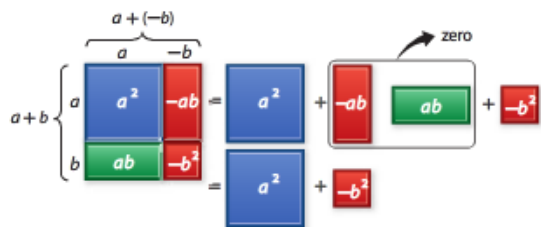


**2 Product of a Sum and a Difference** Now we will see what the result is when we multiply a sum and a difference, or  $(a + b)(a - b)$ . Recall that  $a - b$  can be written as  $a + (-b)$ .



Notice that the middle terms are opposites and add to a zero pair. So  $(a + b)(a - b) = a^2 - ab + ab - b^2 = a^2 - b^2$ .

**StudyTip**

**Patterns** When using any of these patterns,  $a$  and  $b$  can be numbers, variables, or expressions with numbers and variables.

**KeyConcept** Product of a Sum and a Difference

**Words** The product of  $a + b$  and  $a - b$  is the square of  $a$  minus the square of  $b$ .

**Symbols**  $(a + b)(a - b) = (a - b)(a + b) = a^2 - b^2$

**Example 4** Product of a Sum and a Difference

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

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

Product of a sum and a difference

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

$a = 2x^2$  and  $b = 3$

$= 4x^4 - 9$

Simplify.

**GuidedPractice**

Find each product.

4A.  $(3n + 2)(3n - 2)$

4B.  $(4c - 7d)(4c + 7d)$

**Check Your Understanding**

Step-by-Step Solutions begin on page R13.

**Examples 1–2** Find each product.

1.  $(x + 5)^2$       2.  $(11 - a)^2$       3.  $(2x + 7y)^2$

4.  $(3m - 4)(3m - 4)$       5.  $(g - 4h)(g - 4h)$       6.  $(3c + 6d)^2$

**Example 3** 7. **GENETICS** The color of a Labrador retriever's fur is genetic. Dark genes  $D$  are dominant over yellow genes  $y$ . A dog with genes  $DD$  or  $Dy$  will have dark fur. A dog with genes  $yy$  will have yellow fur. Pepper's genes for fur color are  $Dy$ , and Ramiro's are  $yy$ .

	$D$	$y$
$D$	$DD$	$Dy$
$y$	$Dy$	$yy$

- Write an expression for the possible fur colors of Pepper's and Ramiro's puppies.
- What is the probability that a puppy will have yellow fur?

**Example 4** Find each product.

8.  $(a - 3)(a + 3)$

9.  $(x + 5)(x - 5)$

10.  $(6y - 7)(6y + 7)$

11.  $(9t + 6)(9t - 6)$

**Practice and Problem Solving**

Extra Practice is on page R8.

**Examples 1–2** Find each product.

12.  $(a + 10)(a + 10)$

13.  $(b - 6)(b - 6)$

14.  $(h + 7)^2$

15.  $(x + 6)^2$

16.  $(8 - m)^2$

17.  $(9 - 2y)^2$

18.  $(2b + 3)^2$

19.  $(5t - 2)^2$

20.  $(8h - 4n)^2$

**Example 3**

21. **GENETICS** The ability to roll your tongue is inherited genetically from parents if either parent has the dominant trait  $T$ . Children of two parents without the trait will not be able to roll their tongues.

	$T$	$t$
$T$	$TT$	$Tt$
$t$	$Tt$	$tt$

- Show how the combinations can be modeled by the square of a sum.
- Predict the percent of children that will have both dominant genes, one dominant gene, and both recessive genes.

**Example 4** Find each product.

22.  $(u + 3)(u - 3)$

23.  $(b + 7)(b - 7)$

24.  $(2 + x)(2 - x)$

25.  $(4 - x)(4 + x)$

26.  $(2q + 5r)(2q - 5r)$

27.  $(3a^2 + 7b)(3a^2 - 7b)$

28.  $(5y + 7)^2$

29.  $(8 - 10a)^2$

30.  $(10x - 2)(10x + 2)$

31.  $(3t + 12)(3t - 12)$

32.  $(a + 4b)^2$

33.  $(3q - 5r)^2$

34.  $(2c - 9d)^2$

35.  $(g + 5h)^2$

36.  $(6y - 13)(6y + 13)$

37.  $(3a^4 - b)(3a^4 + b)$

38.  $(5x^2 - y^2)^2$

39.  $(8a^2 - 9b^3)(8a^2 + 9b^3)$

40.  $\left(\frac{3}{4}k + 8\right)^2$

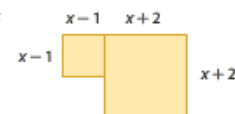
41.  $\left(\frac{2}{5}y - 4\right)^2$

42.  $(7z^2 + 5y^2)(7z^2 - 5y^2)$

43.  $(2m + 3)(2m - 3)(m + 4)$

44.  $(r + 2)(r - 5)(r - 2)(r + 5)$

45. **CSSENSE-MAKING** Write a polynomial that represents the area of the figure at the right.



46. **FLYING DISKS** A flying disk shaped like a circle has a radius of  $x + 3$  inches.

- Write an expression representing the area of the flying disk.
- A hole with a radius of  $x - 1$  inches is cut in the center of the disk. Write an expression for the remaining area.

**GEOMETRY** Find the area of each shaded region.

