

6-3 MULTIPLICATION OF POLYNOMIALS

(Pages 193-196)

6, 8, 24  
26

Find each product.

Examples: a.  $(-5x^2y)^2(3xy^4)$       b.  $(2x + 5)(x - 6)$

Solutions: a.  $(-3x^2y)^2(3xy^4)$       b.  $(2x + 5)(x - 6)$   
 $(9x^4y^2)(3xy^4)$        $2x(x) + 2x(-6) + 5(x) + 5(-6)$   
 $27x^5y^6$        $2x^2 - 7x - 30$

- |                             |                                     |                          |                                 |
|-----------------------------|-------------------------------------|--------------------------|---------------------------------|
| 1. $(-8ab^3)(5a^2b^3)$      | $\frac{-40a^3b^6}{1}$               | 2. $16x^2y^3(-3xy^7)$    | $\frac{-48x^3y^{10}}{1}$        |
| 3. $(2xy)^3(-4x^2)$         | $\frac{-32x^5y^3}{1}$               | 4. $5a^2b(-3ab)^2$       | $\frac{45a^4b^3}{1}$            |
| 5. $(6hk)^2(-2k^2)^3$       | $\frac{-288h^2k^8}{1}$              | 6. $(x^5y^7)^2(-x^4y)^5$ | $\frac{-x^{30}y^{19}}{1}$       |
| 7. $(-3x^2)(5y^3)(-4xy)$    | $\frac{60x^3y^4}{1}$                | 8. $8xy^4(-x^7)(-2y^4)$  | $\frac{16x^8y^8}{1}$            |
| 9. $-5ab(8a - 3b)$          | $\frac{-40a^2b + 15ab^2}{1}$        | 10. $2x(9x^3 - 7x + 1)$  | $\frac{18x^4 - 14x^2 + 2x}{1}$  |
| 11. $(x - 6)(x - 7)$        | $\frac{x^2 - 13x + 42}{1}$          | 12. $(2x + 1)(x + 6)$    | $\frac{2x^2 + 13x + 6}{1}$      |
| 13. $(4y + 1)(4y - 1)$      | $\frac{16y^2 - 1}{1}$               | 14. $(a + 9)(2a - 11)$   | $\frac{2a^2 + 7a - 99}{1}$      |
| 15. $(3c - 2)(5c - 4)$      | $\frac{15c^2 - 22c + 8}{1}$         | 16. $(2 - 5y)(2 + 5y)$   | $\frac{4 - 25y^2}{1}$           |
| 17. $(2x - y)(3x + 4y)$     | $\frac{6x^2 + 5xy - 4y^2}{1}$       | 18. $(a - 7b)(9a - 2b)$  | $\frac{9a^2 - 65ab + 14b^2}{1}$ |
| 19. $(x - 5)^2$             | $\frac{x^2 - 10x + 25}{1}$          | 20. $(c + d)^2$          | $\frac{c^2 + 2cd + d^2}{1}$     |
| 21. $(4y + 3)^2$            | $\frac{16y^2 + 24y + 9}{1}$         | 22. $(7a - 1)^2$         | $\frac{49a^2 - 14a + 1}{1}$     |
| 23. $3(8x - 1)(8x + 1)$     | $\frac{192x^2 - 3}{1}$              |                          |                                 |
| 24. $2x(x - 7)(2x - 3)$     | $\frac{4x^3 - 34x^2 + 42x}{1}$      |                          |                                 |
| 25. $-7x(a - 6)(4a + 1)$    | $\frac{-28a^2x + 161ax + 42x}{1}$   |                          |                                 |
| 26. $-11(3h - 5k)(h + k)$   | $\frac{-33h^2 + 22hk + 55k^2}{1}$   |                          |                                 |
| 27. $(2x^2 + 7)(3x + 5)$    | $\frac{6x^3 + 10x^2 + 21x + 35}{1}$ |                          |                                 |
| 28. $(y^2 - 9y + 1)(y - 9)$ | $\frac{y^3 - 18y^2 + 82y - 9}{1}$   |                          |                                 |

Factor each polynomial over the integers.

For Exercises 1-6, one factor is written for you.

