

Feb 9

MPM2D

Perfect Squares

Next Tues (Feb 17) will be Test date.

Recall: Find the squares of the numbers 1 through 12

$$1^2 = 1 \times 1 = 1$$

$$2^2 = 2 \times 2 = 4$$

$$3^2 =$$

$$4^2 = 4 \times 4 = 16$$

$$5^2 =$$

$$6^2 = 6 \times 6 = 36$$

$$7^2 = 7 \times 7 = 49$$

$$8^2 = 64$$

$$9^2 = 81$$

$$10^2 = 100$$

$$11^2 = 121$$

$$12^2 = 144$$

Memorize!

Perfect Square Trinomial

Investigate: Expand and Simplify.

$$\text{a) } (x+3)^2$$

\curvearrowright

$$= (x+3)(x+3)$$

\curvearrowright

$$= x^2 + (3x) + (3x) + 9$$

\curvearrowright

$$= x^2 + 6x + 9$$

$$\text{d) } (a+b)^2$$

\curvearrowleft

$$= (a+b)(a+b)$$

\curvearrowleft

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

$$\rightarrow = a^2 + 2ab + b^2$$

$$\text{b) } (2h+3)^2$$

$$= (2h+3)(2h+3)$$

$$\text{c) } (3b-5)^2$$

\curvearrowright

$$= (3b-5)(3b-5)$$

$$= 9b^2 - 15b - 15b + 25$$

$$= 9b^2 - 30b + 25$$

$$\text{e) } (a-b)^2$$

$$= (a-b)(a-b)$$

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

Factoring

What patterns do you notice?

$$a^2 + 2ab + b^2 \rightarrow (a+b)^2$$

$$\text{OR } a^2 - 2ab + b^2 \rightarrow (a-b)^2$$

To factor perfect square trinomials:

Example 2 Perfect Square Trinomials

Verify that each trinomial is a perfect square. Then, factor.

$$\begin{aligned} \text{a) } x^2 + 6x + 9 &\rightarrow a^2 + 2ab + b^2 & a = x & \\ &= x^2 + 2 \cdot 3x + 3^2 & b = 3 & \\ &\quad a = x & b = 3 & \\ &\quad \therefore (x+3)^2 & & \\ &\quad a = 2x & & \\ \text{c) } 4x^2 + 28x + 49 && & \\ &= (2x)^2 + (2 \cdot 2x \cdot 7) + 7^2 & b = 7 & \\ &\quad 2ab & & \\ &\quad (2x+7)^2 & & \\ \text{d) } 25k^2 - 60km + 36m^2 && a = 5k & \\ &= (5k)^2 - 2 \cdot 5k \cdot 6m + (6m)^2 & b = 6m & \\ &\quad 2ab & & \\ &\quad (5k - 6m)^2 & & \end{aligned}$$

What value of k would make the following polynomials perfect square trinomials?

$$a) x^2 - 4x + \underline{\underline{k}} \quad a = x$$

$$b = ?$$

$$2ab = -4x$$

$$\therefore b = \frac{2}{2x}$$

$$b) 4x^2 + kx + 25$$

$$k = b^2 =$$

$$a = 2x = (2x)^2 + (2 \cdot 2x \cdot 5) + 5^2$$

$$b = 5 \quad = 4x^2 + 20x + 25 \rightarrow k = 20$$

$$c) 100x^2 + kx + 81 \rightarrow k = ?$$

$$a = 10x = (10x)^2 + (2 \cdot 10x \cdot 9) + 9^2$$

$$b = 9 \quad kx = 180x \quad \therefore k = 180$$

$$d) 49x^2 - 42x + k$$

$$a = 7x \quad (7x)^2 - 2 \cdot (7x) \cdot b + b^2$$

$$b = ? \quad -42x = -14xb$$

$$a^2 + 2ab + b^2 \text{ or}$$

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

$$\Rightarrow \therefore k = 4$$

$$\frac{-42x}{-14x} = b$$

$$\therefore b = 3$$

$$k = b^2 = 9$$

Create two trinomials that are **not** perfect square trinomials and therefore are not factorable!

$$\textcircled{1} \quad 3x^2 + 35x + 5$$

$$\textcircled{2} \quad 25x^2 + 17x + 36$$

Review: Identify the type of polynomial. Factor, if possible.

$$a) 5x^2 - 8x - 4 \quad ac = -20, \quad b = -8$$

$$= 5x^2 - 10x + 2x - 4$$

$$= 5x(x-2) + 2(x-2)$$

$$= (x-2)(5x+2)$$

$$c) 8x^3y + 4x^2y - 6xy^5$$

$$= 2xy(4x^2 + 2x - 3y^4)$$

$$b) x^2 + 2x + 1 \quad a = x$$

$$= x^2 + (2 \cdot x \cdot 1) + 1^2$$

$$= (x+1)^2 \quad b = 1$$

$$a = x$$

$$b = 1$$

$$d) 3x^2 - 3x + 9 \quad ac = 1 \times 3 = 3 -$$

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

$$b = -1 \quad /$$

$$\therefore 3(x^2 - x + 3)$$

I can't find any two integers, which satisfy two conditions.

$$f) 2x^2 - 12x + 18$$

$$= 2(x^2 - 6x + 9)$$

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

$$= 2(x-3)^2 \quad b = 3$$

$$e) 25x^2 - 20x + 4 \quad a = 5x$$

$$= (5x)^2 - (2 \cdot 5x \cdot 2) + 2^2 \quad b = 2$$

$$= (5x-2)^2$$

* HW: Read "HW List made on Feb 9"