In the next example, $c$ is negative. In this case, you need to consider combinations that equal $-8$, like $(-8)(1)$. You must also consider $(-1)(8)$.

## 2 EXAMPLE c Is Negative

Factor $7x^2 - 26x - 8$.

| $7x^2$ | $-26x$ | $-8$ |
|---|---|---|
| $1 \cdot 7$ | $(1)(-8) + (1)(7) = -1$ | $(1)(-8)$ |
| | $(1)(1) + (-8)(7) = -55$ | $(-8)(1)$ |
| | $(1)(-4) + (2)(7) = 10$ | $(2)(-4)$ |
| | $(1)(2) + \boxed{(-4)(7)} = -26$ ✓ | $(-4)(2)$ |

$$7x^2 - 26x - 8 = (1x + -4)(7x + 2)$$

**Check Understanding** 2 Factor each expression.

**a.** $5d^2 - 14d - 3$ **b.** $2n^2 + n - 3$ **c.** $20p^2 - 31p - 9$

Some polynomials can be factored repeatedly. Continue the process of factoring until there are no common factors other than 1. If a trinomial has a common monomial factor, factor it out before trying to find binomial factors.

## 3 EXAMPLE Factoring Out a Monomial First

Factor $20x^2 + 80x + 35$ completely.

$20x^2 + 80x + 35 = 5(4x^2 + 16x + 7)$ **Factor out the GCF.**

Factor $4x^2 + 16x + 7$.

| $4x^2$ | $16x$ | $7$ |
|---|---|---|
| $1 \cdot 4$ | $1 \cdot 7 + 1 \cdot 4 = 11$ | $1 \cdot 7$ |
| | $1 \cdot 1 + 7 \cdot 4 = 29$ | $7 \cdot 1$ |
| $2 \cdot 2$ | $2 \cdot 7 + \boxed{1 \cdot 2} = 16$ ✓ | $1 \cdot 7$ |

$$4x^2 + 16x + 7 = (2x + 1)(2x + 7)$$

$20x^2 + 80x + 35 = 5(2x + 1)(2x + 7)$ **Include the GCF in your final answer.**

**Check Understanding** 3 Factor each expression.

**a.** $2v^2 - 12v + 10$ **b.** $4y^2 + 14y + 6$ **c.** $18k^2 - 12k - 6$

# EXERCISES

For more practice, see *Extra Practice*.

## Practice and Problem Solving

**A Practice by Example**

**Example 1 (page 486)**

**Factor each expression.**

**1.** $2n^2 + 15n + 7$ **2.** $7d^2 + 50d + 7$ **3.** $11w^2 - 14w + 3$

**4.** $3x^2 - 17x + 10$ **5.** $6t^2 + 25t + 11$ **6.** $3d^2 - 17d + 20$

**7.** $16m^2 + 26m + 9$ **8.** $15p^2 - 26p + 11$ **9.** $8y^2 + 30y + 13$

**10.** $2y^2 + 35y + 17$ **11.** $7x^2 - 30x + 27$ **12.** $8x^2 + 18x + 9$

**Example 2 (page 487)**

**Factor each expression.**

**13.** $2t^2 - t - 3$ **14.** $8y^2 - 10y - 3$ **15.** $2q^2 - 11q - 21$

**16.** $7x^2 - 20x - 3$ **17.** $13p^2 + 8p - 5$ **18.** $5k^2 - 2k - 7$

**19.** $10w^2 + 11w - 8$ **20.** $12d^2 - d - 20$ **21.** $14n^2 + 23n - 15$

**Example 3 (page 487)**

**22.** $24m^2 - 32m + 8$ **23.** $21v^2 - 70v + 49$ **24.** $6t^2 + 26t + 24$

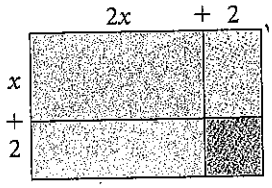
**25.** $25x^2 - 10x - 15$ **26.** $11p^2 + 77p + 66$ **27.** $24v^2 + 10v - 6$

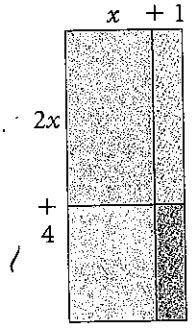
## B Apply Your Skills

**Open-Ended Find three different values that complete each expression so that the trinomial can be factored into the product of two binomials. Factor your trinomials.**

**28.** $4g^2 + \blacksquare g + 10$ **29.** $15m^2 + \blacksquare m - 24$ **30.** $35g^2 + \blacksquare g - 16$

**31. a.** Write each area as a product of two binomials.




**b.** Are the products equal?

**c. Critical Thinking** Explain how the two products you found in part (a) can equal the same trinomial.

**32. Writing** Explain how you would factor the expression $50x^2 - 90x + 16$.

**Factor each expression.**

**33.** $54p^2 + 87p + 28$ **34.** $66r^2 + 57r + 12$ **35.** $14x^2 - 53x + 14$

**36.** $28m^2 + 28m - 56$ **37.** $21h^2 + 72h - 48$ **38.** $55n^2 - 52n + 12$

**39.** $36y^2 + 114y - 20$ **40.** $63w^2 - 89w + 30$ **41.** $99q^2 - 92q + 9$

## C Challenge

**42. Critical Thinking** If $a$ and $c$ in $ax^2 + bx + c$ are prime numbers, and the trinomial is factorable, how many positive values are possible for $b$?

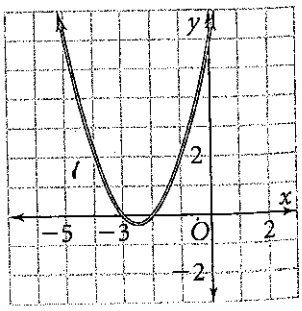
**43. Open-Ended** Write three different factorable trinomials that are of the form $\blacksquare x^2 - 12x + \blacksquare$. Factor your trinomials.

**Factor each expression.**

**44.** $56x^3 + 43x^2 + 5x$ **45.** $49p^2 + 63pq - 36q^2$ **46.** $108g^2h - 162gh + 54h$

**47.** The graph of the function $y = x^2 + 5x + 6$ is shown at the right.

**a.** What are the $x$-intercepts?

**b.** Factor $x^2 + 5x + 6$.

**c. Critical Thinking** Describe the relationship between the binomial factors you found in part (b) and the $x$-intercepts.