FMP10 Name: ____________________________
Date: ____________________________

# 4.6 Factoring Special Trinomials

**Ex.** Factor:

$4x^2 - 9$

$4x^2 + 0x - 9$

$4x^2 + 6x - 6x - 9$

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

$\boxed{(2x+3)(2x-3)}$ ← conjugates

$\otimes\ -36$, $\oplus\ 0$: $6, -6$

$a^2 - 25b^2$

$a^2 + 0ab - 25b^2$

$\boxed{(a-5b)(a+5b)}$

$\otimes\ -25$, $\oplus\ 0$: $-5, 5$

**Difference of Squares:** a binomial expression involving the subtraction of perfect squares

ex. $4q^6 - 169$, $64z^{12} - 16y^4$

Pattern can be applied to both multiplication of conjugates and factoring of difference of squares.

**Ex.** Multiply:

$(3x-4)(3x+4)$

$= (3x)^2 - (4)^2$

$= \boxed{9x^2 - 16}$

$(a^2 + 7b)(a^2 - 7b)$

$= (a^2)^2 - (7b)^2$

$= \boxed{a^4 - 49b^2}$

$2(6q-1)(6q+1)$

$= 2\left((6q)^2 - (1)^2\right)$

$= 2(36q^2 - 1)$

$= \boxed{72q^2 - 2}$

**Ex.** Factor:

$x^2 - 81$

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

$-16c^2 + 25a^2$

$= 25a^2 - 16c^2$

$= \boxed{(5a-4c)(5a+4c)}$

$m^2 + 16$

$\boxed{\text{prime}}$

$7g^3h^2 - 28g^5$ GCF!

$= 7g^3(h^2 - 4g^2)$

$= \boxed{7g^3(h+2g)(h-2g)}$

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**Ex.** Factor:

$4x^2 + 12x + 9$

$4x^2 + 6x + 6x + 9$

$2x(2x+3) + 3(2x+3)$

$(2x+3)(2x+3)$

$= \boxed{(2x+3)^2}$

$\sqrt{4x^2}$, $\sqrt{9}$

$\otimes\ 36$, $\oplus\ 12$: $6, 6$

$x^2 - 8x + 16$

$(x-4)(x-4)$

$= \boxed{(x-4)^2}$

$\otimes\ 16$, $\oplus\ -8$: $-4, -4$

**Perfect Square Trinomial:** The result of a binomial square

$(a+b)^2 = a^2 + \underline{2ab} + b^2$

$(a-b)^2 = a^2 - \underline{2ab} + b^2$

**Ex.** Multiply:

$(x+5)^2$

$= \boxed{x^2 + 10x + 25}$

$(3q-2)^2$

$= \boxed{9q^2 - 12q + 4}$

$3(2a+c)^2$

$= 3(4a^2 + 4ac + c^2)$

$= \boxed{12a^2 + 12ac + 3c^2}$

How can we identify a perfect square trinomial?

$x^2 + 10x + 25$

perfect square $\sqrt{x^2}$ $x$   $2(x)(5)$? ✓   $\sqrt{25}$ $5$ perfect square

$9q^2 - 12q + 4$

$\sqrt{9q^2}$ $3q$   $2(3q)(2)$   $\sqrt{4}$ $2$

**Ex.** Determine the values of q that would make each trinomial a perfect square:

$x^2 + qx + 1$

$\sqrt{x^2}$ $x$   $2(x)(1)$ $2x$   $\sqrt{1}$ $1$

$q = 2$

$= (x + 1)^2$

$9x^2 + qx + 16$

$\sqrt{9x^2}$ $3x$   $2(3x)(4)$ $24x$   $\sqrt{16}$ $4$

$q = 24$

$= (3x + 4)^2$

$49a^2 + qab + 36b^2$

$\sqrt{49a^2}$ $7a$   $2(7a)(6b)$ $84ab$   $\sqrt{36b^2}$ $6b$

$q = 84$

$= (7a + 6b)^2$

**Ex.** Determine if each trinomial is a perfect square, if yes factor using the pattern:

$x^2 + 6x + 9$

$2(x)(3)$ ✓

$= \boxed{(x+3)^2}$

* $x^2 - 6x + 9$

$= \boxed{(x-3)^2}$

$c^2 - 14c + 36$

$2(c)(6)$

$12c$ ✗

not perfect square

$\times$ 36

$+$ −14

$\boxed{\text{prime}}$

$25p^2 - 40pq + 16q^2$

$2(5p)(4q)$

$40pq$ ✓

$= \boxed{(5p - 4q)^2}$

* $25p^2 + 40pq + 16q^2$

$= (5p + 4q)^2$

$4x^2 + 10x + 25$

$2(2x)(5)$

$= 20x$ ✗

$\times$ 100

$+$ 10

$\boxed{\text{prime}}$

Practice: pg. 246/ #1 – 9, 11, 14, 17, 20