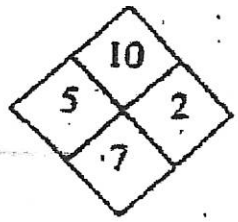
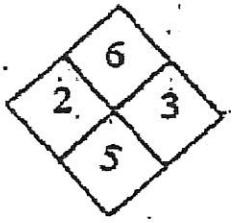
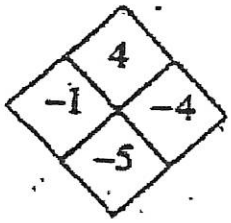
Name: _____ Class: _____

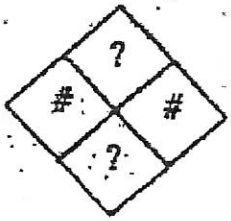
AU7: Notes #5 –Factoring Quadratics (a=1) Date: _____

Warm-Up:
Look for a pattern in the first three diamonds below. For the fourth diamond, explain how you could find the missing numbers (?) if you know the two numbers (#).

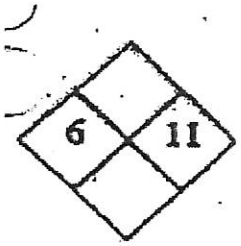


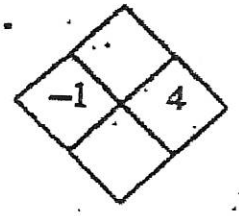


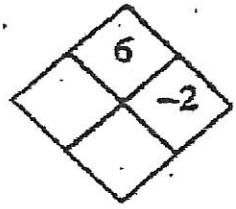


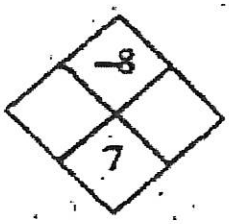


Fill in the missing numbers in the diamonds below.









Factoring Quadratics:

Remember that trinomials come in the form: $ax^2 + bx + c$

- Generally you factor based on the value of c. You find the factors of c that when multiplied make c but when they are added they make b.

Example 1: $x^2 + 5x + 6$

Example 2: $y^2 - 9y + 14$

Example 3: $z^2 + 7z - 18$

Example 4: $y^2 - 10y + 25$

Example 5: $y^2 - 81$

Practice:

1. $x^2 + 7x + 12$

2. $m^2 + 10m + 21$

3. $x^2 - 7x - 8$

4. $x^2 - 6x + 5$

5. $x^2 - 2x - 15$

6. $x^2 + 4x - 32$

7. $x^2 - 6x + 8$

8. $y^2 + 9y + 18$

9. $x^2 - 4$

10. $y^2 - 49$

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AU7: HW# 5 – Factoring Quadratics (a=1) Date: _____

Factor the following quadratics:

1. $x^2 + 5x + 6$

2. $x^2 - 9x + 14$

3. $y^2 + 7y - 18$

4. $b^2 - 8b + 15$

5. $n^2 - 4n - 32$

6. $a^2 - a - 6$

7. $n^2 - 144$

8. $a^2 - 1$

Spiral: Simplify the following.

1. $(2x+3)^2 =$

2. $(x-6)(x+6) =$

3.
$$\begin{array}{r} 2a^3+4a^2-5 \\ +\left(-5a^3-6a^2-5\right) \\ \hline \end{array}$$

4. $\left(7-3b^2+b^4\right)-\left(-3b^3+2b^4-9\right) =$

5. $\dfrac{3a^3b^7c^2}{9a^6b^2c} =$

6. $\left(4xy^{-3}z^2\right)^3\left(-6y^2z^{-4}\right)^2 =$

7. Solve and graph the solution: $3q+6 \le -5(q+2)$

Name _____ Class _____ Date _____

Practice 9-5

Factoring Trinomials of the Type $x^2 + bx + c$

Factor each expression.

