

# 7-8 Multiplying Polynomials

Warm Up

Lesson Presentation

Lesson Quiz

Holt McDougal Algebra 1

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## Answers to Mult. Polynomials

- |   |   |   |   |
|---|---|---|---|
| 1) $12n + 6$                            | 2) $8m - 8$                             | 3) $12r + 9$                            | 4) $20x^2 + 4x$                         |
| 5) $6n^2 + 12n$                         | 6) $6x + 6$                             | 7) $16p + 4$                            | 8) $25m + 5$                            |
| 9) $8b^2 + 2b$                          | 10) $15x + 3$                           | 11) $\frac{10}{9}x^6 + \frac{16}{9}x^5$ | 12) $\frac{9}{10}x + \frac{5}{2}$       |
| 13) $\frac{187}{16}p^2 + \frac{33}{8}p$ | 14) $\frac{8}{25}a^3 + \frac{3}{10}a^2$ | 15) $\frac{3}{2}v^3 + \frac{3}{10}v^2$  | 16) $\frac{56}{15}k^2 + \frac{42}{25}k$ |
| 17) $8a + 20b$                          | 18) $8x - 8y$                           | 19) $7u^6v - 35u^5v^2$                  | 20) $8ba + 24b^2$                       |
| 21) $12x - 24y$                         | 22) $16x^4 - 16x^3y$                    | 23) $8yx + 8y^2$                        | 24) $20m^3n + 20m^2n^2$                 |
| 25) $32x - 8y$                          | 26) $35u + 28v$                         | 27) $40x^2y^4 - 30xy^5$                 | 28) $64x^3 - 8x^2y$                     |
| 29) $12m - 24n$                         | 30) $6yx - 18y^2$                       | 31) $4x^2y - 12xy^2$                    | 32) $24y^2x - 8y^3$                     |
| 33) $35x^2 - 20xy - 35y^2$              | 34) $16x^4 - 16x^3y + 32x^2y^2$         | 35) $16x^3 - 48x^2y + 40xy^2$           |   |
| 36) $40vu^2 - 64v^2u - 24v^3$           | 37) $20x^3 + 32x^2y - 32xy^2$           | 38) $64u^5 + 40u^4v - 64u^3v^2$         |   |
| 39) $28y^2x^2 + 24y^3x + 32y^4$         | 40) $-8a^2 - 12ab - 2b^2$               |   |   |

## 7-8 Multiplying Polynomials

### F.O.I.L. Method

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

1. Multiply the **First** terms.  $(\overbrace{x + 3}^{\text{F}})(\overbrace{x + 2}^{\text{F}}) \rightarrow x \cdot x = x^2$

2. Multiply the **Outer** terms.  $(\overbrace{x + 3}^{\text{O}})(\overbrace{x + 2}^{\text{O}}) \rightarrow x \cdot 2 = 2x$

3. Multiply the **Inner** terms.  $(\overbrace{x + 3}^{\text{I}})(\overbrace{x + 2}^{\text{I}}) \rightarrow 3 \cdot x = 3x$

4. Multiply the **Last** terms.  $(\overbrace{x + 3}^{\text{L}})(\overbrace{x + 2}^{\text{L}}) \rightarrow 3 \cdot 2 = 6$

$$(x + 3)(x + 2) = \overset{\text{F}}{\color{red}x^2} + \overset{\text{O}}{\color{blue}2x} + \overset{\text{I}}{\color{magenta}3x} + \overset{\text{L}}{\color{green}6} = x^2 + 5x + 6$$

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## 7-8 Multiplying Polynomials

### Examples

① Multiplying Using FOIL Simplify  $(4x + 2)(3x - 6)$ .

	First	Outer	Inner	Last
$(4x + 2)(3x - 6)$	$(\boxed{4x})(3x)$	$+(4x)(\boxed{-6})$	$+(\boxed{2})(3x)$	$+(2)(\boxed{-6})$
$=$	$12x^2$	$- \boxed{24x}$	$+ 6x$	$- \boxed{12}$
$=$	$\boxed{12x^2}$	$- \boxed{18x}$	$-$	$\boxed{12}$

The product is  $\boxed{12x^2 - 18x - 12}$ .