Examples: a.  $3x^4 - 30x^2$       b.  $4x(x+2) - 7(x+2)$

Solutions: a.  $3x^2(x^2 - 10)$       b.  $(x+2)(4x - 7)$

- |                               |  |                        |                                     |
|-------------------------------|--|------------------------|-------------------------------------|
| 1. $32x^3 - 48x^2$            | $\frac{16x^2(2x-3)}{(1+ab)(1-ab)}$                 | 2. $20a^3b + 5a^2$     | $\frac{5a^2(4ab+1)}{(y+7)(4y^2)}$   |
| 3. $1 - a^2b^2$               |  | 4. $4y^3 + 28y^2$      |                                     |
| 5. $6a^2b + 3ab^2$            | $\frac{3ab(2a+b)}{7(y^2+3y+3)}$                    | 6. $x^4 + 3x^2 + 2$    | $\frac{(x^2+1)(x^2+2)}{8h(2h+1)+1}$ |
| 7. $7y^2 + 21y + 21$          |  | 8. $16h^2 + 8h + 1$    |                                     |
| 9. $9n^2 + 30n + 25$          | $\frac{3n(3n+10)+25}{(4x-3y)(4x+3y)}$              | 10. $k^2 - 81$         | $\frac{(k-9)(k+9)}{(3k-h)(3k+h)}$   |
| 11. $16x^2 - 9y^2$            |  | 12. $9k^2 - h^2$       |                                     |
| 13. $16c^2 + 24c + 9$         | $\frac{4c(4c+6)+9}{a(q+20)+100}$                   | 14. $a^2 + 20a + 100$  |                                     |
| 15. $4x^{10} - 9$             | $\frac{(2x^5-3)(2x^5+3)}{4x(x-y)+y^2}$             | 16. $4x^2 - 4xy + y^2$ |                                     |
| 17. $9h^3k + 6h^2k^2 - 3h^2k$ | $\frac{3h^2k(3h+2k-1)}{(2a+1)(3a-5)}$              |                        |                                     |
| 18. $3a(2a+1) - 5(2a+1)$      |  |                        |                                     |
| 19. $5ab - 20b - 7a + 28$     | $\frac{a(5b-7)+2(-10b+14)}{x(y+5)+6(y+5)}$         |                        |                                     |
| 20. $xy + 6y + 5x + 30$       |  |                        |                                     |
| 21. $1 - 4a^6$                | $\frac{(1-2a^3)(1+2a^3)}{(h^2+7)(a-b)}$            |                        |                                     |
| 22. $a(h^2+7) - b(h^2+7)$     |  |                        |                                     |
| 23. $x^3 + 5x^2 + 4x + 20$    | $\frac{x(x^2+4)+5(x^2+4)}{(12a-5bc^2)(12a+5bc^2)}$ |                        |                                     |
| 24. $144a^2 - 25b^2c^4$       |  |                        |                                     |
| 25. $x^3 - 4x^2 + 2x - 8$     | $\frac{x(x^2+2)+4(x^2-2)}{x(x^2+2)+4+x^2}$         |                        |                                     |

6-5 FACTORING QUADRATIC TRINOMIALS

(Pages 201-203)

Factor each polynomial over the integers.