1. $x^2 + 8x + 16$
2. $d^2 + 8d + 7$
3. $y^2 + 6y + 8$
4. $b^2 - 2b - 3$
5. $s^2 - 4s - 5$
6. $x^2 + 12x + 32$
7. $x^2 - 9x + 20$
8. $x^2 - 5x + 6$
9. $a^2 + 3a + 2$
10. $p^2 - 8p + 7$
11. $d^2 + 6d + 5$
12. $n^2 + n - 6$
13. $x^2 + 5x - 14$
14. $b^2 + 9b + 14$
15. $x^2 + 14x + 45$
16. $a^2 + 7a + 12$
17. $x^2 + 13x + 22$
18. $x^2 + 3x - 4$
19. $x^2 - 8x + 12$
20. $x^2 + 7x - 18$
21. $n^2 - 7n + 10$
22. $s^2 - 5s - 14$
23. $x^2 - 9x + 8$
24. $x^2 - 2x - 24$
25. $x^2 - 6x - 27$
26. $x^2 - 16x - 36$
27. $x^2 + 7x + 10$
28. $x^2 - 3x - 28$
29. $m^2 - 4m - 21$
30. $x^2 - 2x - 15$
31. $x^2 - 5x - 24$
32. $b^2 - 4b - 60$
33. $x^2 - 3x - 18$
34. $m^2 + 7m + 10$
35. $n^2 - n - 72$
36. $k^2 - 6k + 5$
37. $x^2 + 9x + 20$
38. $x^2 - 10x + 9$
39. $x^2 - 8x + 16$
40. $d^2 - 4d + 3$
41. $b^2 - 26b + 48$
42. $n^2 - 15n + 26$
43. $n^2 - n - 6$
44. $z^2 - 14z + 49$
45. $x^2 + 7x + 12$
46. $x^2 - 18x + 17$
47. $x^2 + 16x + 28$
48. $t^2 - 6t - 27$
49. $b^2 + 4b - 12$
50. $d^2 + 11d + 18$
51. $x^2 + x - 20$
52. $x^2 - 13x + 42$
53. $x^2 + x - 6$
54. $x^2 + 4x - 21$
55. $a^2 + 2a - 35$
56. $h^2 + 7h - 18$
57. $x^2 + 3x - 10$
58. $p^2 - 12p - 28$
59. $y^2 + 6y - 55$
60. $b^2 + 3b - 4$
61. $x^2 + 2x - 63$
62. $x^2 - 2x - 8$
63. $x^2 - 11x - 60$
64. $r^2 + 2r - 35$
65. $c^2 - 3c - 10$
66. $x^2 + 8x + 15$
67. $x^2 - 8x + 15$
68. $n^2 - 23n + 60$
69. $c^2 + 3c - 10$
70. $x^2 - 9x + 14$
71. $x^2 - 10x + 24$
72. $x^2 + 6x - 27$
73. $y^2 - 16y + 64$
74. $n^2 + 10n + 25$
75. $r^2 - 14r - 51$
76. $x^2 + 3x - 40$
77. $x^2 - x - 42$
78. $n^2 - 2n - 63$
79. $a^2 + 7a + 6$
80. $x^2 - 14x + 48$
81. $x^2 - 11x + 28$
82. $n^2 + 16n - 36$
83. $n^2 - 4n - 21$
84. $y^2 + 16y - 17$

9.0

Name: _____ **Class:** _____

AU7: Notes # 6 – Factoring Quadratics ($a \neq 1$) **Date:** _____

Factoring Trinomials:

Remember that trinomials come in the form: $ax^2 + bx + c$

- Generally you factor based on the value of c. You find the factors of c that when multiplied make c but when they are added they make b.
- You will now also have to deal with the value of a. This will complicate things as you will have to find the right combinations for the factors of a and c that will produce the b value.

Examples where c is positive:

1. $2x^2 + 7x + 3$

2. $11x^2 - 14x + 3$

Try-It!

a. $2x^2 + 5x + 2$

b. $2y^2 - 5y + 2$

Examples where *c* is negative:

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

4. $5y^2 - 14y - 3$

Try-It!

a. $7x^2 - 20x - 3$

b. $13y^2 + 8y - 5$

Examples where *a* is not prime:

5. $6x^2 - 17x + 5$

6. $4x^2 - 4x - 15$

Try-It!

a. $16x^2 - 26x + 3$

b. $6x^2 - 5x - 6$

Special Case:

7. $16x^2 - 49$

8. $4x^4 - 81y^6$

Try-It!

a. $16x^2 - 1$

b. $25y^8 - 121$

Alternate Methods

Keys to Success:

1. Take the *a* and *c* value and multiply them together. Write the new trinomial with your new "*c*" value and leave off the *a* value.
2. Factor the trinomial the way you factor any trinomial by finding the factors of the *c* value that when added together make the *b* value. Make sure you watch for sign changes.
3. Now write your two binomials again but this time write the original *a* value back in front of both *x*'s.
4. Find the GCF's of each individual binomial if possible and factor it out.
5. Write the new binomials without the GCF included.

