# Factoring using Reverse of FOIL

Vol. II No. 31(Notes)

January 3, 2018

# ***But first, let's review multiplying Binomials***

[1] using the distributive property.

[2] using the FOIL method

[3] using the Box method

1) Multiply $(2x + 3)(5x + 8)$

Using the distributive property, multiply

**2x**$(5x + 8)$ + **3**$(5x + 8)$.

$10x^2 + 16x + 15x + 24$

Combine like terms.

**$10x^2 + 31x + 24$**

A shortcut of the distributive property is called the **FOIL** method.

The FOIL method is ONLY used when you multiply 2 binomials. It is an acronym and tells you which terms to multiply.

2) Use the FOIL method to multiply the following binomials:

$(y + 3)(y + 7)$.

$(y + 3)(y + 7)$.

**F** tells you to multiply the FIRST terms of each binomial.

$y^2$

$(y + 3)(y + 7)$.

**O** tells you to multiply the <u>OUTER</u> terms of each binomial.

$y^2$ **+ 7y**

$(y + 3)(y + 7)$.

**I** tells you to multiply the <u>INNER</u> terms of each binomial.

$y^2 + 7y$ **$+ 3y$**

$(y + 3)(y + 7)$.

**L** tells you to multiply the LAST terms of each binomial.

$y^2 + 7y + 3y$ **+ 21**

Combine like terms.

**$y^2 + 10y + 21$**

Remember, FOIL reminds you to multiply the:

**F**irst terms

**O**uter terms

**I**nner terms

**L**ast terms

# The third method is the Box Method. This method works for every problem!

Here's how you do it. Multiply $(3x - 5)(5x + 2)$

Draw a box. Write a polynomial on the top and side of a box. It does not matter which goes where.

This will be modeled in the next problem along with FOIL.

| | $3x$ | $-5$ |
|---|---|---|
| $5x$ | | |
| $+2$ | | |

# 3) Multiply $(3x - 5)(5x + 2)$

First terms: $15x^2$

Outer terms: $+6x$

Inner terms: $-25x$

Last terms: $-10$

Combine like terms.

**$15x^2 - 19x - 10$**

| | $3x$ | $-5$ |
|---|---|---|
| $5x$ | $15x^2$ | $-25x$ |
| $+2$ | $+6x$ | $-10$ |

You have 3 techniques. Pick the one you like the best!

# 4) Multiply $(7p - 2)(3p - 4)$

First terms: $21p^2$

Outer terms: $-28p$

Inner terms: $-6p$

Last terms: $+8$

Combine like terms.

**$21p^2 - 34p + 8$**

| | $7p$ | $-2$ |
|---|---|---|
| $3p$ | $21p^2$ | $-6p$ |
| $-4$ | $-28p$ | $+8$ |

# Multiply $(y + 4)(y – 3)$

1. $y^2 + y – 12$ ✓
2. $y^2 – y – 12$
3. $y^2 + 7y – 12$
4. $y^2 – 7y – 12$
5. $y^2 + y + 12$
6. $y^2 – y + 12$
7. $y^2 + 7y + 12$
8. $y^2 – 7y + 12$

# Multiply $(2a - 3b)(2a + 4b)$

1. $4a^2 + 14ab - 12b^2$
2. $4a^2 - 14ab - 12b^2$
3. $4a^2 + 8ab - 6ba - 12b^2$
4. ✓ $4a^2 + 2ab - 12b^2$
5. $4a^2 - 2ab - 12b^2$

# 5) Multiply $(2x - 5)(x^2 - 5x + 4)$

You cannot use FOIL because they are not BOTH binomials. You must use the distributive property.

$$\mathbf{2x}(x^2 - 5x + 4) \mathbf{- 5}(x^2 - 5x + 4)$$

$$2x^3 - 10x^2 + 8x - 5x^2 + 25x - 20$$

Group and combine like terms.

$$2x^3 - 10x^2 - 5x^2 + 8x + 25x - 20$$

$$\mathbf{2x^3 - 15x^2 + 33x - 20}$$

5) Multiply $(2x - 5)(x^2 - 5x + 4)$

You cannot use FOIL because they are not BOTH binomials. You must use the distributive property or box method.

| | $x^2$ | $-5x$ | $+4$ |
|---|---|---|---|
| $2x$ | $2x^3$ | $-10x^2$ | $+8x$ |
| $-5$ | $-5x^2$ | $+25x$ | $-20$ |

Almost done! Go to the next slide!

