Tips to Keep in Mind While Factoring

1. When factoring polynomials, always look for the greatest common factor first. Then, if there is one, remember to include this common factor as part of the answer.
2. **To factor completely** means to find factors of the polynomial such that none of the factors are themselves factorable.
3. Not all polynomials are factorable. Any polynomial that cannot be factored as the product of polynomials with integer coefficients is not factorable.
4. Factoring can be checked by multiplying the factors. The product should be the original expression.

4. Completely factor each trinomial. Be sure to begin by looking for the greatest common factor.

a. $5x^2-32x-21$

b. $24x^2+87x-36$

Note

No matter which method you use (the *ac*-method or the trial-and-error method), factoring trinomials takes time. With practice, you will become more efficient with either method. Make sure to be patient and observant.

Completion Example 4 Factoring Trinomials

Completely factor each trinomial. Be sure to begin by looking for the greatest common factor.

a. $15x^2+38x+7$ **b.** $4y^2+6y-108$

Solution

a. $15x^2+38x+7=(5x+\_\_\_\_\_)(3x+\_\_\_\_\_)$

b. $4y^2+6y-108=2(\_\_\_\_\_\,y^2+\_\_\_\_\_\,y-\_\_\_\_\_)$

$=2(2y-\_\_\_\_\_)(y+\_\_\_\_\_)$

Now work margin exercise 4.

Completion Example Answers

4. a. $(5x+1)(3x+7)$ **b.** $2(2y^2+3y-54)=2(2y-9)(y+6)$

Margin Exercise Answers

1. $(3a+2)(a+4)$ **2.** $3(b-2)(4b+5)$ **3.** $(7x-2)(x+3)$ **4. a.** $(5x+3)(x-7)$ **b.** $3(x+4)(8x-3)$

8.4 Exercises

Concept Check

Fill-in-the-Blank. Complete each sentence using information found in this section.

1. When using the *ac*-method of factoring, you need to find two integers whose _____ is *ac* and whose _____ is *b*.
2. The *ac*-method of factoring uses the _____ method.

True/False. Determine whether each statement is true or false. If a statement is false, explain how it can be changed so the statement will be true. (**Note:** There may be more than one acceptable change.)

3. A trinomial is factorable if the middle term is the difference of the inner and outer products of two binomials.

4. If it is not possible to find a product of two integers a and c whose sum is b, then the trinomial $ax^2 + bx + c$ is not factorable.

5. The first step in the ac-method of factoring is to rewrite the middle term.

Practice

Completely factor each polynomial. If a polynomial cannot be factored, write "not factorable."

1. $3x^2 + 7x - 6$

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

3. $4x^2 + 2x - 12$

4. $9x^2 - 3x - 12$

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

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

7. $6x^2 + 13x + 6$

8. $10x^2 + 9x + 2$

9. $-2x^2 - 11x - 5$

10. $-12x^2 - 25x - 12$

11. $50x^2 + 15x - 2$

12. $44x^2 + 3x - 2$

13. $15x^2 - 8x + 1$

14. $18x^2 - 15x + 2$

15. $8a^2b - 22ab + 12b$

16. $12m^3n - 50m^2n + 8mn$

17. $16x^2 - 8x + 1$

18. $3x^2 - 11x - 4$

19. $64x^2 - 48x + 9$

20. $9x^2 - 12x + 4$

21. $6x^2 + 2x - 20$

22. $12y^2 - 15y + 3$

23. $10x^2 + 35x + 30$

24. $24y^2 + 4y - 4$

25. $-18x^2 + 72x - 8$

26. $7x^4 - 5x^3 + 3x^2$

27. $-45y^2 + 30y + 120$

28. $-12m^2 + 22m + 4$

29. $12x^2 - 60x + 75$

30. $32y^2 + 50$

31. $6x^3 + 9x^2 - 6x$

32. $-5y^2 + 40y - 60$

33. $12x^3 - 108x^2 + 243x$

34. $30a^3 + 51a^2 + 9a$

35. $9x^3y^3 + 9x^2y^3 + 9xy^3$

36. $48x^2y - 354xy + 126y$

37. $48xy^3 - 100xy^2 + 48xy$

38. $24a^2x^2 + 72a^2x + 243x$

39. $21y^4 - 98y^3 + 56y^2$

40. $72a^3 - 306a^2 + 189a$

Writing & Thinking

41. The volume of an open box is found by cutting equal squares (x inches on a side) from a sheet of cardboard that is 5 inches by 25 inches. The function representing this volume is $V(x) = 4x^3 - 60x^2 + 125x$, where $0 < x < 2.5$. Factor this function and use the factors to explain, in your own words, how the function represents the volume.

(**Note:** Volume of a box = length × width × height.)