LESSON 5.4

Factoring Trinomials

You will need:

the Lab Gear 

LAB GEAR RECTANGLES

1. **Exploration**

a. Use the Lab Gear to make as many different rectangles as you can with one x^2-block, ten x-blocks, and any number of yellow blocks. For each one, write a multiplication equation to show that *area = length times width.* Look for patterns.

b. Use the Lab Gear to make as many different rectangles as you can with one x^2-block, 18 yellow blocks, and any number of x-blocks. For each one, write a multiplication equation to show that *area = length times width.* Look for patterns.

2. Use the Lab Gear to help you find the other side of the rectangle having the given area. Look for patterns. One is impossible.

	Side	Area
a.	$x + 4$	$x^2 + 9x + 20$
b.	$x + 3$	$x^2 + 4x + 3$
c.	$x + 6$	$x^2 + 6x + 8$
d.	$x + 1$	$x^2 + 3x + 2$
e.	$x + 4$	$x^2 + 7x + 12$

FACTORS AND PRODUCTS

Definition: To *factor* means to write as a product.

For example, two ways of factoring 12 are to write it as $6 \cdot 2$ or as $4 \cdot 3$. Some polynomials can be factored. With the Lab Gear we model this by making a rectangle or a box.

3. By making a Lab Gear rectangle and writing a related multiplication equation, show that $5y + y^2$ can be written as the product of a monomial and a binomial.

You have factored the polynomial $5y + y^2$.

4. By making a rectangle with the Lab Gear and writing a related multiplication equation, show that the trinomial $x^2 + 3x + 2$ can be written as a product of two binomials.

As this problem showed, some trinomials of the form $x^2 + bx + c$ can be factored.

5. Factor each trinomial into the product of two binomials. It may help to use the Lab Gear to make rectangles.

a. $x^2 + 8x + 7$

b. $x^2 + 8x + 12$

c. $x^2 + 8x + 15$

6. Are there any more trinomials of the form $x^2 + 8x +$ ___ that can be factored into two binomials? If so, write and factor them. If not, explain.

7. Factor each trinomial into the product of two binomials. It may help to use the Lab Gear to make rectangles.

a. $x^2 + 13x + 12$

b. $x^2 + 8x + 12$

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

8. Are there any more trinomials of the form $x^2 +$ ___$x + 12$ that can be factored into two binomials? If so, write and factor them. If not, explain.

THE THIRD DEGREE

9. Factor these third-degree polynomials into a product of three first-degree polynomials. Making a box with the Lab Gear may help.

a. $x^2y + 5xy + 6y$

b. $x^3 + 5x^2 + 6x$

c. $y^3 + 5y^2 + 6y$

d. $xy^2 + 5xy + 6x$

10. Describe a strategy to factor the polynomials above without the Lab Gear.

11. Factor, using the Lab Gear if you need to, $x^2y + x^2 + 5xy + 5x + 6y + 6$.

PLUS AND MINUS

12. a. Use the corner piece and the Lab Gear to show the multiplication

$$(y + 4)(y + 3).$$

Write the product.

b. How many blocks of each type were needed to show the product?

13. a. Use the corner piece and the Lab Gear to show the multiplication

$$(y - 4)(y + 3).$$

Write the product.

b. Compare the number of blocks of each type used to show this product with the number of blocks used in problem 12.

14. Write another multiplication that requires one y^2-block, seven y-blocks, and twelve 1-blocks to show the product. Model it with the blocks and write the product. Compare work with your classmates. Is there more than one possibility?

MISSING TERMS

Supply the missing terms. Then compare your answers with your classmates' answers.

15. $x^2 + 15x + \_\_ = (x + \_\_)(x + \_\_)$

16. $x^2 - 7x + \_\_ = (x - \_\_)(x - \_\_)$

17. $x^2 + \_\_\_x + 15 = (x + \_\_)(x + \_\_)$

18. $x^2 - \_\_\_x + 7 = (x - \_\_)(x - \_\_)$

19. Which problems, 15-18, have more than one answer? Explain.

FACTORING BY TRIAL AND ERROR

20. If possible, factor each trinomial into a product of binomials. Try to do it without using the Lab Gear.

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

b. $a^2 + 11a + 30$

c. $m^2 + 20m + 100$

d. $p^2 + 2p + 1$

21. Factor.

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

b. $x^2 - 13x + 12$

c. $x^2 - 8x + 15$

d. $x^2 - 9$

22. Factor.

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

c. $6x^2 + x - 1$

d. $6x^2 - x - 1$

23. Factor.

a. $x^4 - 8x^2 + 15$

b. $x^4 - 8x^2 + 16$

WHAT'S YOUR PROBLEM?

24. Make up six trinomials of the form $x^2 + bx + c$. Four should be factorable, and two should be impossible to factor. Exchange with another student, and try to factor each other's trinomials.