$6x^2 - 17x + 5$

1. Take the *a* and *c* value and multiply them together. Write the new trinomial with your new "*c*" value and leave off the *a* value.

   $6 \times 5 = 30$, *thus the new trinomial is:* $x^2 - 17x + 30$

2. Factor the trinomial the way you factor any trinomial by finding the factors of the *c* value that when added together make the *b* value. Make sure you watch for sign changes.

   The factors of 30: 1 & 30, 2 & 15, 3 & 10, 5 & 6 and they both have to be negative since a negative times a negative is positive, therefore I only have to add the factors together to make 17, thus they are 2 & 15. Therefore it should look like this: $(x-2)(x-15)$

3. Now write your two binomials again but this time write the original *a* value back in front of both *x*'s.

   $(6x-2)(6x-15)$

4. Find the GCF's of each individual binomial if possible and factor it out.

   $(6x-2)$ *the GCF is 2, therefore:* $2(3x-1)$
   $(6x-15)$ *the GCF is 3, therefore:* $3(2x-5)$

5. Write the new binomials without the GCF included.

   $6x^2 - 17x + 5$ *factors into:* $(3x-1)(2x-5)$, *multiply to make sure! It works!*

Factoring by Grouping

$6x^2 - 17x + 5$

1. Take the *a* and *c* value and multiply them together. Write the new trinomial with your new "*c*" value and leave off the *a* value.

   $6 \times 5 = 30$, *thus the new trinomial is:* $x^2 - 17x + 30$

2. Factor the trinomial the way you factor any trinomial by finding the factors of the *c* value that when added together make the *b* value. Make sure you watch for sign changes.

   The factors of 30: 1 & 30, 2 & 15, 3 & 10, 5 & 6 and they both have to be negative since a negative times a negative is positive, therefore I only have to add the factors together to make 17, thus they are 2 & 15. Therefore it should look like this: $(x-2)(x-15)$

3. Now write original expression as:

   $6x^2 - 15x - 2x + 5$

4. Group the first two terms together and factor; group the last two terms together and factor:

   $(6x^2 - 15x)(-2x + 5)$
   $3x(2x-5) - 1(2x-5)$

5. Since the $(2x-5)$ was distributed to the $3x$ and -1, it can be rewritten as:

   $(3x-1)(2x-5)$

Now you try by going back over any of the previous problems and apply a method that you like.

9:6

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AU7: HW # 6 – Factoring Quadratics ($a \neq 1$) Date: _____

Factor the following:

1. $3x^2 + 2x - 5$

2. $10a^2 - 9a + 2$

3. $r^2 - 3rs - 10s^2$

4. $2x^2 + 5x + 2$

5. $16x^2 + 8x + 1$

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

7. $18y^2 - 23y - 6$

8. $24z^2 + 2z - 15$

9. $81y^2 - 144$

10. $x^8 - 4y^2$

Spiral: Write equivalent expressions by factoring.

11. $x^2 - 7x - 18$

12. $3x^2 - 6x$

13. $40a^8 - 16a^4 + 8a^2$

14. $x^2 - 16x + 64$

Name _____ Class _____ Date _____

Reteaching 9-6

Factoring Trinomials of the Type $ax^2 + bx + c$

OBJECTIVE: Factoring trinomials of the type $ax^2 + bx + c$; $a > 1$

MATERIALS: None

A table can be helpful when factoring trinomials of the type $ax^2 + bx + c$.

Examples

Factor $2x^2 + 13x + 20$.

Write the first term in the top left box of the table. → $2x^2$

Write the constant term in the bottom right box of the table. → 20

Find the product ac. → Since $a = 2$ and $c = 20$, $ac = 40$.

Find two numbers whose product is ac and sum is b. → Since $ac = 40$ and $b = 13$, the numbers are 8 and 5.

These numbers are the coefficients of the x terms that are written in the remaining boxes of the table.

$2x^2$	$8x$
$5x$	20

(Note: Try repeating these steps, exchanging the locations of $5x$ and $8x$.)

Now, find the greatest common factors of the terms in each row and column. Write these above and to the left of the table.

	x	4
$2x$	$2x^2$	$8x$
5	$5x$	20

Read across the top of the table to find one factor. → $x + 4$

Read down the left of the table to find the other factor. → $2x + 5$

So, $2x^2 + 13x + 20 = (x + 4)(2x + 5)$.

