To see the advantage of rearranging terms, multiply the polynomials in Example 2 as they are given. Then compare your work with the solution of Example 2.

Example 2 Multiply: $(y + 2x)(x^3 - 2y^3 + 3xy^2 + x^2y)$

Solution

$$\begin{array}{r} x^3 - 2y^3 + 3xy^2 + x^2y \\ \underline{y + 2x} \end{array}$$

Rearrange in order of decreasing degree of x.

$$\begin{array}{r} x^3 + x^2y + 3xy^2 - 2y^3 \\ \underline{2x + y} \\ 2x^4 + 2x^3y + 6x^2y^2 - 4xy^3 \\ \underline{\quad x^3y + x^2y^2 + 3xy^3 - 2y^4} \\ 2x^4 + 3x^3y + 7x^2y^2 - xy^3 - 2y^4 \end{array}$$

Oral Exercises

Arrange in order of decreasing degree in the variable printed in color.

1. $5 + 2x^2 - 3x$, x
2. $3n - 4n^2 + n^3 - 3$, n
3. $a^2b - 2ab^2 + a^3 + 3b^3$, a
4. $xy^2 - 3x^2y + 2x^3y - 2y$, x

5–8. Repeat Exercises 1–4 after replacing "decreasing" by "increasing."

Complete.

9. $(2x + 3)(4x + 1) = (\_?\_)4x + (\_?\_)1$
10. $(t - 5)(2t - 3) = (\_?\_)2t - (\_?\_)3$
11. $(a^2 + 2a + 3)(a - 2) = (\_?\_)a - (\_?\_)2$
12. $(y^2 - y + 6)(2y + 3) = (\_?\_)2y + (\_?\_)3$
13. $(x + 2)(x + 3) = (x + 2)x + (x + 2)3 = (\_?\_)x^2 + (\_?\_)x + (\_?\_)$
14. $(x - 3)(x + 5) = (x - 3)x + (x - 3)5 = (\_?\_)x^2 + (\_?\_)x - (\_?\_)$

Written Exercises

Multiply. Use the vertical form.

A

1. $\begin{array}{r} 3x - 5 \\ \underline{2x + 1} \end{array}$
2. $\begin{array}{r} 5t - 1 \\ \underline{2t - 3} \end{array}$
3. $\begin{array}{r} a^2 - 3a + 4 \\ \underline{2a + 3} \end{array}$
4. $\begin{array}{r} r^2 + 2r - 5 \\ \underline{3r - 2} \end{array}$
5. $\begin{array}{r} 3x - 2y \\ \underline{2x + 5y} \end{array}$
6. $\begin{array}{r} 2a - 5b \\ \underline{a - 3b} \end{array}$
7. $\begin{array}{r} c^2 + 2cd - 3d^2 \\ \underline{c - 2d} \end{array}$
8. $\begin{array}{r} 2x^2 - 3xy - y^2 \\ \underline{2x + y} \end{array}$

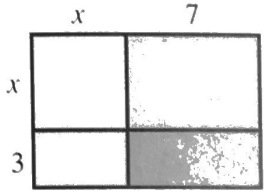
Multiply. Use the horizontal form.

9. $(y + 3)(y + 2)$
10. $(n + 7)(n + 5)$
11. $(a + 4)(a - 1)$
12. $(r - 3)(r + 6)$
13. $(2x - 1)(x - 5)$
14. $(3a - 2)(a - 3)$
15. $(3z - 2)(2z + 3)$
16. $(5k + 2)(2k - 3)$

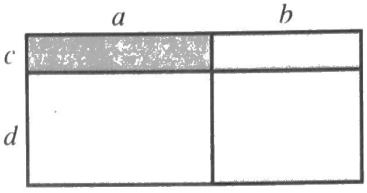
17. $(4s - 5)(4s + 5)$
18. $(3x + 7)(3x - 7)$
19. $(a + 2)(a^2 + 3a + 5)$
20. $(x + 3)(x^2 + 2x + 4)$
21. $(m - 1)(m^2 + 2m + 6)$
22. $(y - 5)(y^2 - 3y - 7)$
23. $(2x - 1)(x^2 - x + 3)$
24. $(3s + 2)(2s^2 - 2s + 1)$
25. $(3z - 2)(3z^2 - z + 4)$
26. $(2n - 5)(2n^2 - 3n - 2)$

In each of the following figures, a rectangle has been divided into four smaller rectangles. (a) Find the sum of the areas of the four smaller rectangles. (b) Find the product of the length and width of the original rectangle. (c) Compare your answers to parts (a) and (b).

27.



28.



Multiply using either the horizontal or vertical form. Arrange the terms in each factor in order of decreasing or increasing degree of one of the variables.

B
29. $(2 + y)(y^2 - 2y + 3)$
30. $(5 + x)(x^2 - 5x + 4)$
31. $(2y - 3)(2y - 4 + y^2)$
32. $(3y - 4)(y - 2y^2 + 6)$
33. $(2 - 3x)(x^2 - 2x + 5)$
34. $(1 - 2a)(a^2 - 4 + 3a)$
35. $(2r - s)(s^2 + 4r^2 - 4rs)$
36. $(y - 2x)(2x^2 + y^2 - 3xy)$

Solve.

Sample $(x + 4)(x + 3) = (x + 1)(x + 5)$

Solution

$$\begin{aligned} x^2 + 7x + 12 &= x^2 + 6x + 5 \\ 7x + 12 &= 6x + 5 && \{\text{Subtract } x^2 \text{ from both sides.} \\ x + 12 &= 5 && \{\text{Subtract } 6x \text{ from both sides.} \\ x &= -7 && \{\text{Subtract 12 from both sides.} \end{aligned}$$

$\therefore$ the solution set is $\{-7\}$. ***Answer***

37. $(x + 2)(x - 5) = (x - 1)(x - 3)$
38. $(x - 3)(x + 7) - (x + 1)(x + 5) = 0$
39. $(2x - 5)(x - 4) + 2x(1 - x) = 0$
40. $(3x + 5)(2x - 3) = (x - 1)(6x + 5)$
41. $(x - 3)(x^2 - 2x + 6) = x(x^2 - 5x + 9)$
42. $(2n - 3)(n^2 + 3n - 2) = (n - 1)(2n^2 + 5n - 4)$

Express as a polynomial.

43. The square of $x^2 - 3x + 5$
44. The square of $n^2 + 2n - 1$
45. The cube of $x + 5$
46. The cube of $a - 3$
47. Given that $(2 - y)^3 = 8 - 12y + 6y^2 - y^3$, find $(2 - y)^4$.
48. Subtract the product of $2x - y$ and $x - 2y$ from $x^2 + y^2$.