LESSON 7-8 Practice A
Special Products of Binomials

Fill in the blanks below. Then simplify.

1. $(x + 5)^2$

$\boxed{x}^2 + 2(\boxed{x})(\boxed{5}) + \boxed{5}^2$

$x^2 + 10x + 25$

2. $(m + 3)^2$

$\boxed{m}^2 + 2(\boxed{m})(\boxed{3}) + \boxed{3}^2$

$m^2 + 6m + 9$

3. $(2 + a)^2$

$\boxed{2}^2 + 2(\boxed{2})(\boxed{a}) + \boxed{a}^2$

$4 + 4a + a^2$

Multiply.

4. $(x + 4)^2$

$x^2 + 8x + 16$

5. $(a + 7)^2$

$a^2 + 14a + 49$

6. $(8 + b)^2$

$64 + 16b + b^2$

Fill in the blanks below. Then simplify.

7. $(x - 10)^2$

$\boxed{x}^2 - 2(\boxed{x})(\boxed{10}) + \boxed{10}^2$

$x^2 - 20x + 100$

8. $(y - 6)^2$

$\boxed{y}^2 - 2(\boxed{y})(\boxed{6}) + \boxed{6}^2$

$y^2 - 12y + 36$

9. $(9 - x)^2$

$\boxed{9}^2 - 2(\boxed{9})(\boxed{x}) + \boxed{x}^2$

$81 - 18x + x^2$

Multiply.

10. $(y - 7)^2$

$y^2 - 14y + 49$

11. $(b - 11)^2$

$b^2 - 22b + 121$

12. $(3 - x)^2$

$9 - 6x + x^2$

Fill in the blanks below. Then simplify.

13. $(x + 7)(x - 7)$

$\boxed{x}^2 - \boxed{7}^2$

$x^2 - 49$

14. $(4 + y)(4 - y)$

$\boxed{4}^2 - \boxed{y}^2$

$16 - y^2$

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

$\boxed{x}^2 - \boxed{2}^2$

$x^2 - 4$

Multiply.

16. $(x + 8)(x - 8)$

$x^2 - 64$

17. $(3 + y)(3 - y)$

$9 - y^2$

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

$x^2 - 1$

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LESSON 7-8 Practice B
Special Products of Binomials

Multiply.

1. $(x + 2)^2$

$x^2 + 4x + 4$

2. $(m + 4)^2$

$m^2 + 8m + 16$

3. $(3 + a)^2$

$9 + 6a + a^2$

4. $(2x + 5)^2$

$4x^2 + 20x + 25$

5. $(3a + 2)^2$

$9a^2 + 12a + 4$

6. $(6 + 5b)^2$

$36 + 60b + 25b^2$

7. $(b - 3)^2$

$b^2 - 6b + 9$

8. $(8 - y)^2$

$64 - 16y + y^2$

9. $(a - 10)^2$

$a^2 - 20a + 100$

10. $(3x - 7)^2$

$9x^2 - 42x + 49$

11. $(4m - 9)^2$

$16m^2 - 72m + 81$

12. $(6 - 3n)^2$

$36 - 36n + 9n^2$

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

$x^2 - 9$

14. $(8 + y)(8 - y)$

$64 - y^2$

15. $(x + 6)(x - 6)$

$x^2 - 36$

16. $(5x + 2)(5x - 2)$

$25x^2 - 4$

17. $(10x + 7y)(10x - 7y)$

$100x^2 - 49y^2$

18. $(x^2 + 3y)(x^2 - 3y)$

$x^4 - 9y^2$

19. Write a simplified expression that represents the...

a. area of the large rectangle.

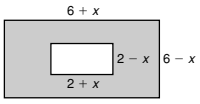
$36 - x^2$

b. area of the small rectangle.

$4 - x^2$

c. area of the shaded area.

32



20. The small rectangle is made larger by adding 2 units to the length and 2 units to the width.

a. What is the new area of the smaller rectangle?

