

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_

**Simplify each product.**

1.  $2x(x + 8)$

2.  $(n + 7)5n$

3.  $6h^2(7 + h)$

4.  $-b^2(b - 10)$

5.  $-3c(8 + 2c - c^3)$

6.  $y(2y^2 - 3y + 6)$

7.  $4t(t^2 - 6t + 2)$

8.  $-m(4m^3 - 8m^2 + m)$

9.  $7j(-2j^2 - 8j - 3)$

10.  $-t^2(2t^4 + 4t - 8)$

11.  $2k(-3k^3 + k^2 - 10)$

12.  $8a^2(-a^7 + 7a - 7)$

13.  $4v^3(2v^2 - 3v + 5)$

14.  $5d(-d^3 + 2d^2 - 3d)$

15.  $11w(w^2 + 2w + 6)$

**Simplify. Write in standard form.**

1.  $-3\underline{x}(4x^2 - 6x + 12)$

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

3.  $9\underline{a}(-3a^2 + a - 5)$

4.  $\underline{p}(p + 4) - 2p(p - 8)$

5.  $\underline{t}(t + 4) + t(4t^2 - 2)$

6.  $6\underline{c}(2c^2 - 4) - c(8c)$

7.  $-5\underline{m}(2m^3 - 7m^2 + m)$

8.  $2\underline{q}(q + 1) - q(q - 1)$

9.  $-n^2(-6n^2 + 2n)$

## Problem Solving

A cylinder has a radius of  $3m^2n$  and a height of  $7mn$ . The formula for the volume of a cylinder is  $V = \pi r^2 h$ , where  $r$  is the radius and  $h$  is the height. What is the volume of the cylinder? Simplify your answer.

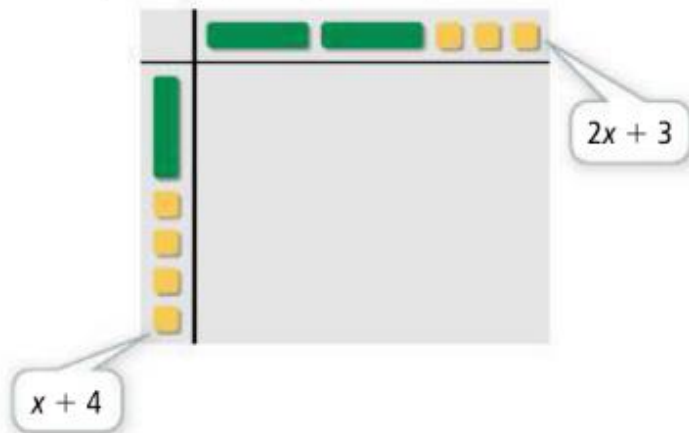
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## USING MODELS to MULTIPLY – ALGEBRA TILES

You can use algebra tiles to model the multiplication of two binomials.

### Activity

Find the product  $(x + 4)(2x + 3)$ .



$$2x^2 + 3x + 8x + 12$$

$$2x^2 + 11x + 12$$

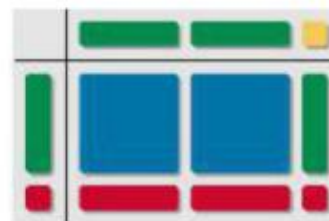
Add coefficients of like terms.

The product is  $2x^2 + 11x + 12$ .

You can also model products that involve subtraction. Red tiles indicate negative variables and negative numbers.

### Activity

Find the product  $(x - 1)(2x + 1)$ .



$$2x^2 + x - 2x - 1$$

$$2x^2 - x - 1$$

Add coefficients of like terms.

The product is  $2x^2 - x - 1$ .

## Exercises

Use algebra tiles to find each product.

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

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

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

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

# WINDOW ROCK HIGH SCHOOL

7<sup>th</sup> hour MATH-RTI

## Lesson: Multiplying Binomials

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Objective: To multiply two binomials or a binomial by a trinomial.

Example 1: Using the distributive property

What is a simpler form of  $(2x + 4)(3x - 7)$ ?

$$(2x + 4)(3x - 7) = 2x(3x - 7) + 4(3x - 7) \quad \text{Distribute the second factor, } 3x - 7.$$

$$= 6x^2 - 14x + 4(3x - 7) \quad \text{Distribute } 2x.$$

$$= 6x^2 - 14x + 12x - 28 \quad \text{Distribute 4.}$$

$$= 6x^2 - 2x - 28 \quad \text{Combine like terms.}$$

Example 2: Using a table

What is a simpler form of  $(x - 3)(4x - 5)$ ?



Make a table of products.

	$4x$	$-5$
$x$	$4x^2$	$-5x$
$-3$	$-12x$	$15$

When labeling the rows and columns, think of  $x - 3$  as  $x + (-3)$ . Think of  $4x - 5$  as  $4x + (-5)$ .

