Week Two

Yearlong Algebra

Desoto County Schools

NAME _____ DATE _____ PERIOD _____

8-4 Study Guide and Intervention

Factoring Trinomials: $ax^2 + bx + c$

Factor $ax^2 + bx + c$ To factor a trinomial of the form $ax^2 + bx + c$, find two integers, m and n whose product is equal to ac and whose sum is equal to b. If there are no integers that satisfy these requirements, the polynomial is called a **prime polynomial**.

Example 1 **Factor $2x^2 + 15x + 18$.**

In this example, $a = 2$, $b = 15$, and $c = 18$. You need to find two numbers whose sum is 15 and whose product is $2 \cdot 18$ or 36. Make a list of the factors of 36 and look for the pair of factors whose sum is 15.

Factors of 36	Sum of Factors
1, 36	37
2, 18	20
3, 12	15

Use the pattern $ax^2 + mx + nx + c$, with $a = 2$, $m = 3$, $n = 12$, and $c = 18$.

$$\begin{aligned} 2x^2 + 15x + 18 &= 2x^2 + 3x + 12x + 18 \\ &= (2x^2 + 3x) + (12x + 18) \\ &= x(2x + 3) + 6(2x + 3) \\ &= (x + 6)(2x + 3) \end{aligned}$$

Therefore, $2x^2 + 15x + 18 = (x + 6)(2x + 3)$.

Example 2 **Factor $3x^2 - 3x - 18$.**

Note that the GCF of the terms $3x^2$, $3x$, and 18 is 3. First factor out this GCF.

$3x^2 - 3x - 18 = 3(x^2 - x - 6)$.

Now factor $x^2 - x - 6$. Since $a = 1$, find the two factors of -6 whose sum is -1.

Factors of -6	Sum of Factors
$1, -6$	-5
$-1, 6$	5
$-2, 3$	1
$2, -3$	-1

Now use the pattern $(x + m)(x + n)$ with $m = 2$ and $n = -3$.

$x^2 - x - 6 = (x + 2)(x - 3)$

The complete factorization is $3x^2 - 3x - 18 = 3(x + 2)(x - 3)$.

Exercises

Factor each trinomial, if possible. If the trinomial cannot be factored using integers, write *prime*.

1. $2x^2 - 3x - 2$
2. $3m^2 - 8m - 3$
3. $16r^2 - 8r + 1$
4. $6x^2 + 5x - 6$
5. $3x^2 + 2x - 8$
6. $18x^2 - 27x - 5$
7. $2a^2 + 5a + 3$
8. $18y^2 + 9y - 5$
9. $-4c^2 + 19c - 21$
10. $8x^2 - 4x - 24$
11. $28p^2 + 60p - 25$
12. $48x^2 + 22x - 15$
13. $3y^2 - 6y - 24$
14. $4x^2 + 26x - 48$
15. $8m^2 - 44m + 48$
16. $6x^2 - 7x + 18$
17. $2a^2 - 14a + 18$
18. $18 + 11y + 2y^2$

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8-4 Skills Practice

Factoring Trinomials: $ax^2 + bx + c$

Factor each trinomial, if possible. If the trinomial cannot be factored using integers, write *prime*.

1. $2x^2 + 5x + 2$

2. $3n^2 + 5n + 2$

3. $2s^2 + 9s - 5$

4. $3g^2 - 7g + 2$

5. $2t^2 - 11t + 15$

6. $2x^2 + 3x - 6$

7. $2y^2 + y - 1$

8. $4h^2 + 8h - 5$

9. $4x^2 - 3x - 3$

10. $4b^2 + 15b - 4$

11. $9p^2 + 6p - 8$

12. $6q^2 - 13q + 6$

13. $3a^2 + 30a + 63$

14. $10w^2 - 19w - 15$

Solve each equation. Check your solutions.

15. $2x^2 + 7x + 3 = 0$

16. $3w^2 + 14w + 8 = 0$

17. $3n^2 - 7n + 2 = 0$

18. $5d^2 - 22d + 8 = 0$

19. $6h^2 + 8h + 2 = 0$

20. $8p^2 - 16p = 10$

21. $9y^2 + 18y - 12 = 6y$

22. $4a^2 - 16a = -15$

23. $10b^2 - 15b = 8b - 12$

24. $6d^2 + 21d = 10d + 35$

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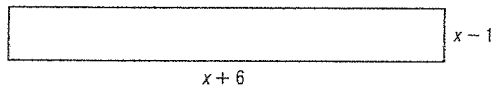
8-4 Enrichment

Area Models for Quadratic Trinomials

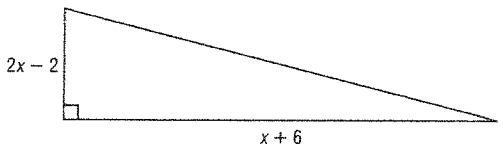
After you have factored a quadratic trinomial, you can use the factors to draw geometric models of the trinomial.

$x^2 + 5x - 6 = (x - 1)(x + 6)$

To draw a rectangular model, the value 2 was used for x so that the shorter side would have a length of 1. Then the drawing was done in centimeters. So, the area of the rectangle is $x^2 + 5x - 6$.



To draw a right triangle model, recall that the area of a triangle is one-half the base times the height. So, one of the sides must be twice as long as the shorter side of the rectangular model.



$x^2 + 5x - 6 = (x - 1)(x + 6)$

$= \frac{1}{2}(2x - 2)(x + 6)$

The area of the right triangle is also $x^2 + 5x - 6$.

Factor each trinomial. Then follow the directions to draw each model of the trinomial.

1. $x^2 + 2x - 3$ Use $x = 2$. Draw a rectangle in centimeters.

2. $3x^2 + 5x - 2$ Use $x = 1$. Draw a rectangle in centimeters.

3. $x^2 - 4x + 3$ Use $x = 4$. Draw two different right triangles in centimeters.

4. $9x^2 - 9x + 2$ Use $x = 2$. Draw two different right triangles. Use 0.5 centimeter for each unit.

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Factoring Trinomials (a = 1)

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Factor each completely.

1) $b^2 + 8b + 7$

2) $n^2 - 11n + 10$

3) $m^2 + m - 90$

4) $n^2 + 4n - 12$

5) $n^2 - 10n + 9$

6) $b^2 + 16b + 64$

7) $m^2 + 2m - 24$

8) $x^2 - 4x + 24$

9) $k^2 - 13k + 40$

10) $a^2 + 11a + 18$

11) $n^2 - n - 56$

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

13) $b^2 - 6b + 8$

14) $n^2 + 6n + 8$

15) $2n^2 + 6n - 108$

16) $5n^2 + 10n + 20$

17) $2k^2 + 22k + 60$

18) $a^2 - a - 90$

19) $p^2 + 11p + 10$

20) $5v^2 - 30v + 40$

21) $2p^2 + 2p - 4$

22) $4v^2 - 4v - 8$

23) $x^2 - 15x + 50$

24) $v^2 - 7v + 10$

25) $p^2 + 3p - 18$

26) $6v^2 + 66v + 60$