

# 4-4

## Reteaching

# Practice Factoring

### Factoring Quadratic Expressions

**Problem**

What is  $6x^2 - 5x - 4$  in factored form?

$a = 6, b = -5, \text{ and } c = -4$  Find  $a, b, \text{ and } c$ ; they are the coefficients of each term.

$ac = -24$  and  $b = -5$  We are looking for factors with product  $ac$  and sum  $b$ .

Factors of $-24$	1, $-24$	$-1, 24$	2, $-12$	$-2, 12$	3, $-8$	$-3, 8$	4, $-6$	$-4, 6$
Sum of factors	$-23$	23	$-10$	10	$-5$	5	$-2$	2

The factors 3 and  $-8$  are the combination whose sum is  $-5$ .

$$6x^2 + 3x - 8x - 4$$

Rewrite the middle term using the factors you found.

$$3x(2x + 1) - 4(2x + 1)$$

Find common factors by grouping the terms in pairs.

$$(3x - 4)(2x + 1)$$

Rewrite using the Distributive Property.

**Check**  $(3x - 4)(2x + 1)$

You can check your answer by multiplying the factors together.

$$6x^2 + 3x - 8x - 4$$

$$6x^2 - 5x - 4$$

Remember that not all quadratic expressions are factorable.

### Exercises

Factor each expression.

1.  $x^2 + 6x + 8$

2.  $x^2 - 4x + 3$

3.  $2x^2 - 6x + 4$

4.  $2x^2 - 11x + 5$

5.  $2x^2 - 7x - 4$

6.  $4x^2 + 16x + 15$

7.  $x^2 - 5x - 14$

8.  $7x^2 - 19x - 6$

9.  $x^2 - x - 72$

10.  $2x^2 + 9x + 7$

11.  $x^2 + 12x + 32$

12.  $4x^2 - 28x + 49$

13.  $x^2 - 3x - 10$

14.  $2x^2 + 9x + 4$

15.  $9x^2 - 6x + 1$

16.  $x^2 - 10x + 9$

17.  $x^2 + 4x - 12$

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

19.  $x^2 - 8x + 12$

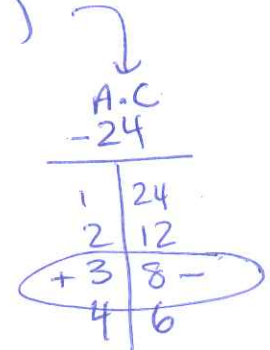
20.  $2x^2 - 5x - 3$

21.  $x^2 - 6x + 5$

22.  $3x^2 + 2x - 8$

Not "my" way

$AC = -24$   $b = -5$   
My way (ax)(ax)



$$\left(\frac{6x+3}{3}\right)\left(\frac{6x-8}{2}\right)$$

$$(2x+1)(3x-4)$$

## 4-4

**Reteaching** (continued)

## Factoring Quadratic Expressions

- $a^2 + 2ab + b^2 = (a + b)^2$  Factoring perfect square trinomials
- $a^2 - 2ab + b^2 = (a - b)^2$
- $a^2 - b^2 = (a + b)(a - b)$  Factoring a difference of two squares

**Problem**

What is  $25x^2 - 20x + 4$  in factored form?

There are three terms. Therefore, the expression may be a perfect square trinomial.

$$a^2 = 25x^2 \text{ and } b^2 = 4 \quad \text{Find } a^2 \text{ and } b^2.$$

$$a = 5x \text{ and } b = 2 \quad \text{Take square roots to find } a \text{ and } b.$$

Check that the choice of  $a$  and  $b$  gives the correct middle term.

$$2ab = 2 \cdot 5x \cdot 2 = 20x$$

Write the factored form.

$$a^2 - 2ab + b^2 = (a - b)^2$$

$$25x^2 - 20x + 4 = (5x - 2)^2$$

- Check**
- |                         |                                                                |
|-------------------------|----------------------------------------------------------------|
| $(5x - 2)^2$            | You can check your answer by multiplying the factors together. |
| $(5x - 2)(5x - 2)$      | Rewrite the square in expanded form.                           |
| $25x^2 - 10x - 10x + 4$ | Distribute.                                                    |
| $25x^2 - 20x + 4$       | Simplify.                                                      |

**Exercises**

Factor each expression.

23.  $x^2 - 12x + 36$

24.  $x^2 + 30x + 225$

25.  $9x^2 - 12x + 4$

26.  $x^2 - 64$

27.  $9x^2 - 42x + 49$

28.  $25x^2 - 1$

29.  $27x^2 - 12$

30.  $49x^2 + 42x + 9$

31.  $16x^2 - 32x + 16$

32.  $9x^2 - 16$

33.  $8x^2 - 18$

34.  $81x^2 + 126x + 49$

35.  $125x^2 - 100x + 20$

36.  $-x^2 + 196$

37.  $-16x^2 - 24x - 9$

# 4-4

## Reteaching

Answers

### Factoring Quadratic Expressions

#### Problem

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$6x^2 + 3x - 8x - 4$  Rewrite the middle term using the factors you found.

