

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

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|-----------------------------|-------------------------------------|--------------------------|---------------------------------|
| 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. $(x+2)(4x - 7)$

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

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|-----------------------------------------|--------------------------------------|---------------------------|--------------------------------------|
| 1. $y^2 + 8y + 12$ | <u>$(y+6)(y+2)$</u> | 2. $a^2 - 10a + 21$ | <u>$(a-7)(a-3)$</u> |
| 3. $x^2 + 3x - 18$ | <u>$(x+6)(x-3)$</u> | 4. $c^2 - 6c - 16$ | <u>$(c-8)(c+2)$</u> |
| 5. $a^2 - 11a + 30$ | <u>$(a-5)(a-6)$</u> | 6. $x^2 - 10x + 9$ | <u>$(x-9)(x-1)$</u> |
| 7. $2x^2 - 7x + 3$ | <u>$(2x-1)(x-3)$</u> | 8. $3y^2 + 5y + 2$ | <u>$(3y+2)(y+1)$</u> |
| 9. $5b^2 + 13b + 6$ | <u>$(5b+3)(b+2)$</u> | 10. $2a^2 + a - 1$ | <u>$(2a-1)(a+1)$</u> |
| 11. $4x^2 + 8x + 3$ | <u>$(2x+1)(2x+3)$</u> | 12. $3x^2 - 13x + 4$ | <u>$(3x-1)(x-4)$</u> |
| 13. $h^2 + 8h + 15$ | <u>$(h+3)(h+5)$</u> | 14. $2n^2 + n - 3$ | <u>$(2n+3)(n-1)$</u> |
| 15. $7a^2 + 2a - 5$ | <u>$(7a-5)(a+1)$</u> | 16. $x^2 - 4x - 21$ | <u>$(x-7)(x+3)$</u> |
| 17. $y^2 - 12y + 27$ | <u>$(y-3)(y-9)$</u> | 18. $6x^2 - 5x - 1$ | <u>$(6x+1)(x-1)$</u> |
| 19. $a^2 + 9a - 10$ | <u>$(a-1)(a+10)$</u> | 20. $x^6 - 3x^3y - 10y^2$ | <u>$(x^3-5y)(x^3+2y)$</u> |
| 21. $2h^4 - 9h^2 + 7$ | <u>$(2h^2-7)(h^2-1)$</u> | 22. $3b^2 + 11b + 10$ | <u>$(3b+5)(b+2)$</u> |
| 23. $n^4 - n^2b - 6b^2$ | <u>$(n^2-3b)(n^2+2b)$</u> | 24. $c^2 - 7cd + 12d^2$ | <u>$(c-3d)(c-4d)$</u> |
| 25. $8x^2 + 18x + 9$ | <u>$(4x+3)(2x+3)$</u> | 26. $9a^2 + 6a - 8$ | <u>$(3a-2)(3a+4)$</u> |
| 27. $9x^2 - 26x - 3$ | <u>$(9x+1)(x-3)$</u> | 28. $6a^6 + a^3 - 12$ | <u>$(2a^3+3)(3a^3-4)$</u> |
| 29. $15 - 2x - x^2$
$-x^2 - 2x + 15$ | <u>$(x+5)(-x+3)$</u> | 30. $6 - 13d + 2d^2$ | <u>$(d-6)(2d-1)$</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. $3x^4 - 3x^2 - 36$

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

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|--------------------------------------------------|----------------------------|---------------------|-----------------------|
| 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. $16x^2 + 4xy - 6y^2$ | $2(2x-y)(4x+3y)$ | | |

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