NAME _____ DATE _____

5–6 Squares of Binomials

Objective: To find squares of binomials and to factor perfect square trinomials.

Vocabulary

Square of a Binomial

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

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

Perfect Square Trinomial

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

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

Example 1 Write each square as a trinomial.

a. $(x + 4)^2$ **b.** $(5u - 2)^2$ **c.** $(2x + 3y)^2$ **d.** $(5a^2 - 4b^2)^2$

Solution Use the patterns for the square of a binomial.

a. $(x + 4)^2 = x^2 + 2(x \cdot 4) + 4^2$
$= x^2 + 8x + 16$
Pattern: $(a + b)^2 = a^2 + 2ab + b^2$

b. $(5u - 2)^2 = (5u)^2 - 2(5u \cdot 2) + 2^2$
$= 25u^2 - 20u + 4$
Pattern: $(a - b)^2 = a^2 - 2ab + b^2$

c. $(2x + 3y)^2 = (2x)^2 + 2(2x \cdot 3y) + (3y)^2$
$= 4x^2 + 12xy + 9y^2$
Pattern: $(a + b)^2 = a^2 + 2ab + b^2$

d. $(5a^2 - 4b^2)^2 = (5a^2)^2 - 2(5a^2 \cdot 4b^2) + (4b^2)^2$
$= 25a^4 - 40a^2b^2 + 16b^4$
Pattern: $(a - b)^2 = a^2 - 2ab + b^2$

Write each square as a trinomial.

1. $(x + 3)^2$
2. $(y - 2)^2$
3. $(a - 4)^2$
4. $(n + 5)^2$
5. $(3u - 1)^2$
6. $(5c - 1)^2$
7. $(3y + 4)^2$
8. $(4k + 5)^2$
9. $(5k - 2)^2$
10. $(ab - 3)^2$
11. $(3p + 5q)^2$
12. $(4x - 3y)^2$
13. $(3y - 5)^2$
14. $(5a - 7b)^2$
15. $(2x + y)^2$
16. $(x^2 + 5)^2$
17. $(ef - 7)^2$
18. $(pq - 3)^2$
19. $(2ab - c)^2$
20. $(-3ab + b^2)^2$
21. $(-4 + 3f)^2$
22. $(-11u + v^2)^2$
23. $(5p^3 - 6)^2$
24. $(-9t^2 - 2)^2$

NAME _____ DATE _____

5–6 *Squares of Binomials* *(continued)*

Example 2 Decide whether each trinomial is a perfect square. If it is, factor it.

a. $4x^2 - 12x + 9$ **b.** $16u^2 + 20uv + 25v^2$

Solution **a.** $4x^2 - 12x + 9$

1. Is the first term a square? Yes; $4x^2 = (2x)^2$
2. Is the last term a square? Yes; $9 = (3)^2$
3. Is the middle term, neglecting the sign, twice the product of $2x$ and 3? Yes; $12x = 2(2x \cdot 3)$

Since the answers to Questions 1–3 are all Yes, $4x^2 - 12x + 9$ is a perfect square.

Use the pattern $a^2 - 2ab + b^2 = (a - b)^2$: $4x^2 - 12x + 9 = (2x - 3)^2$.

b. $16u^2 + 20uv + 25v^2$

1. Is the first term a square? Yes; $16u^2 = (4u)^2$
2. Is the last term a square? Yes; $25v^2 = (5v)^2$
3. Is the middle term, neglecting the sign, twice the product of $4u$ and $5v$? No; $20uv \neq 2(4u \cdot 5v)$

Since the answer to Question 3 is No, $16u^2 + 20uv + 25v^2$ is not a perfect square.

Decide whether each trinomial is a perfect square. If it is, factor it. If it is not, write *not a perfect square*.

25. $n^2 - 4n + 4$ **26.** $k^2 + 10k + 25$ **27.** $a^2 - 6a + 9$

28. $y^2 - 8y + 16$ **29.** $a^2 - 4a + 16$ **30.** $81 + 18y + y^2$

31. $9x^2 - 12x + 4$ **32.** $16k^2 - 40k + 25$ **33.** $9y^2 + 48y + 64$

34. $9 + 6y + 4y^2$ **35.** $25x^2 + 80xy + 64y^2$ **36.** $4c^2 - 12c + 9$

37. $9n^2 - 24n + 16$ **38.** $81 - 36k + 4k^2$ **39.** $81k^2 + 180k + 100$

40. $49a^2 - 42ab + 9b^2$ **41.** $4m^2 - 36mn + 81n^2$ **42.** $16x^2 - 24xy + 9y^2$

Mixed Review Exercises

Evaluate if $x = 3$ and $y = 2$.

1. $x + y + (-6)$ **2.** $x - |5 - y|$ **3.** $6 + x^2y$

4. $(3 + xy)^2$ **5.** $(x)^3(-y)^3$ **6.** $(x^2y^2)^2$

Simplify.

7. $(2x + 5)(2x - 5)$ **8.** $(x - 6)(x + 2)$ **9.** $(6 - 2)^3$

10. $4 - 2^3$ **11.** $\frac{(a^4)^3}{(a^2)^4}$ **12.** $\frac{(3xy)^2}{9xy}$