$16 - x^2$

b. What is the area of the new shaded area?

20

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LESSON 7-8 Practice C
Special Products of Binomials

Multiply.

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

$9x^2 + 6x + 1$

2. $(5m + 0.5)^2$

$25m^2 + 5m + 0.25$

3. $(7 + 2a)^2$

$49 + 28a + 4a^2$

4. $(2x + 3y)^2$

$4x^2 + 12xy + 9y^2$

5. $(2a^2 + 9b)^2$

$4a^4 + 36a^2b + 81b^2$

6. $(5a^2 + 4b^2)^2$

$25a^4 + 40a^2b^2 + 16b^4$

7. $(b - 0.5)^2$

$b^2 - b + 0.25$

8. $\left(\frac{1}{4} - y^2\right)^2$

$\frac{1}{16} - \frac{1}{2}y^2 + y^4$

9. $(a - 0.25)^2$

$a^2 - 0.5a + 0.0625$

10. $(3x^3 - 7)^2$

$9x^6 - 42x^3 + 49$

11. $(2x^2y - 11)^2$

$4x^4y^2 - 44x^2y + 121$

12. $\left(\frac{1}{2}a^3 - 3\right)^2$

$\frac{1}{4}a^6 - 3a^3 + 9$

13. $(x + 0.6)(x - 0.6)$

$x^2 - 0.36$

14. $\left(\frac{1}{2} + y\right)\left(\frac{1}{2} - y\right)$

$\frac{1}{4} - y^2$

15. $(x + 0.25)(x - 0.25)$

$x^2 - 0.0625$

16. $(a^2b + ab)(a^2b - ab)$

$a^4b^2 - a^2b^2$

17. $(0.8x^2 + y^2)(0.8x^2 - y^2)$

$0.64x^4 - y^4$

18. $(4x^3y + 5x)(4x^3y - 5x)$

$16x^6y^2 - 25x^2$

19. Write a simplified expression that represents the...

a. area of the large rectangle.

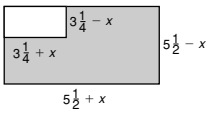
$30\frac{1}{4} - x^2$

b. area of the small rectangle.

$10\frac{9}{16} - x^2$

c. area of the shaded area.

$19\frac{11}{16}$



20. A rectangle has a length $(x + 3.5)$ and an area of $x^2 - 12.25$. What is the width of the rectangle?

$x - 3.5$

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LESSON 7-8 Reteach
Special Products of Binomials

A **perfect-square trinomial** is a trinomial that is the result of squaring a binomial.

$(a + b)^2 = a^2 + 2ab + b^2$ — Square *a*. Square *b*. **Add** product of 2, *a*, and *b*.

$(a - b)^2 = a^2 - 2ab + b^2$ — Square *a*. Square *b*. **Subtract** product of 2, *a*, and *b*.

Multiply $(x + 4)^2$.

$(x + 4)^2$	*a*: x *b*: 4
$x^2 + 2(x)(4) + 4^2$	*Middle term is added.*
$x^2 + 8x + 16$	*Simplify.*

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

$(4x - 3)^2$	*a*: $4x$ *b*: 3
$16x^2 - 2(4x)(3) + 3^2$	*Middle term is subtracted.*
$16x^2 - 24x + 9$	*Simplify.*

State whether each product will result in a perfect-square trinomial.

1. $(x + 5)(x + 5)$

yes

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

no

3. $(5x - 6)(5x - 6)$

yes

Fill in the blanks. Then write the perfect-square trinomial.

4. $(x + 7)^2$

Square *a*: x^2

$2(a)(b)$: $14x$

Square *b*: 49

$x^2 + 14x + 49$

5. $(x - 1)^2$

Square *a*: x^2

$2(a)(b)$: $2x$

Square *b*: 1

$x^2 - 2x + 1$

6. $(2x + 10)^2$

Square *a*: $4x^2$

$2(a)(b)$: $40x$

Square *b*: 100

$4x^2 + 40x + 100$

Multiply.