5) Multiply $(2x - 5)(x^2 - 5x + 4)$

Combine like terms!

| | $x^2$ | $-5x$ | $+4$ |
|---|---|---|---|
| $2x$ | $2x^3$ | $-10x^2$ | $+8x$ |
| $-5$ | $-5x^2$ | $+25x$ | $-20$ |

$$2x^3 - 15x^2 + 33x - 20$$

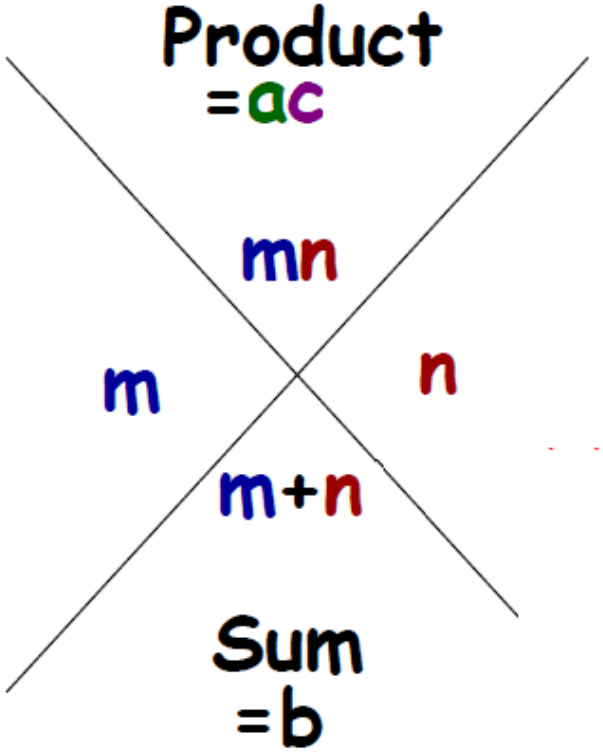
# Multiply $(2p + 1)(p^2 - 3p + 4)$

1. $2p^3 + 2p^3 + p + 4$
2. $y^2 - y - 12$
3. $y^2 + 7y - 12$
4. $y^2 - 7y - 12$

# Factor

## Factor the x-box way

$$y = ax^2 + bx + c$$




First Last

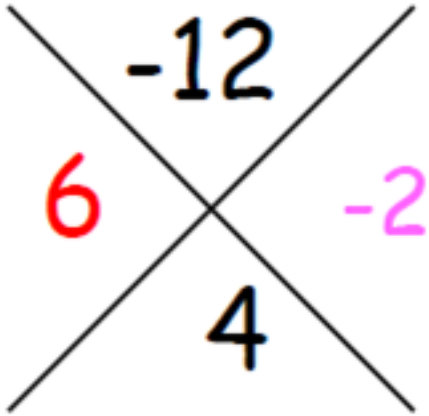
and

Middle

Coefficients

# Factor

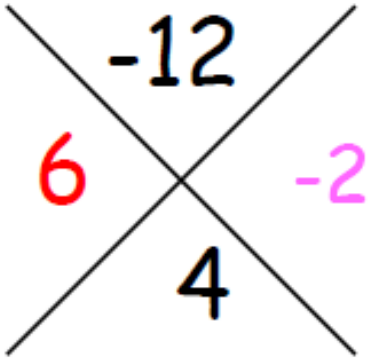
$$x^2 + 4x - 12$$



# Factor

Factor using the x-box method.

1) $x^2 + 4x - 12$

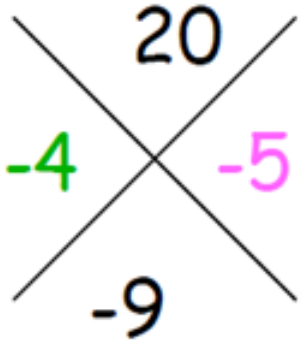



Solution:

$x^2 + 4x - 12 = (x + 6)(x - 2)$

# Factor

$$x^2 - 9x + 20$$




$$(x - 4)(x - 5)$$

Solution:

$$x^2 - 9x + 20 = (x - 4)(x - 5)$$

Factor

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