NAME DATE SECTION **6-3**

Finding the Missing Factor

Finding the missing factor of a monomial or a polynomial requires division. Here are two examples:

$6a = \_\_\_\_(2a)$ Divide: $\frac{6a}{2a}$. The quotient is 3.

$3ab + 6a + 12a^2 = \_\_\_\_(b + 2 + 4a)$ Divide term by term: $\frac{3ab}{b}$, $\frac{6a}{2}$, and $\frac{12a^2}{2a}$

Since all quotients equal 3a, 3a is the missing factor (provided that a or b do not equal 0). To check your answer, simplify $3a(b + 2 + 4a)$.

Directions: Find the missing factor of each expression below. Write the factor in the blank in the term. Then find your answer in the Answer Bank and write its corresponding letter in the blank before the problem. When you have finished, write the letters in order, starting with the first problem, to complete the statement at the end of the activity.

1. ____ $98a = \_\_\_\_\_(7a)$
2. ____ $15a = \_\_\_\_\_(5)$
3. ____ $12a^2 = \_\_\_\_\_(6a)$
4. ____ $3a^2b = \_\_\_\_\_(a)$
5. ____ $18ab = \_\_\_\_\_(9a)$
6. ____ $27a^2b^2 = \_\_\_\_\_(3ab)$
7. ____ $6a + 6b = \_\_\_\_\_(a + b)$
8. ____ $21a + 28 = \_\_\_\_\_(3a + 4)$
9. ____ $42a + 54b = \_\_\_\_\_(7a + 9b)$
10. ____ $12a + 3a^2 = \_\_\_\_\_(4 + a)$
11. ____ $15a^2 + 12a + 30 = \_\_\_\_\_(5a^2 + 4a + 10)$
12. ____ $2b^2 - 2b = \_\_\_\_\_(b - 1)$

Finding the Missing Factor

13. _____ $12a^2b + 18a^2b + 6a =$ _____ $(2ab + 3ab + 1)$

14. _____ $3a^3b^2 - 3a^2b^3 + 3ab^4 =$ _____ $(a^2 - ab + b^2)$

15. _____ $a^3b + 2a^2b^2 + 4ab^3 =$ _____ $(a^2 + 2ab + 4b^2)$

16. _____ $-10ab + 4ab^3 + 14b^4 =$ _____ $(-5a + 2ab^2 + 7b^3)$

17. _____ $a^2b^7 - 2a^2b^6 + a^5b^3 =$ _____ $(b^4 - 2b^3 + a^3)$

18. _____ $-7a + 49a^2 - 14 =$ _____ $(-a + 7a^2 - 2)$

19. _____ $15a^2 - 27a =$ _____ $(5a - 9)$

20. _____ $12a^3 + 30a^2 - 12a =$ _____ $(2a^2 + 5a - 2)$

Answer Bank

A. $3a$	O. $2b$	S. 6	L. $6a$	M. a^2b^3	F. 14	I. 7
Y. $3ab^2$	P. 3	C. $2a$	T. $3ab$	R. $9ab$	N. ab	

You can check your answers for this activity by multiplying each factor.

If one of the ____ ____ ____ ____ ____ ____ ____ ____ ____ ____, you must use the Distributive Property.

NAME DATE SECTION **6-4**

Factoring the Difference of Squares

A *perfect square* or a *square number* is a number or term that has two factors that are the same. An example of a square number is 1, whose factors are $1 \cdot 1$. Another example is 4, whose factors are $2 \cdot 2$. Still other examples are 9, 16, 25, 36, and so on.

Some monomials are also perfect squares. An example is x^2, whose factors are $x \cdot x$. Another example is x^{10}, whose factors are $x^5 \cdot x^5$, and yet another is $49x^8$, whose factors are $7x^4 \cdot 7x^4$.

The difference of two square numbers can always be factored using the formula $(a^2 - b^2) = (a - b)(a + b)$. This formula only applies to square numbers, and you can always check your answer by multiplying the binomials.

Directions: State whether or not each binomial can be factored. If it can be factored, factor it. If it cannot be factored, write "cannot be factored." Hint: The total number of binomials that cannot be factored can be expressed as the difference of two square numbers.

1. $x^2 - 36 =$ _____
2. $x^2 - 64 =$ _____
3. $x^2 - 1 =$ _____
4. $x^2 + 16 =$ _____
5. $4x^2 - 121 =$ _____
6. $2x^2 - 25 =$ _____
7. $x^4 - 4 =$ _____
8. $16x^2 - 49 =$ _____
9. $x^2y^2 - 9 =$ _____
10. $x^3 - 144 =$ _____
11. $25x^2y^2 - 36 =$ _____
12. $10x^4 - 81 =$ _____
13. $x^6y^4 - 169 =$ _____
14. $x^6y^8 - 100 =$ _____
15. $8x^4y^2 - 25 =$ _____

NAME DATE SECTION **6-6**

Factoring Trinomials I

Factoring trinomials is a skill that is often used to solve equations. It is easy to factor trinomials if you can determine factors of numbers and find sums or differences. To check that the factors you use are correct, simply multiply the binomials.