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## 7-8 Multiplying Polynomials

- 2 Applying Multiplication of Polynomials Find the area of the shaded region. Simplify.

$$\text{area of outer rectangle} = (3x + 2)(2x - 1)$$

$$\text{area of hole} = x(x + 3)$$

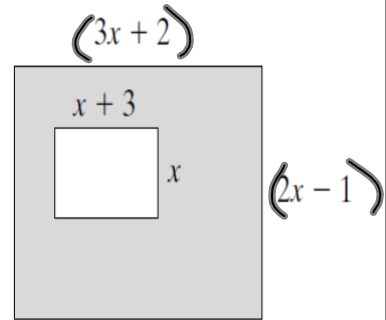
$$\text{area of shaded region} = \text{area of outer rectangle} - \text{area of hole}$$

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

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

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

$$= 5x^2 - 2x - 2 \text{ Simplify.}$$



Substitute.

Use FOIL to simplify  $(3x + 2)(2x - 1)$  and the Distributive Property to simplify  $x(x + 3)$ .

Group like terms.

## 7-8 Multiplying Polynomials

### Example 3A: Multiplying Binomials

Multiply.

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

$$s^2 - 2s + 4s - 8$$

$$s^2 + 2s - 8$$

## 7-8 Multiplying Polynomials

### Example 3B: Multiplying Binomials

Multiply.

$$(x - 4)^2$$

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

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

$$x^2 - 8x + 16$$

$$3^2$$

$$3 \cdot 3$$

## 7-8 Multiplying Polynomials

### Example 3C: Multiplying Binomials

Multiply.

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

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

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

## 7-8 Multiplying Polynomials

To multiply polynomials with more than two terms, you can use the Distributive Property several times. Multiply  $(5x + 3)$  by  $(2x^2 + 10x - 6)$ :

$$\begin{array}{r}
 (5x + 3)(2x^2 + 10x - 6) \\
 \hline
 \cancel{10x^3} + \cancel{50x^2} - \cancel{30x} + \underline{6x^2} + \underline{30x} - \underline{18} \\
 \hline
 10x^3 + 56x^2 - 18
 \end{array}$$

## 7-8 Multiplying Polynomials

### Example 4A: Multiplying Polynomials

Multiply.

$$\begin{array}{r}
 (x - 5)(x^2 + 4x - 6) \\
 \hline
 \underline{x^3} + \underline{4x^2} - \underline{6x} - \underline{5x^2} - \underline{20x} + \underline{30} \\
 \hline
 x^3 - x^2 - 26x + 30
 \end{array}$$

## 7-8 Multiplying Polynomials

### Example 4B: Multiplying Polynomials

Multiply.

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

## 7-8 Multiplying Polynomials

### Example 4C: Multiplying Polynomials

Multiply.

$$(x + 3)^3$$

$$\begin{aligned} & (x+3)(x+3)(x+3) \\ & \quad x^2 + 3x + 3x + 9 \\ & \quad (x^2 + 6x + 9)(x+3) \\ & \quad x^3 + 6x^2 + 9x + 3x^2 + 27x + 27 \\ & \quad x^3 + 9x^2 + 27x + 27 \end{aligned}$$

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### Check It Out! Example 4a

Multiply.

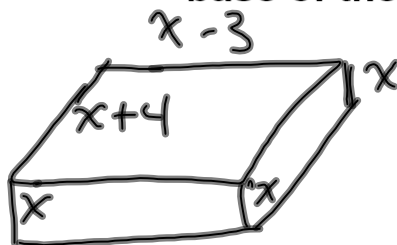
$$(x + 3)(x^2 - 4x + 6)$$

## 7-8 Multiplying Polynomials

### 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.



$$\begin{aligned}
 V &= lwh \\
 &= (x+4)(x-3)(x) \\
 &= (x^2 - 3x + 4x - 12)(x) \\
 &= (x^2 + x - 12)(x) \\
 &= x^3 + x^2 - 12x
 \end{aligned}$$

**7-8** Multiplying Polynomials**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.

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

**7-8** Multiplying Polynomials**Lesson Quiz: Part I**

**Multiply.**

1.  $(6s^2t^2)(3st)$
2.  $4xy^2(x + y)$
3.  $(x + 2)(x - 8)$
4.  $(2x - 7)(x^2 + 3x - 4)$
5.  $6mn(m^2 + 10mn - 2)$
6.  $(2x - 5y)(3x + y)$



**7-8** Multiplying Polynomials**Lesson Quiz: Part II**

- 7.** A triangle has a base that is 4cm longer than its height.
- Write a polynomial that represents the area of the triangle.
  
  - Find the area when the height is 8 cm.