Warm - Up

1. Simplify: $2x^{-2}y(3xy^3)^2$

2. Name the following polynomial by its degree and number of terms: $3x^3 + 4x^2 - 6x + 10$

3. $(3x^4 - 6 + 5x) - (3 + 2x - 7x^4)$

4. $2x^3(3x - 6)$

5. Find the factors of ac that multiply to b:

$6x^2 - 5x - 4$

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1. $14x^6$

3. $3r^5s^5t^5$

5. $21x^7y^3$

8. $6a^3b + 9ab^4$

10. $-3x^3 + 12x^2 - 18x$

12. $20m^4n^5 - 5m^3n^6$

25. a. $2x^2 - 3x$

b. 20 in^2

Objective

Multiply polynomials.

To multiply a binomial by a binomial, you can apply the Distributive Property more than once:

$(x + 3)(x + 2) = x(x + 2) + 3(x + 2)$ *Distribute x and 3.*

$= x(x + 2) + 3(x + 2)$ *Distribute x and 3 again.*

$= x(x) + x(2) + 3(x) + 3(2)$ *Multiply.*

$= x^2 + 2x + 3x + 6$ *Combine like terms.*

$= x^2 + 5x + 6$

Practice...

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

2. $(x + 4)(x + 6)$

Example 3A: Multiplying Binomials

Multiply.

$(s + 4)(s - 2)$

$(x - 4)^2$

$(x-4)(x-4)$

$x^2 - 4x - 4x + 16$

$x^2 - 8x + 16$

$(8m^2 - n)(m^2 - 3n)$

$8m^4 - 24m^2n - m^2n + 3n^2$

$8m^4 - 25m^2n + 3n^2$

Helpful Hint

In the expression $(x + 5)^2$, the base is $(x + 5)$.
$(x + 5)^2 = (x + 5)(x + 5)$

Multiply.

$(x - 3)^2$

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

FOIL = First, outer, Inner, Last

$(2x + 1)^2$

$(2x+1)(2x+1)$

$4x^2 + 2x + 2x + 1$

$4x^2 + 4x + 1$

Example 4A: Multiplying Polynomials

Multiply.

$(x - 5)(x^2 + 4x - 6)$

$x^3 + 4x^2 - 6x - 5x^2 - 20x + 30$

$x^3 - x^2 - 26x + 30$

$(2x - 5)(-4x^2 - 10x + 3)$

$-8x^3 - 20x^2 + 6x + 20x^2 - 50x - 15$

$-8x^3 + 56x - 15$

$(x + 3)^3$

Example 4D: Multiplying Polynomials

Multiply.

$(3x + 1)(x^3 - 4x^2 - 7)$

Multiply.

$(x + 3)(x^2 - 4x + 6)$

Multiply.

1. $(3x + 2)(x^2 - 2x + 5)$

2. $(2x + 1)^3$

Example 5: *Application*

The width of a rectangular prism is 3 feet less than the height, and the length of the prism is 4 feet more than the height.

a. Write a polynomial that represents the area of the base of the prism.

b. Find the area of the base when the height is 5 ft.

Check It Out! Example 5

The length of a rectangle is 4 meters shorter than its width.

a. Write a polynomial that represents the area of the rectangle.

b. Find the area of a rectangle when the width is 6 meters.

Daily Practice

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Multiply.

41. $-5x(2x^2 - 3x - 1)$
42. $-2a^2b^3(3ab^2 - a^2b)$
43. $-7x^3y \cdot x^2y^2(2x - y)$
44. $(x + 5)(x - 3)$
45. $(x + 4)^2$
46. $(m - 5)^2$
47. $(5x - 2)(x + 3)$
48. $(3x - 4)^2$
49. $(5x + 2)(2x - 1)$
50. $(x - 1)(x - 2)$
51. $(x - 8)(7x + 4)$
52. $(2x + 7)(3x + 7)$
53. $(x + 2)(x^2 - 3x + 5)$
54. $(2x + 5)(x^2 - 4x + 3)$
55. $(5x - 1)(-2x^3 + 4x - 3)$
56. $(x - 3)(x^2 - 5x + 6)$
57. $(2x^2 - 3)(4x^3 - x^2 + 7)$
58. $(x - 4)^3$
59. $(x - 2)(x^2 + 2x + 1)$
60. $(2x + 10)(4 - x + 6x^3)$
61. $(1 - x)^3$

62. **Geometry** The length of the rectangle at right is 3 feet longer than its width.
    a. Write a polynomial that represents the area of the rectangle.
    b. Find the area of the rectangle when the width is 5 feet.