For example, $x^2 - 2x - 15$ can be factored as $(x - 5)(x + 3)$, because the factors of -15 whose sum equal -2 are -5 and 3.

Here is another example. $x^2 - 7x + 12$ can be factored as $(x - 4)(x - 3)$, because the factors of 12 whose sum equal -7 are -3 and -4.

Directions: Factor each trinomial and write your answer in the space provided. You will likely be correct if each factor is used twice. Check your answers.

1. $x^2 + 5x + 6 =$ _____
2. $x^2 - 6x - 7 =$ _____
3. $x^2 - 12x + 32 =$ _____
4. $x^2 - 4x + 4 =$ _____
5. $x^2 - 9x + 8 =$ _____
6. $x^2 + x - 20 =$ _____
7. $x^2 - x - 30 =$ _____
8. $x^2 - 16x + 60 =$ _____
9. $x^2 - 3x - 28 =$ _____
10. $x^2 - 2x - 15 =$ _____
11. $x^2 + 3x + 2 =$ _____
12. $x^2 - 15x + 36 =$ _____
13. $x^2 - 6x + 5 =$ _____
14. $x^2 - 12x + 27 =$ _____
15. $x^2 - 6x - 40 =$ _____
16. $x^2 - 21x + 108 =$ _____

NAME DATE SECTION **6-7**

Factoring Trinomials II

To factor trinomials you must find factors and their sums and differences. If the leading coefficient of a trinomial is a number other than 1, find the factors of the coefficient and the third term. Then examine combinations of the factors to find the sum that is the same as the second term.

For example, to factor $2x^2 - 11x - 12$, first find the factors of 2, then find the factors of -12. Combine these factors so that their products and sums equal -11. $(2 \times -4) + (-3 \times 1) = -11$. Therefore $2x^2 - 11x - 12$ can be factored as $(2x - 3)(x - 4)$. Check this by multiplying the binomials.

Directions: Factor each trinomial. Hint: One factor of each polynomial is a factor of the polynomial in the next problem. Always check your work.

1. $3x^2 - 11x - 4 =$ _____
2. $6x^2 - x - 1 =$ _____
3. $2x^2 + 13x - 7 =$ _____
4. $x^2 - x - 56 =$ _____
5. $x^2 - 5x - 24 =$ _____
6. $4x^2 + 11x - 3 =$ _____
7. $2x^2 + 11x + 15 =$ _____
8. $6x^2 + 11x - 10 =$ _____
9. $12x^2 + x - 6 =$ _____
10. $4x^2 + 15x + 9 =$ _____
11. $x^2 + 12x + 27 =$ _____
12. $5x^2 + 52x + 63 =$ _____
13. $10x^2 - x - 21 =$ _____
14. $12x^2 - 28x + 15 =$ _____
15. $18x^2 - 3x - 10 =$ _____

NAME DATE SECTION **6-8**

Factoring Binomials and Trinomials

Use the following steps when factoring binomials and trinomials:

1. Find the greatest common factor or the greatest monomial factor (if there is one).
2. Write the expression as the product of the factor and a polynomial.
3. Factor the polynomial, if possible.
4. Always check by multiplying.

Directions: Factor each polynomial and write the factors in the space after the polynomial. Find each pair of factors in the Answer Bank on the next page, and write the letters of the factors in the spaces provided before the problem. When you have finished, write the letters, starting with the first problem, in the spaces at the end of the activity to complete a message. Hint: It may be necessary to switch the order of the two letters in each problem to complete the message.

1. ____ ____ $x^2 - x - 6 =$ _____
2. ____ ____ $x^2 - 9x + 20 =$ _____
3. ____ ____ $x^2 + 9x + 14 =$ _____
4. ____ ____ $x^2 - 9x + 8 =$ _____
5. ____ ____ $3x^2 + 16x + 16 =$ _____
6. ____ ____ $x^2 - 13x + 40 =$ _____
7. ____ ____ $x^2 - 6x + 8 =$ _____
8. ____ ____ $x^2 + 2x - 3 =$ _____
9. ____ ____ $x^2 - x - 2 =$ _____
10. ____ ____ $x^2 + 8x + 16 =$ _____
11. ____ ____ $2x^3 - 16x^2 =$ _____
12. ____ ____ $4x + 28 =$ _____
13. ____ ____ $2x^2 - x - 6 =$ _____
14. ____ ____ $2x^3 + 2x^2 =$ _____
15. ____ ____ $x^2 - 11x + 24 =$ _____
16. ____ ____ $6x^2 + 42x =$ _____

NAME DATE SECTION

6-8 (continued)

Factoring Binomials and Trinomials

Answer Bank			
N. $(x + 4)$	O. $(x - 8)$	E. $(x + 7)$	C. $(x + 1)$
P. $(x + 2)$	S. $(x + 3)$	I. $(x - 4)$	M. $(x - 5)$
L. $(x - 1)$	B. 4	R. $(x - 3)$	F. $(2x + 3)$
T. $2x^2$	D. $6x$	Y. $(3x + 4)$	A. $(x - 2)$

___ ___ ___ ___ ___

___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

___ ___ ___ ___ ___ ___ ___ ___

___ ___ ___ ___ ___ ___ ___ ___ ___.