MTH1W – Unit 5: Algebra II

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Lesson #5.4a: Factoring Trinomials

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Learning Goal: We are learning to factor trinomials.

Once again, let's play: "Find the Pair!"

1) Find two numbers which multiply to -60 and add to -7

60
1 x -60
2 x -30
3 x -20
4 x -15
5 x -12

$M = -60 = (5)(-12)$
$A = -7 = (5) + (-12)$

M	A	S#	B#
+	+	+	+
+	-	-	-
-	-	+	-
-	+	-	+

Now we are going to learn why we find pairs. The following trinomials need to be factored. Remember that factoring is the opposite of expanding. Now remember, that when we FOILed a few lessons ago, we ended up with trinomials. Therefore, today's factoring is the opposite of FOILing. Our answers will always be (*binomial*)(*binomial*). The method we use is called "decomposition"

Let's say our trinomial looks like: $Ax^2 + Bx + C$

M	A	S#	B#
+	+	+	+
+	-	-	-
-	-	+	-
-	+	-	+

How to Set-Up Factoring by Decomposition

A. Multiply the first coefficient (A) and the constant term (C) together. This is the number that you are finding the factors of.
B. The specific factor pair that you are looking for, must add up to the middle coefficient (B) term.
C. The rest I will teach you by example (too wordy to write!)

2) $8x^2 + 6x - 5$

STEP 1: $M = -40$, $A = 6$

-40
-1 x 40
-2 x 20
-4 x 10

STEP 2: $6x = -4x + 10x$

STEP 3: $\frac{8x^2 - 4x}{4x} + \frac{10x - 5}{5}$

$= 4x(2x-1) + 5(2x-1)$

STEP 4: $(2x-1)(4x+5)$

3) $x^2 + 17x + 52$

$M = 52 = 4 \times 13$
$A = 17 = 4 + 13$

$= x^2 + 4x + 13x + 52$

$= x(x+4) + 13(x+4)$

$= (x+4)(x+13)$

4) $2n^2 + n - 36$

$M = -72 = (-8)(9)$

$A = 1 = (-8) + (9)$

$= 2n^2 - 8n + 9n - 36$

$2n \qquad 9$

$= 2n(n-4) + 9(n-4)$

$= (n-4)(2n+9)$

5) $9a^2 - 47a + 10$

$M = 90 = (-45)(-2)$

$A = -47 = (-45) + (-2)$

$= 9a^2 - 45a - 2a + 10$

$9a \qquad -2$

$= 9a(a-5) - 2(a-5)$

$= (a-5)(9a-2)$

6) $n^2 + 5n + 6$

$M = 6 = (2)(3)$

$A = 5 = 2 + 3$

$= n^2 + 2n + 3n + 6$

$n \qquad 3$

$= n(n+2) + 3(n+2)$

$= (n+2)(n+3)$

7) $9n^2 - 34n - 8$

$M = -72 = (-36)(2)$

$A = -34 = (-36) + (2)$

$= 9n^2 - 36n + 2n - 8$

$9n \qquad 2$

$= 9n(n-4) + 2(n-4)$

$= (n-4)(9n+2)$

8) $2r^2 - 5r - 3$

$M = -6 = 1 \times -6$

$A = -5 = 1 + (-6)$

$= 2r^2 + r - 6r - 3$

$r \qquad -3$

$= r(2r+1) - 3(2r+1)$

$= (2r+1)(r-3)$

9) $x^2 - 12x + 27$

$M = 27 = (-9)(-3)$

$A = -12 = (-9) + (-3)$

$= x^2 - 9x - 3x + 27$

$x \qquad -3$

$= x(x-9) - 3(x-9)$

$= (x-9)(x-3)$

Success Criteria:

- I can set up my factoring by finding a factor pair that multiplies to the first and last terms (A×C), but adds to the middle term (B).
- I can use "Factoring by Decomposition" to factor a trinomial