2.04 Factoring Trinomials

Basic Algebra: One Step at a Time. Pages 147-156: # 74, 83, 89, 99, 100

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p. 154: 74. $x^2 + 11x - 60$

SOLUTION: Notice that this is a trinomial since it has three terms. This can be factored using F OI L (or actually maybe it should be written F L OI).
In this case, the First times First is obviously x times x.

$x^2 + 11x - 60$
$(x \quad \_\_\_)(x \quad \_\_\_)$

The Last times Last must be two numbers whose product is -60. Since the sign is negative, this means that you must use opposite signs for the two numbers. The difference between the two numbers must be the middle term which is 11. In other words, find two numbers whose product is 60 and whose difference is 11. Can you think of it? If so, you can go ahead and put it down. If you can't think of it, then start with 1, and list all of the numbers that divide into 60 like this:

60
$1 \bullet 60$
$2 \bullet 30$
$3 \bullet 20$
$4 \bullet 15$
$5 \bullet 12$
$6 \bullet 10$

After this, 7 does not divide evenly into 60. Neither does 8 or 9. Then the next number would be 10, and $10 \bullet 6$ is the reverse of $6 \bullet 10$. This means that you have all the combinations.

Now, look at the list above, and see which combination of numbers would have a difference of 11. That would be $4 \bullet 15$ or $15 \bullet 4$

$(x \quad 15)(x \quad 4)$

In order to make the middle term $+11$, use $+15$ times -4.

$(x + 15)(x - 4)$

Of course, $(x - 4)(x + 15)$ is equally correct!!

p. 154: 83. $x^2 - 3x - 28$

SOLUTION: Notice that this is a trinomial since it has three terms. This can be factored using F OI L (or actually maybe it should be written F L OI).
In this case, the First times First is obviously x times x.

$$x^2 - 3x - 28$$
$$(x \quad \_\_\_)(x \quad \_\_\_)$$

The Last times Last must be two numbers whose product is -28. Since the sign is negative, this means that you must use opposite signs for the two numbers. The difference between the two numbers must be the middle term which is 11. In other words, find two numbers whose product is 28 and whose difference is 3. Can you think of it? If so, you can go ahead and put it down. If you can't think of it, then start with 1, and list all of the numbers that divide into 28 like this:

$$\underline{28}$$
$$1 \bullet 28$$
$$2 \bullet 14$$
$$4 \bullet 7$$

After this, 5 does not divide evenly into 28. Neither does 6. Then the next number would be 7, and $7 \bullet 4$ is the reverse of $4 \bullet 7$. This means that you have all the combinations.

Now, look at the list above, and see which combination of numbers would have a difference of 3. That would be $4 \bullet 7$ or $7 \bullet 4$

$$(x \quad 7)(x \quad 4)$$

In order to make the middle term -3, use -7 times $+4$.

$$(x - 7)(x + 4)$$

Of course, $(x + 4)(x - 7)$ is equally correct!!

p. 154: 89. $x^2 + 23x - 50$

SOLUTION: Notice that this is a trinomial since it has three terms. This can be factored using F OI L (or actually maybe it should be written F L OI).
In this case, the First times First is obviously x times x.

$$x^2 + 23x - 50$$
$$(x \quad \_\_\_)(x \quad \_\_\_)$$

The Last times Last must be two numbers whose product is -50. Since the sign is negative, this means that you must use opposite signs for the two numbers. The difference between the two numbers must be the middle term which is 23. In other words, find two numbers whose product is 50 and whose difference is 23. Can you think of it? If so, you can go ahead and put it down. If you can't think of it, then start with 1, and list all of the numbers that divide into 50 like this:

$$\underline{50}$$
$$1 \bullet 50$$
$$2 \bullet 25$$
$$5 \bullet 10$$

After this, 6, 7, 8, and 9 do not divide evenly into 50, and the next number would be $10 \bullet 5$ is the reverse of $5 \bullet 10$. This means that you have all the combinations.

Now, look at the list above, and see which combination of numbers would have a difference of 23. That would be $2 \bullet 25$ or $25 \bullet 2$

$$(x \quad 25)(x \quad 2)$$

In order to make the middle term $+23$, use $+25$ times -2.

$$(x + 25)(x - 2)$$

Of course, $(x - 2)(x + 25)$ is equally correct!!

p. 154: 99. $2x^3 - 14x^2 + 20x$

SOLUTION: Notice that this is a trinomial since it has three terms. However, BEFORE trying to factor this using F OI L, the first step in ANY factoring problem is to see if there are any COMMON FACTORS! I call this FCFF—Factor the Common Factor First! In this case, the common factor is $2x$:

$$2x(\qquad\qquad)$$

$$2x(x^2 - 7x + 10)$$

What is left in the parentheses is a trinomial that can (usually in this section!) be factored!

This can be factored by the F L OI method!

In this case, the First times First is obviously x times x.

$$2x(x^2 - 7x + 10)$$

$$2x\ (x\ \_\_\_)(x\ \_\_\_)$$

The Last times Last must be two numbers whose product is $+10$. Since the sign is positive, this means that you must the use same signs for the two numbers. The sum of these two numbers must be the coefficient of middle term which is -7. You can probably guess that the combination you need is $5 \bullet 2$ -- actually $(-5) \bullet (-2)$.

Of course, $2x(x - 5)(x - 2)$ is the final answer!!

p. 154: 100. $5x^3 + 5x^2 - 10x$

SOLUTION: Notice that this is a trinomial since it has three terms. However, BEFORE trying to factor this using F OI L, the first step in ANY factoring problem is to see if there are any COMMON FACTORS! I call this FCFF—Factor the Common Factor First! In this case, the common factor is 5x:

$$5x(\qquad\qquad)$$

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

What is left in the parentheses is a trinomial that can (usually in this section!) be factored!

This can be factored by the F L OI method!

In this case, the First times First is obviously x times x.

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

$$5x\ (x\ \_\_\_)(x\ \_\_\_)$$

The Last times Last must be two numbers whose product is -2. Since the sign is negative, this means that you must the use opposite signs for the two numbers. The difference of these numbers must be the coefficient of middle term which is $+1$. You can probably guess that the combination you need is $(+2)\bullet(-1)$.

$5x(x + 2)(x - 1)$ **is the final answer!!**