7. $(x - 8)^2$

$x^2 - 16x + 64$

8. $(x + 2)^2$

$x^2 + 4x + 4$

9. $(7x - 5)^2$

$49x^2 - 70x + 25$

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LESSON 7-8

Reteach

Special Products of Binomials (continued)

When you multiply certain types of binomials, the middle term will be zero.

Multiply $(a + b)(a - b)$.

$(a + b)(a - b)$

$a(a - b) + b(a - b)$ *Distribute.*

$a^2 - ab + ab - b^2$

$a^2 - b^2$ *Combine like terms.*

This type of special product is called a **difference of squares**.

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

Square *a*. Square *b*. Subtract.

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

$(x + 4)(x - 4)$ *a:* x *b:* 4

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

$x^2 - 16$ *Simplify.*

Multiply $(7 + 8x)(7 - 8x)$.

$(7 + 8x)(7 - 8x)$ *a:* 7 *b:* $8x$

$(7)^2 - (8x)^2$

$49 - 64x^2$ *Simplify.*

State whether the products will form a difference of squares or a perfect-square trinomial.

10. $(x + 10)(x - 10)$ — difference of squares

11. $(y + 6)(y + 6)$ — perfect-square trinomial

12. $(z - 3)(z - 3)$ — perfect-square trinomial

Fill in the blanks. Then write the difference of squares.

13. $(a + 7)(a - 7)$ — Square *a*: a^2; Square *b*: 49; $a^2 - 49$

14. $(2 + m)(2 - m)$ — Square *a*: 4; Square *b*: m^2; $4 - m^2$

15. $(2x + 5)(2x - 5)$ — Square *a*: $4x^2$; Square *b*: 25; $4x^2 - 25$

Multiply.

16. $(x + 8)(x - 8)$ — $x^2 - 64$

17. $(10 + x)(10 - x)$ — $100 - x^2$

18. $(5x + 2y)(5x - 2y)$ — $25x^2 - 4y^2$

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LESSON 7-8

Challenge

Patterns in Special Products

The expansions of $(a + b)^2$, $(a - b)^2$, and $(a + b)(a - b)$ show patterns involving *a* and *b*. You can discover other patterns involving *a* and *b* when you combine these special products.

In Exercises 1–5, use the given values of *a* and *b* to complete the table below.

	a	*b*	$(a + b)^2$	$(a - b)^2$	$(a + b)^2 - (a - b)^2$	*ab*
1.	−3	5	4	64	−60	−15
2.	−2	−4	36	4	32	8
3.	3	6	81	9	72	18
4.	4	7	121	9	112	28
5.	5	−8	9	169	−160	−40

6. a. From the table, how are the values of $(a + b)^2 - (a - b)^2$ and *ab* related?

The difference $(a + b)^2 - (a - b)^2$ is four times the product ab.

b. Based on your work in Exercises 1–5 and your answer to part ***a***, write *a* simplification of $(a + b)^2 - (a + b)^2$.

$4ab$

c. Use algebra to show that your response to part ***b*** is true.

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

7. Using a table like the one that you completed in Exercises 1–5 and the values of *a* and *b* used there, write a simplification of $(a + b)^2 + (a - b)^2$.

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

Write a conjecture for the simplification of each sum or difference. Try to do as much of the simplification as you can mentally.

8. $[(a^2 + b^2) + (a^2 - b^2)]^2$ — $4a^4$

9. $[(a^2 + b^2) - (a^2 - b^2)]^2$ — $4b^4$

Simplify each expression.

10. $[(a^2 + b^2) + (a^2 - b^2)]^2$

$[(a^2 + b^2) + (a^2 - b^2)]^2$
$= (a^2 + a^2 + b^2 - b^2)^2$
$= (2a^2)^2 = 2^2a^4 = 4a^4$

11. $[(a^2 + b^2) - (a^2 - b^2)]^2$

$[(a^2 + b^2) - (a^2 - b^2)]^2$
$= (a^2 - a^2 + b^2 + b^2)^2$
$= (2b^2)^2 = 2^2b^4 = 4b^4$

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LESSON 7-8

Problem Solving

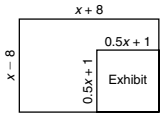
Special Products of Binomials

Write the correct answer.

