

4-4

Reteaching

Factoring Quadratic Expressions

Problem

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

$a = 6$, $b = -5$, and $c = -4$ Find a , b , 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 .

$$\underbrace{6x^2 + 3x} - \underbrace{8x - 4}$$

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

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

Rewrite the middle term using the factors you found.

Find common factors by grouping the terms in pairs.

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.

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

4-4 Reteaching (continued)

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. $x^2 - 12x + 36$

$$(x - 6)^2$$

26. $x^2 - 64$

$$(x + 8)(x - 8)$$

29. $27x^2 - 12$

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

32. $9x^2 - 16$

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

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

$$5(5x - 2)^2$$

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

$$(x + 15)^2$$

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

$$(3x - 7)^2$$

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

$$(7x + 3)^2$$

33. $8x^2 - 18$

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

36. $-x^2 + 196$

$$-(x + 14)(x - 14)$$

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

$$(3x - 2)^2$$

28. $25x^2 - 1$

$$(5x + 1)(5x - 1)$$

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

$$16(x - 1)^2$$

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

$$(9x + 7)^2$$

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

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