

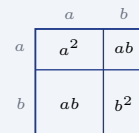
# Special Products of Polynomials

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_ / 18

### Quick Review and Helpful Hints

Three handy patterns: square of a sum  $(a + b)^2 = a^2 + 2ab + b^2$ ; square of a difference  $(a - b)^2 = a^2 - 2ab + b^2$ ; difference of squares  $(a + b)(a - b) = a^2 - b^2$ . Spotting these lets you expand quickly without full FOIL.

▶ **Example:** Expand  $(x + 3)^2$ . **Work:** Use  $(a + b)^2 = a^2 + 2ab + b^2$  with  $a = x, b = 3$ :  $x^2 + 2(x)(3) + 9$ . ★ **Answer:**  $x^2 + 6x + 9$



$(a + b)^2 = a^2 + 2ab + b^2$ .

### ◆ Practice Problems

Expand each product.

- |   |  |
|---|--|
| <p>1. <math>(x + 1)^2</math> _____</p> <p>2. <math>(x + 4)^2</math> _____</p> <p>3. <math>(x - 2)^2</math> _____</p> <p>4. <math>(x - 5)^2</math> _____</p> <p>5. <math>(x + 3)(x - 3)</math> _____</p> <p>6. <math>(x + 7)(x - 7)</math> _____</p> <p>7. <math>(2x + 1)^2</math> _____</p> | <p>8. <math>(3x - 2)^2</math> _____</p> <p>9. <math>(x + 6)^2</math> _____</p> <p>10. <math>(2x + 5)(2x - 5)</math> _____</p> <p>11. <math>(x - 1)^2</math> _____</p> <p>12. <math>(5x + 3)(5x - 3)</math> _____</p> <p>13. <math>(4x + 1)^2</math> _____</p> <p>14. <math>(x - 8)(x + 8)</math> _____</p> |
|---|--|

### ◆ Word Problems

15. A square has side  $(x + 2)$ . Write its area, expanded. \_\_\_\_\_
16. A square patio is planned with side length  $(x + 10)$  feet. Write the expanded expression for its area. \_\_\_\_\_
17. Multiply  $(x + 9)(x - 9)$ . \_\_\_\_\_
18. A square has side  $(2x - 3)$ . Write its area, expanded. \_\_\_\_\_



## Answer Keys

1.  $x^2 + 2x + 1$

2.  $x^2 + 8x + 16$

3.  $x^2 - 4x + 4$

4.  $x^2 - 10x + 25$

5.  $x^2 - 9$

6.  $x^2 - 49$

7.  $4x^2 + 4x + 1$

8.  $9x^2 - 12x + 4$

9.  $x^2 + 12x + 36$

10.  $4x^2 - 25$

11.  $x^2 - 2x + 1$

12.  $25x^2 - 9$

13.  $16x^2 + 8x + 1$

14.  $x^2 - 64$

15.  $x^2 + 4x + 4$

16.  $x^2 + 20x + 100$

17.  $x^2 - 81$

18.  $4x^2 - 12x + 9$

### Step-by-Step Explanations

1. Use the square-of-a-sum pattern  $(a + b)^2 = a^2 + 2ab + b^2$ . Here  $a = x$  and  $b = 1$ , so  $x^2 + 2(x)(1) + 1^2 = x^2 + 2x + 1$ .

2. This is another square of a sum. Let  $a = x$  and  $b = 4$ ; then  $(x + 4)^2 = x^2 + 2(x)(4) + 4^2 = x^2 + 8x + 16$ .

3. For a square of a difference, use  $(a - b)^2 = a^2 - 2ab + b^2$ . With  $a = x$  and  $b = 2$ , the result is  $x^2 - 4x + 4$ .

4. Use  $(a - b)^2 = a^2 - 2ab + b^2$  with  $a = x$  and  $b = 5$ . That gives  $x^2 - 2(x)(5) + 25 = x^2 - 10x + 25$ .

5. The factors have the same first term and opposite signs, so use the difference-of-squares pattern  $(a + b)(a - b) = a^2 - b^2$ . Here  $a = x$  and  $b = 3$ , giving  $x^2 - 9$ .

6. This is a difference of squares because the signs are opposite. Square  $x$  and square 7, then subtract:  $x^2 - 7^2 = x^2 - 49$ .

7. Use  $(a + b)^2 = a^2 + 2ab + b^2$  with  $a = 2x$  and  $b = 1$ . Then  $(2x)^2 = 4x^2$ ,  $2(2x)(1) = 4x$ , and  $1^2 = 1$ , so the expansion is  $4x^2 + 4x + 1$ .

8. Use the square-of-a-difference pattern with  $a = 3x$  and  $b = 2$ . Square each end and subtract twice the product:  $9x^2 - 12x + 4$ .

9. Here  $a = x$  and  $b = 6$  in  $(a + b)^2$ . The middle term is  $2ab = 2(x)(6) = 12x$ , and  $6^2 = 36$ , so the expansion is  $x^2 + 12x + 36$ .

10. The signs are opposite, so the middle terms cancel. Use  $a^2 - b^2$  with  $a = 2x$  and  $b = 5$ :  $(2x)^2 - 5^2 = 4x^2 - 25$ .

11. This is  $(x - 1)^2$ , so use  $a^2 - 2ab + b^2$ . With  $a = x$  and  $b = 1$ , the expansion is  $x^2 - 2x + 1$ .

12. Opposite signs mean difference of squares. Square  $5x$  to get  $25x^2$  and square 3 to get 9, so the product is  $25x^2 - 9$ .

13. Use the square-of-a-sum pattern with  $a = 4x$  and  $b = 1$ . The terms are  $(4x)^2 = 16x^2$ ,  $2(4x)(1) = 8x$ , and  $1^2 = 1$ , so the expansion is  $16x^2 + 8x + 1$ .

14. This matches  $(a - b)(a + b)$ , so use  $a^2 - b^2$ . Here  $a = x$  and  $b = 8$ , so the expanded form is  $x^2 - 64$ .

15. The area of a square is side squared, so the expression is  $(x + 2)^2$ . Use  $(a + b)^2$  to get  $x^2 + 2(x)(2) + 4 = x^2 + 4x + 4$ .

16. Use  $(a + b)^2$  with  $a = x$  and  $b = 10$ . The middle term is  $2(x)(10) = 20x$ , and  $10^2 = 100$ , so the answer is  $x^2 + 20x + 100$ .

17. The binomials are conjugates, meaning the same terms with opposite signs. The middle terms cancel, so  $(x + 9)(x - 9) = x^2 - 9^2 = x^2 - 81$ .

18. The side length is  $(2x - 3)$ , so the area is  $(2x - 3)^2$ . Use  $(a - b)^2$  with  $a = 2x$  and  $b = 3$  to get  $4x^2 - 12x + 9$ .



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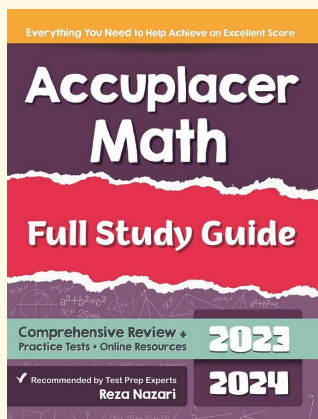


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