1. This week Kyara worked $x + 4$ hours. She is paid $x - 4$ dollars per hour. Write a polynomial for the amount that Kyara earned this week. Then calculate her pay if $x = 12$.

$x^2 - 16$;
$128

2. A museum set aside part of a large gallery for a special exhibit.



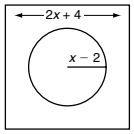
Write a polynomial for the area of the gallery that is not part of the exhibit. Then calculate the area of that section if $x = 60$.

$0.75x^2 - x - 65$;
2575 square feet

3. Gary is building a square table for a kitchen. In his initial sketch, each side measured *x* inches. After rearranging some furniture, he realized he would have to add one foot to the length and remove one foot from the width and have a rectangular table instead. Write a polynomial to represent the area of the rectangular table.

$x^2 - 144$ in^2

A fountain is in the center of a square garden. The radius of the fountain is $x - 2$ feet. The length of the garden is $2x + 4$ feet. Use this information and the diagram for questions 4 – 7. Select the best answer.



4. Which polynomial represents the area of the fountain?

A $2\pi x - 4\pi$ **C** $\pi x^2 - 4\pi$
B $\pi x^2 - 4\pi x - 4\pi$ **(D)** $\pi x^2 - 4\pi x + 4\pi$

5. Which polynomial represents the area of the garden, including the fountain?

F $4x^2 + 8$ **H** $4x^2 + 16$
(G) $4x^2 + 16x + 16$ **J** $4x^2 + 8x + 16$

6. Which polynomial represents the area of the garden *outside* the fountain? (Use 3.14 for π.)

(A) $0.86x^2 + 28.56x + 3.44$
B $0.86x^2 + 3.44x + 28.56$
C $7.14x^2 + 28.56x + 3.44$
D $7.14x^2 + 3.44x + 28.56$

7. A 3-ft wide path is built around the garden. Which expression represents the area of the path?

F $12x + 33$ **H** $4x^2 + 28x + 49$
(G) $24x^2 + 84$ **J** $4x^2 + 40x + 100$

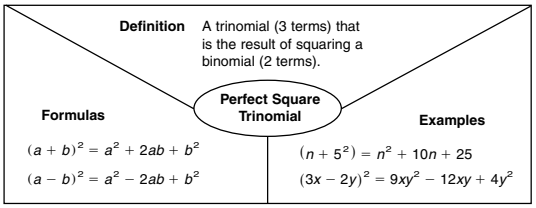
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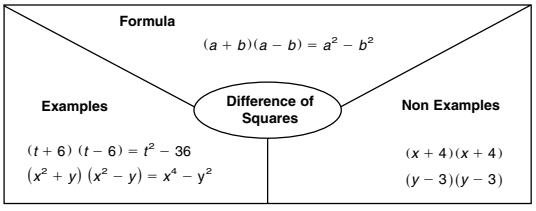
LESSON 7-8

Reading Strategies

Use a Concept Map

When multiplying a binomial by another binomial, there are two special kinds of products that may result. They are outlined in these concept maps.





Answer the following.

1. Which type of special product is $x^2 - 64y^2$? — difference of squares

2. Which type of special product will result from multiplying $(k^2 - 3)(k^2 - 3)$? — perfect square trinomial

3. Why is $(x + 4)(x + 4)$ not a difference of squares? — It will have 3 terms.

Multiply. Then identify the type of special product.

4. $(c^2 + 10d)(c^2 + 10d)$

$c^4 + 20c^2d + 100d^2$;
perfect square trinomial

5. $(2s + 3)(2s - 3)$

$4s^2 - 9$;
difference of squares

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