The product is  $4x^2 - 5x - 12x + 15$ , or  $4x^2 - 17x + 15$ .

Example 3: Using FOIL

What is a simpler form of  $(5x - 3)(2x + 1)$ ?

$$\begin{aligned}
 (5x - 3)(2x + 1) &= \text{First } (5x)(2x) + \text{Outer } (5x)(1) + \text{Inner } (-3)(2x) + \text{Last } (-3)(1) \\
 &= 10x^2 + 5x - 6x - 3 \\
 &= 10x^2 - x - 3
 \end{aligned}$$

The product is  $10x^2 - x - 3$ .

Practice: Multiplying Binomials

**Simplify each product using the Distributive Property.**

**1.**  $(x + 3)(x + 8)$

**2.**  $(y - 4)(y + 7)$

**3.**  $(m + 9)(m - 3)$

**4.**  $(c - 6)(c - 4)$

**5.**  $(2r - 5)(r + 3)$

**6.**  $(3x + 1)(5x - 3)$

**7.**  $(d + 2)(4d - 3)$

**8.**  $(5t - 1)(3t - 2)$

**9.**  $(a + 11)(11a + 1)$

**Simplify each product using a table.**

**10.**  $(x + 3)(x - 5)$

**11.**  $(a - 2)(a - 13)$

**12.**  $(w - 4)(w + 8)$

**13.**  $(5h - 3)(h + 7)$

**14.**  $(x - 3)(2x + 3)$

**15.**  $(2p + 1)(6p + 4)$

**Simplify each product using the FOIL method.**

**16.**  $(2x - 6)(x + 3)$

**17.**  $(n - 5)(3n - 4)$

**18.**  $(4p^2 + 2)(3p - 1)$

**19.**  $(a + 7)(a - 3)$

**20.**  $(x + 3)(3x - 2)$

**21.**  $(k - 9)(k + 5)$

**22.**  $(b - 5)(b - 11)$

**23.**  $(4m - 1)(m + 4)$

**24.**  $(7z + 3)(4z - 6)$

**25.**  $(2h + 6)(5h - 3)$

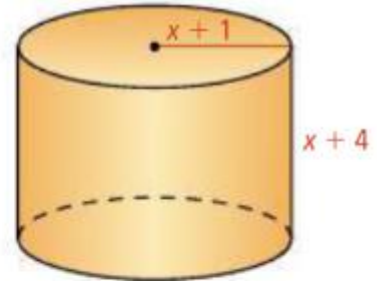
**26.**  $(3w + 12)(w + 3)$

**27.**  $(6c - 2)(9c - 8)$

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Example:

**Multiple Choice** A cylinder has the dimensions shown in the diagram. Which polynomial in standard form best describes the total surface area of the cylinder?



- ☐ A  $2\pi x^2 + 4\pi x + 2\pi$ 
☐ C  $4\pi x^2 + 14\pi x + 10\pi$   
☐ B  $2\pi x^2 + 10\pi x + 8\pi$ 
☐ D  $2\pi x^2 + 2\pi x + 10\pi$

The total surface area (S.A.) of a cylinder is given by the formula

$S.A. = 2\pi r^2 + 2\pi rh$ , where  $r$  is the radius of the cylinder and  $h$  is the height.

$$S.A. = 2\pi r^2 + 2\pi rh$$

$$= 2\pi(x + 1)^2 + 2\pi(x + 1)(x + 4)$$

$$= 2\pi(x + 1)(x + 1) + 2\pi(x + 1)(x + 4)$$

$$= 2\pi(x^2 + x + x + 1) + 2\pi(x^2 + 4x + x + 4)$$

$$= 2\pi(x^2 + 2x + 1) + 2\pi(x^2 + 5x + 4)$$

$$= 2\pi(x^2 + 2x + 1 + x^2 + 5x + 4)$$

$$= 2\pi(2x^2 + 7x + 5)$$

$$= 4\pi x^2 + 14\pi x + 10\pi$$

Surface area of a cylinder

Substitute  $x + 1$  for  $r$  and  $x + 4$  for  $h$ .

Write  $(x + 1)^2$  as  $(x + 1)(x + 1)$ .

Multiply binomials.

Combine like terms.

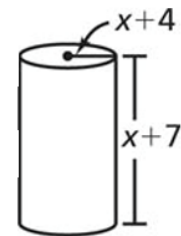
Factor out  $2\pi$ .

Combine like terms.

Write in standard form.

The correct answer is C.

Practice: 1. What is the surface area of the cylinder at the right? Write your answer in simplified form.



2. The radius of a cylindrical popcorn tin is  $(3x + 1)$  in. The height of the tin is three times the radius. What is the surface area of the cylinder? Write your answer in simplified form. ■

3. The radius of a cylindrical tennis ball can is  $(2x + 1)$  cm. The height of the tennis ball can is six times the radius. What is the surface area of the cylinder? Write your answer in simplified form.