You can check your answer using FOIL.

Factor $3x^2 - 2x - 8$.

$ac = 3(-8) = -24$

$b = -2$

The numbers whose product is -24 and sum is -2 are -6 and 4. Write $-6x$ and $4x$ in the table and find the GCFs of each row and column.

	$3x$	4
x	$3x^2$	$4x$
-2	$-6x$	-8

$3x^2 - 2x - 8 = (3x + 4)(x - 2)$.

Exercises

Factor each expression.

1. $2x^2 + 11x + 14$
2. $4x^2 - 12x + 5$
3. $6x^2 - 13x + 2$
4. $6x^2 + 7x - 20$
5. $3x^2 + 4x - 4$
6. $8x^2 - 13x - 6$
7. $2x^2 - 5x + 3$
8. $5x^2 - 26x - 24$
9. $6x^2 - 7x - 3$
10. $6x^2 + 7x - 3$

Name _____ Class _____ Date _____

Practice 9-6

Factoring Trinomials of the Type $ax^2 + bx + c$

Factor each expression.

1. $2x^2 + 3x + 1$
2. $2x^2 + 5x + 3$
3. $2n^2 + n - 6$
4. $3x^2 - x - 4$
5. $2y^2 - 9y - 5$
6. $5x^2 - 2x - 7$
7. $7n^2 + 9n + 2$
8. $3c^2 - 17c - 6$
9. $3x^2 + 8x + 4$
10. $6x^2 - 7x - 10$
11. $3x^2 - 10x + 8$
12. $3y^2 - 16y - 12$
13. $5x^2 + 2x - 3$
14. $3x^2 + 7x + 2$
15. $7x^2 - 10x + 3$
16. $3x^2 + 8x + 5$
17. $2x^2 + 9x + 4$
18. $5x^2 - 7x + 2$
19. $5x^2 - 22x + 8$
20. $4x^2 + 17x - 15$
21. $5x^2 - 33x - 14$
22. $3x^2 - 2x - 8$
23. $3y^2 + 7y - 6$
24. $2x^2 + 13x - 24$
25. $4y^2 - 11y - 3$
26. $2y^2 + 9y + 7$
27. $5y^2 - 3y - 2$
28. $7y^2 + 19y + 10$
29. $7x^2 - 30x + 8$
30. $3x^2 + 17x + 10$
31. $2x^2 + 5x - 3$
32. $2x^2 - 5x + 3$
33. $3x^2 + 10x + 3$
34. $2x^2 - x - 21$
35. $5x^2 - 11x + 2$
36. $4x^2 + 4x - 15$
37. $6x^2 - 19x + 15$
38. $2x^2 - x - 15$
39. $3x^2 - 7x - 6$
40. $2x^2 - 5x - 12$
41. $6x^2 - 7x - 5$
42. $4x^2 + 7x + 3$
43. $12y^2 - 7y + 1$
44. $6y^2 - 5y + 1$
45. $6x^2 - 11x + 4$
46. $12x^2 + 19x + 5$
47. $7y^2 + 47y - 14$
48. $11x^2 - 54x - 5$
49. $15x^2 - 19x + 6$
50. $8x^2 - 30x + 25$
51. $14y^2 + 15y - 9$
52. $22x^2 + 51x - 10$
53. $14x^2 - 41x + 15$
54. $8y^2 + 17y + 9$
55. $8x^2 + 65x + 8$
56. $20x^2 + 37x + 15$
57. $24y^2 + 41y + 12$
58. $18x^2 - 27x + 4$
59. $10x^2 + 3x - 4$
60. $10y^2 - 29y + 10$

Name _____ Class _____ Date _____

Reteaching 9-7

Factoring Special Cases

OBJECTIVE: Factoring the difference of two squares

MATERIALS: None

- The difference of two squares is written $a^2 - b^2$. Note that both terms must be perfect squares.
- The **factors** of the difference of two squares, $a^2 - b^2$ are $(a + b)$ and $(a - b)$. Once you have determined that the binomial you want to factor is the difference of two squares, you can factor by using the formula $a^2 - b^2 = (a + b)(a - b)$.

Examples

Factor $a^2 - 16$.

$a^2 - 16$	← **Both terms are perfect squares.**
$a^2 - 4^2$	← **Rewrite 16 as 4^2.**
$a^2 - b^2 = (a + b)(a - b)$	← **Write the formula.**
$a^2 - 4^2 = (a + 4)(a - 4)$	← **Replace b with 4.**
$(a + 4)(a - 4)$	← **Solution**

Factor $3a^2 - 75$.