$3x(2x + 1) - 4(2x + 1)$  Find common factors by grouping the terms in pairs.

$(3x - 4)(2x + 1)$  Rewrite using the Distributive Property.

**Check**  $(3x - 4)(2x + 1)$  You can check your answer by multiplying the factors together.

$$6x^2 + 3x - 8x - 4$$

$$6x^2 - 5x - 4$$

Remember that not all quadratic expressions are factorable.

#### Exercises

Factor each expression.

- $x^2 + 6x + 8$   $(x+4)(x+2)$
- $x^2 - 4x + 3$   $(x-3)(x-1)$
- $2x^2 - 6x + 4$   $2(x-2)(x-1)$
- $2x^2 - 11x + 5$   $(2x-1)(x-5)$
- $2x^2 - 7x - 4$   $(2x+1)(x-4)$
- $4x^2 + 16x + 15$   $(2x+5)(2x+3)$
- $x^2 - 5x - 14$   $(x+2)(x-7)$
- $7x^2 - 19x - 6$   $(7x+2)(x-3)$
- $x^2 - x - 72$   $(x-9)(x+8)$
- $2x^2 + 9x + 7$   $(2x+7)(x+1)$
- $x^2 + 12x + 32$   $(x+4)(x+8)$
- $4x^2 - 28x + 49$   $(2x-7)(2x-7)$
- $x^2 - 3x - 10$   $(x+4)(x-5)$
- $2x^2 + 9x + 4$   $(2x+1)(x+4)$
- $9x^2 - 6x + 1$   $(3x-1)(3x-1)$
- $x^2 - 10x + 9$   $(x-1)(x-9)$
- $x^2 + 4x - 12$   $(3x-1)(3x-1)$
- $x^2 + 7x + 10$   $(x+5)(x+2)$
- $x^2 - 8x + 12$   $(x-6)(x-2)$
- $2x^2 - 5x - 3$   $(2x+1)(x-3)$
- $x^2 - 6x + 5$   $(x-1)(x-5)$
- $3x^2 + 2x - 8$   $(3x-4)(x+2)$

# 4-4 Reteaching (continued)

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- $a^2 - b^2 = (a + b)(a - b)$  Factoring a difference of two squares

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 $a = 5x$  and  $b = 2$  Take square roots to find  $a$  and  $b$ .

Check that the choice of  $a$  and  $b$  gives the correct middle term.

$2ab = 2 \cdot 5x \cdot 2 = 20x$   
 Write the factored form.  
 $a^2 - 2ab + b^2 = (a - b)^2$   
 $25x^2 - 20x + 4 = (5x - 2)^2$

- Check**  $(5x - 2)^2$  You can check your answer by multiplying the factors together.  
 $(5x - 2)(5x - 2)$  Rewrite the square in expanded form.  
 $25x^2 - 10x - 10x + 4$  Distribute.  
 $25x^2 - 20x + 4$  Simplify.

### Exercises

Factor each expression.

- |                                             |                                         |                                           |
|---------------------------------------------|-----------------------------------------|-------------------------------------------|
| 23. $x^2 - 12x + 36$<br>$(x-6)(x-6)$        | 24. $x^2 + 30x + 225$<br>$(x+15)(x+15)$ | 25. $9x^2 - 12x + 4$<br>$(3x-2)(3x-2)$    |
| 26. $x^2 - 64$<br>$(x+8)(x-8)$              | 27. $9x^2 - 42x + 49$<br>$(3x-7)(3x-7)$ | 28. $25x^2 - 1$<br>$(5x+1)(5x-1)$         |
| 29. $27x^2 - 12$<br>$3(3x+2)(3x-2)$         | 30. $49x^2 + 42x + 9$<br>$(7x+3)(7x+3)$ | 31. $16x^2 - 32x + 16$<br>$16(x-1)(x-1)$  |
| 32. $9x^2 - 16$<br>$(3x+4)(3x-4)$           | 33. $8x^2 - 18$<br>$2(2x+3)(2x-3)$      | 34. $81x^2 + 126x + 49$<br>$(9x+7)(9x+7)$ |
| 35. $125x^2 - 100x + 20$<br>$5(5x-2)(5x-2)$ | 36. $-x^2 + 196$<br>$-(x+14)(x-14)$     | 37. $-16x^2 - 24x - 9$<br>$-(4x+3)(4x+3)$ |