 + 6x = 7$ | Original equation |
| $x^2 + 6x - 7 = 0$ | Rewrite equation so that one side equals 0. |
| $(x - 1)(x + 7) = 0$ | Factor. |
| $x - 1 = 0$ or $x + 7 = 0$ | Zero Product Property |
| $x = 1$ $x = -7$ | Solve each equation. |

The solution set is $\{1, -7\}$. Since $1^2 + 6 = 7$ and $(-7)^2 + 6(-7) = 7$, the solutions check.

Example 2 **ROCKET LAUNCH** A rocket is fired with an initial velocity of 2288 feet per second. How many seconds will it take for the rocket to hit the ground? The formula $h = vt - 16t^2$ gives the height h of the rocket after t seconds when the initial velocity v is given in feet per second.

- | | |
|----------------------------|-----------------------|
| $h = vt - 16t^2$ | Formula |
| $0 = 2288t - 16t^2$ | Substitute. |
| $0 = 16t(143 - t)$ | Factor. |
| $16t = 0$ or $143 - t = 0$ | Zero Product Property |
| $t = 0$ $t = 143$ | Solve each equation. |

The value $t = 0$ represents the time at launch. The rocket returns to the ground in 143 seconds, or a little less than 2.5 minutes after launch.

EXERCISES

Solve each equation. Check your solutions.

- | | | |
|-----------------------------------|-----------------------------------|-------------------------------------|
| 1. $x^2 - 4x + 3 = 0$ $\{1, 3\}$ | 2. $y^2 - 5y + 4 = 0$ $\{1, 4\}$ | 3. $m^2 + 10m + 9 = 0$ $\{-1, -9\}$ |
| 4. $x^2 = x + 2$ $\{-1, 2\}$ | 5. $x^2 - 4x = 5$ $\{-1, 5\}$ | 6. $x^2 - 12x + 36 = 0$ $\{6\}$ |
| 7. $c^2 - 8 = -7c$ $\{-8, 1\}$ | 8. $p^2 = 9p - 14$ $\{2, 7\}$ | 9. $-9 - 8x + x^2 = 0$ $\{-1, 9\}$ |
| 10. $x^2 + 6 = 5x$ $\{2, 3\}$ | 11. $a^2 = 11a - 18$ $\{2, 9\}$ | 12. $y^2 - 8y + 15 = 0$ $\{3, 5\}$ |
| 13. $x^2 = 24 - 10x$ $\{-12, 2\}$ | 14. $a^3 - 18a = -72$ $\{6, 12\}$ | 15. $b^2 = 10b - 16$ $\{2, 8\}$ |

Use the formula $h = vt - 16t^2$ to solve each problem.

16. **FOOTBALL** A punter can kick a football with an initial velocity of 48 feet per second. How many seconds will it take for the ball to return to the ground? **3 seconds**
17. **BASEBALL** A ball is thrown up with an initial velocity of 32 feet per second. How many seconds will it take for the ball to return to the ground? **2 seconds**
18. **ROCKET LAUNCH** If a rocket is launched with an initial velocity of 1600 feet per second, when will the rocket be 14,400 feet high? **at 10 seconds and at 90 seconds**

Lesson 9-3

8 (2 pgs)

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9-3 Skills Practice

Factoring Trinomials: $x^2 + bx + c$

Factor each trinomial.

- | | |
|--|---|
| 1. $t^2 + 8t + 12$
$(t + 2)(t + 6)$ | 2. $n^2 + 7n + 12$
$(n + 3)(n + 4)$ |
| 3. $p^2 + 9p + 20$
$(p + 5)(p + 4)$ | 4. $h^2 + 9h + 18$
$(h + 6)(h + 3)$ |
| 5. $n^2 + 3n - 18$
$(n + 6)(n - 3)$ | 6. $x^2 + 2x - 8$
$(x + 4)(x - 2)$ |
| 7. $y^2 - 5y - 6$
$(y + 1)(y - 6)$ | 8. $g^2 + 3g - 10$
$(g + 5)(g - 2)$ |
| 9. $s^2 + 4s - 12$
$(s - 2)(s + 6)$ | 10. $x^2 - x - 12$
$(x - 4)(x + 3)$ |
| 11. $w^2 - w - 6$
$(w - 3)(w + 2)$ | 12. $y^2 - 6y + 8$
$(y - 2)(y - 4)$ |
| 13. $x^2 - 8x + 15$
$(x - 5)(x - 3)$ | 14. $b^2 - 9b + 8$
$(b - 1)(b - 8)$ |
| 15. $c^2 - 15c + 56$
$(c - 7)(c - 8)$ | 16. $-4 - 3m + m^2$
$(m - 4)(m + 1)$ |

Solve each equation. Check your solutions.