$3a^2 - 75$	← **Both terms are *not* perfect squares.**
$3(a^2 - 25)$	← **Both $3a^2$ and 75 are divisible by 3. Factor out 3.**
$3(a^2 - 5^2)$	← **25 is a perfect square. Rewrite 25 as 5^2.**
$a^2 - b^2 = (a + b)(a - b)$	← **Write the formula.**
$3(a^2 - 5^2) = 3(a + 5)(a - 5)$	← **Replace b with 5.**
$3(a + 5)(a - 5)$	← **Solution**

Exercises

Factor each expression.

1. $a^2 - 36$
2. $x^2 - 64$
3. $y^2 - 49$
4. $4x^2 - 25$
5. $9y^2 - 16$
6. $25x^2 - 64$
7. $3x^2 - 12$
8. $2x^2 - 18$
9. $4x^2 - 16$
10. $x^2 - 225$
11. $x^2 - 144$
12. $16x^2 - 49$
13. $6x^2 - 54$
14. $7x^2 - 112$
15. $5x^2 - 125$

Name _____ Class _____ Date _____

Practice 9-7

Factoring Special Cases

Factor each expression.

1. $x^2 - 9$
2. $4m^2 - 1$
3. $a^2 + 2a + 1$
4. $4x^2 + 12x + 9$
5. $x^2 - 22x + 121$
6. $n^2 - 4$
7. $9x^2 - 4$
8. $16c^2 - 49$
9. $9x^2 - 30x + 25$
10. $4x^2 - 20x + 25$
11. $2a^2 - 18$
12. $x^2 - 24x + 144$
13. $3n^2 - 3$
14. $9h^2 + 60h + 100$
15. $9d^2 - 49$
16. $81a^2 - 400$
17. $r^2 - 36$
18. $3a^2 - 48$
19. $b^2 + 4b + 4$
20. $10x^2 - 90$
21. $25x^2 - 64$
22. $12w^2 - 27$
23. $g^3 - 25g$
24. $x^2 + 6x + 9$
25. $a^2 - 25$
26. $36s^2 - 225$
27. $4b^2 + 44b + 121$
28. $x^2 - 16x + 64$
29. $x^2 - 2x + 1$
30. $d^2 - 49$
31. $x^3 - 36x$
32. $9y^2 - 289$
33. $x^2 - 30x + 225$
34. $100a^2 - 9$
35. $2x^2 + 4x + 2$
36. $5n^3 - 20n$
37. $9n^2 + 12n + 4$
38. $d^2 - 169$
39. $4a^2 - 81$
40. $x^2 - 121$
41. $5x^2 + 40x + 80$
42. $16n^2 + 56n + 49$
43. $3n^2 - 30n + 75$
44. $a^2 + 26a + 169$
45. $25x^2 - 144$
46. $9d^2 - 64$
47. $n^2 - 28n + 196$
48. $49a^2 - 14a + 1$
49. $y^2 + 8y + 16$
50. $y^2 - 400$
51. $x^2 - 10x + 25$
52. $4x^2 - 60x + 225$
53. $3x^2 - 363$
54. $y^2 - 81$
55. $a^2 - 100$
56. $256a^2 - 1$
57. $n^2 + 34n + 289$
58. $2d^3 - 50d$
59. $y^2 + 22y + 121$
60. $144x^2 - 25$
61. $4x^2 - 169$
62. $x^2 - 12x + 36$
63. $64r^2 + 80r + 25$
64. $50m^3 - 32m$
65. $b^2 - 225$
66. $x^2 - 18x + 81$
67. $b^2 - 64$
68. $16x^2 - 72x + 81$
69. $b^2 - 256$
70. $x^2 + 24x + 144$
71. $225x^2 - 16$
72. $2x^3 + 40x^2 + 200x$
73. $4r^2 - 25$
74. $16x^2 + 8x + 1$
75. $b^2 - 14b + 49$
76. $x^2 + 30x + 225$
77. $m^2 - 28m + 196$
78. $9r^2 - 256$
79. $b^2 + 20b + 100$
80. $m^2 - 16$
81. $4x^2 - 32x + 64$
82. $x^2 - 196$
83. $8x^3 - 32x$
84. $25x^2 - 30x + 9$
85. $8m^2 - 16m + 8$
86. $9x^2 - 400$
87. $m^2 - 144$