Examples: a.  $x^2 - 2x - 35$

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

Solutions: a.  $x^2 - 2x - 35$   
 $(x + 5)(x - 7)$

b.  $2x^6 - 7x^3 + 3$   
 $(2x^3 - 1)(x^3 - 3)$

- |   |                                      |                           |                                      |
|---|--------------------------------------|---------------------------|--------------------------------------|
| 1. $y^2 + 8y + 12$                      | <u><math>(y+6)(y+2)</math></u>       | 2. $a^2 - 10a + 21$       | <u><math>(a-7)(a-3)</math></u>       |
| 3. $x^2 + 3x - 18$                      | <u><math>(x+6)(x-3)</math></u>       | 4. $c^2 - 6c - 16$        | <u><math>(c-8)(c+2)</math></u>       |
| 5. $a^2 - 11a + 30$                     | <u><math>(a-5)(a-6)</math></u>       | 6. $x^2 - 10x + 9$        | <u><math>(x-9)(x-1)</math></u>       |
| 7. $2x^2 - 7x + 3$                      | <u><math>(2x-1)(x-3)</math></u>      | 8. $3y^2 + 5y + 2$        | <u><math>(3y+2)(y+1)</math></u>      |
| 9. $5b^2 + 13b + 6$                     | <u><math>(5b+3)(b+2)</math></u>      | 10. $2a^2 + a - 1$        | <u><math>(2a-1)(a+1)</math></u>      |
| 11. $4x^2 + 8x + 3$                     | <u><math>(2x+1)(2x+3)</math></u>     | 12. $3x^2 - 13x + 4$      | <u><math>(3x-1)(x-4)</math></u>      |
| 13. $h^2 + 8h + 15$                     | <u><math>(h+3)(h+5)</math></u>       | 14. $2n^2 + n - 3$        | <u><math>(2n+3)(n-1)</math></u>      |
| 15. $7a^2 + 2a - 5$                     | <u><math>(7a-5)(a+1)</math></u>      | 16. $x^2 - 4x - 21$       | <u><math>(x-7)(x+3)</math></u>       |
| 17. $y^2 - 12y + 27$                    | <u><math>(y-3)(y-9)</math></u>       | 18. $6x^2 - 5x - 1$       | <u><math>(6x+1)(x-1)</math></u>      |
| 19. $a^2 + 9a - 10$                     | <u><math>(a-1)(a+10)</math></u>      | 20. $x^6 - 3x^3y - 10y^2$ | <u><math>(x^3-5y)(x^3+2y)</math></u> |
| 21. $2h^4 - 9h^2 + 7$                   | <u><math>(2h^2-7)(h^2-1)</math></u>  | 22. $3b^2 + 11b + 10$     | <u><math>(3b+5)(b+2)</math></u>      |
| 23. $n^4 - n^2b - 6b^2$                 | <u><math>(n^2-3b)(n^2+2b)</math></u> | 24. $c^2 - 7cd + 12d^2$   | <u><math>(c-3d)(c-4d)</math></u>     |
| 25. $8x^2 + 18x + 9$                    | <u><math>(4x+3)(2x+3)</math></u>     | 26. $9a^2 + 6a - 8$       | <u><math>(3a-2)(3a+4)</math></u>     |
| 27. $9x^2 - 26x - 3$                    | <u><math>(9x+1)(x-3)</math></u>      | 28. $6a^6 + a^3 - 12$     | <u><math>(2a^3+3)(3a^3-4)</math></u> |
| 29. $15 - 2x - x^2$<br>$-x^2 - 2x + 15$ | <u><math>(x+5)(-x+3)</math></u>      | 30. $6 - 13d + 2d^2$      | <u><math>(d-6)(2d-1)</math></u>      |

Factor each polynomial over the integers.

Examples: a.  $8x^3 - y^3$

b.  $3x^4 - 3x^2 - 36$

Solutions: a.  $8x^3 - y^3$

$(2x)^3 - (y)^3$

$(2x - y)((2x)^2 + (2x)(y) + (y)^2)$

$(2x - y)(4x^2 + 2xy + y^2)$

b.  $3x^4 - 3x^2 - 36$

$3(x^4 - x^2 - 12)$

$3(x^2 + 3)(x^2 - 4)$

$3(x^2 + 3)(x + 2)(x - 2)$

1.  $8 + y^3$   
 $2^3 + y^3$

$(y+2)(y^2-2y+4)$

2.  $1 - 27x^3$

$(1-3x)(1+3x+9x^2)$

3.  $x^3 - 27$

$(x-3)(x^2+3x+9)$

4.  $x^3 - 1000$

$(x-10)(x^2+10x+100)$

5.  $64h^3 - k^3$

$(4h-k)(16h^2+4hk+k^2)$

6.  $n^3 + 1$

$(n+1)(n^2+n+1)$

7.  $1 + 64a^9$

$(4a^3+1)(16a^6-4a^3+1)$

8.  $3x^2y - 48y$

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

9.  $125 - 8a^3$

$(5-2a)(4a^2+10a+25)$

10.  $300 - 75x^2$

$-75(x-2)(x+2)$

11.  $3 - 16x - 12x^2$

$-(2x+3)(6x-1)$

12.  $28x^5 - 63x^3$

$7x^3(2x-3)(2x+3)$

13.  $5a^3 - 20a^2 + 15a$

$5a(a-3)(a-1)$

14.  $-6b^3 - 18b^2 + 60b$

$-6b(b-2)(b+5)$

15.  $-18x^4 - 12x^3 - 2x^2$

$-2x^2(3x+1)^2$

16.  $4a^2x - 48ax + 144x$

$4x(a-6)^2$

17.  $16b^4 - a^4$

$(4b^2 - a^2)(4b^2 + a^2)$

★ 18.  $2x^4 - 16x^2 - 18$

$2(x^4 - 8x^2 - 9)$

$2(x^2-9)(x^2+1)$

19.  $3c^4 + 30c^2 + 72$

$3(c^2+4)(c^2+6)$

20.  $5x^4 + 135x$

$5x(x+3)(x^2-3x+9)$

21.  $16x^2 + 4xy - 6y^2$

$2(2x-y)(4x+3y)$

$5^3 - (2a)^3$   
 $125 - 8a^3$