- | | |
|---------------------------------|----------------------------------|
| 17. $x^2 - 6x + 8 = 0$ {2, 4} | 18. $b^2 - 7b + 12 = 0$ {3, 4} |
| 19. $m^2 + 5m + 6 = 0$ {-3, -2} | 20. $d^2 + 7d + 10 = 0$ {-5, -2} |
| 21. $y^2 - 2y - 24 = 0$ {-4, 6} | 22. $p^2 - 3p = 18$ {-3, 6} |
| 23. $h^2 + 2h = 35$ {-7, 5} | 24. $a^2 + 14a = -45$ {-9, -5} |
| 25. $n^2 - 36 = 5n$ {-4, 9} | 26. $w^3 + 30 = 11w$ {5, 6} |

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9-3 Practice (Average)

Factoring Trinomials: $x^2 + bx + c$

Factor each trinomial.

- | | | |
|---|---|--|
| 1. $a^2 + 10a + 24$
$(a + 4)(a + 6)$ | 2. $h^2 + 13h + 27$
$(h + 3)(h + 9)$ | 3. $x^2 + 14x + 33$
$(x + 11)(x + 3)$ |
| 4. $g^2 - 2g - 63$
$(g + 7)(g - 9)$ | 5. $w^2 + w - 56$
$(w + 8)(w - 7)$ | 6. $y^2 + 4y - 60$
$(y + 10)(y - 6)$ |
| 7. $b^2 + 4b - 32$
$(b - 4)(b + 8)$ | 8. $n^2 - 3n - 28$
$(n - 7)(n + 4)$ | 9. $c^2 + 4c - 45$
$(c - 5)(c + 9)$ |
| 10. $z^2 - 11z + 30$
$(z - 6)(z - 5)$ | 11. $d^2 - 16d + 63$
$(d - 9)(d - 7)$ | 12. $x^2 - 11x + 24$
$(x - 3)(x - 8)$ |
| 13. $q^2 - q - 56$
$(q - 8)(q + 7)$ | 14. $x^2 - 6x - 55$
$(x + 5)(x - 11)$ | 15. $32 + 18r + r^2$
$(r + 16)(r + 2)$ |
| 16. $48 - 16g + g^2$
$(g - 12)(g - 4)$ | 17. $j^2 - 9jk - 10k^2$
$(j - 10k)(j + k)$ | 18. $m^2 - mv - 56v^2$
$(m - 8v)(m + 7v)$ |

Solve each equation. Check your solutions.

- | | | |
|---------------------------------------|-------------------------------------|------------------------------------|
| 19. $x^2 + 17x + 42 = 0$
{-14, -3} | 20. $p^2 + 5p - 84 = 0$
{-12, 7} | 21. $k^2 + 3k - 54 = 0$
{-9, 6} |
| 22. $b^2 - 12b - 64 = 0$
{-4, 16} | 23. $n^2 + 4n = 32$
{-8, 4} | 24. $h^2 - 17h = -60$
{5, 12} |
| 25. $c^2 - 26c = 56$
{-2, 28} | 26. $z^2 - 14z = 72$
{-4, 18} | 27. $y^2 - 84 = 5y$
{-7, 12} |
| 28. $80 + a^3 = 18a$
{8, 10} | 29. $u^3 = 16u + 36$
{-2, 18} | 30. $17x + g^2 = -52$
{-13, -4} |
31. Find all values of k so that the trinomial $x^2 + kx - 35$ can be factored using integers.
-34, -2, 2, 34

CONSTRUCTION For Exercises 32 and 33, use the following information.

A construction company is planning to pour concrete for a driveway. The length of the driveway is 16 feet longer than its width w .

32. Write an expression for the area of the driveway. $w(w + 16)$ ft²
33. Find the dimensions of the driveway if it has an area of 260 square feet. 10 ft by 26 ft

WEB DESIGN For Exercises 34 and 35, use the following information.

Janeel has a 10-inch by 12-inch photograph. She wants to scan the photograph, then reduce the result by the same amount in each dimension to post on her Web site. Janeel wants the area of the image to be one eighth that of the original photograph.

34. Write an equation to represent the area of the reduced image.
 $(10 - x)(12 - x) = 15$, or $x^2 - 22x + 105 = 0$
35. Find the dimensions of the reduced image. 3 in. by 5 in.