



## 5.1 The Greatest Common Factor and Factoring by Grouping

1. Factoring out the greatest common factor:  $15x + 25 = 5(3x + 5)$
3. Factoring out the greatest common factor:  $6a + 9 = 3(2a + 3)$
5. Factoring out the greatest common factor:  $4x - 8y = 4(x - 2y)$
7. Factoring out the greatest common factor:  $3x^2 - 6x - 9 = 3(x^2 - 2x - 3)$
9. Factoring out the greatest common factor:  $3a^2 - 3a - 60 = 3(a^2 - a - 20)$
11. Factoring out the greatest common factor:  $24y^2 - 52y + 24 = 4(6y^2 - 13y + 6)$
13. Factoring out the greatest common factor:  $9x^2 - 8x^3 = x^2(9 - 8x)$
15. Factoring out the greatest common factor:  $13a^2 - 26a^3 = 13a^2(1 - 2a)$
17. Factoring out the greatest common factor:  $21x^2y - 28xy^2 = 7xy(3x - 4y)$
19. Factoring out the greatest common factor:  $22a^2b^2 - 11ab^2 = 11ab^2(2a - 1)$
21. Factoring out the greatest common factor:  $7x^3 + 21x^2 - 28x = 7x(x^2 + 3x - 4)$
23. Factoring out the greatest common factor:  $121y^4 - 11x^4 = 11(11y^4 - x^4)$
25. Factoring out the greatest common factor:  $100x^4 - 50x^3 + 25x^2 = 25x^2(4x^2 - 2x + 1)$
27. Factoring out the greatest common factor:  $8a^2 + 16b^2 + 32c^2 = 8(a^2 + 2b^2 + 4c^2)$
29. Factoring out the greatest common factor:  $4a^2b - 16ab^2 + 32a^2b^2 = 4ab(a - 4b + 8ab)$
31. Factoring out the greatest common factor:  $121a^3b^2 - 22a^2b^3 + 33a^3b^3 = 11a^2b^2(11a - 2b + 3ab)$
33. Factoring out the greatest common factor:  $12x^2y^3 - 72x^5y^3 - 36x^4y^4 = 12x^2y^3(1 - 6x^3 - 3x^2y)$
35. Factoring by grouping:  $xy + 5x + 3y + 15 = x(y + 5) + 3(y + 5) = (y + 5)(x + 3)$
37. Factoring by grouping:  $xy + 6x + 2y + 12 = x(y + 6) + 2(y + 6) = (y + 6)(x + 2)$
39. Factoring by grouping:  $ab + 7a - 3b - 21 = a(b + 7) - 3(b + 7) = (b + 7)(a - 3)$
41. Factoring by grouping:  $ax - bx + ay - by = x(a - b) + y(a - b) = (a - b)(x + y)$
43. Factoring by grouping:  $2ax + 6x - 5a - 15 = 2x(a + 3) - 5(a + 3) = (a + 3)(2x - 5)$
45. Factoring by grouping:  $3xb - 4b - 6x + 8 = b(3x - 4) - 2(3x - 4) = (3x - 4)(b - 2)$
47. Factoring by grouping:  $x^2 + ax + 2x + 2a = x(x + a) + 2(x + a) = (x + a)(x + 2)$
49. Factoring by grouping:  $x^2 - ax - bx + ab = x(x - a) - b(x - a) = (x - a)(x - b)$
51. Factoring by grouping:  
$$ax + ay + bx + by + cx + cy = a(x + y) + b(x + y) + c(x + y) = (x + y)(a + b + c)$$





# Introductory Algebra

## Problem Set 5.1

### Solutions to Every Odd-Numbered Problem

Name \_\_\_\_\_

Date \_\_\_\_\_

53. Factoring by grouping:  $6x^2 + 9x + 4x + 6 = 3x(2x + 3) + 2(2x + 3) = (2x + 3)(3x + 2)$
55. Factoring by grouping:  $20x^2 - 2x + 50x - 5 = 2x(10x - 1) + 5(10x - 1) = (10x - 1)(2x + 5)$
57. Factoring by grouping:  $20x^2 + 4x + 25x + 5 = 4x(5x + 1) + 5(5x + 1) = (5x + 1)(4x + 5)$
59. Factoring by grouping:  $x^3 + 2x^2 + 3x + 6 = x^2(x + 2) + 3(x + 2) = (x + 2)(x^2 + 3)$
61. Factoring by grouping:  $6x^3 - 4x^2 + 15x - 10 = 2x^2(3x - 2) + 5(3x - 2) = (3x - 2)(2x^2 + 5)$
63. Its greatest common factor is  $3 \cdot 2 = 6$ .
65. The correct factoring is:  $12x^2 + 6x + 3 = 3(4x^2 + 2x + 1)$
67. The factored form is:  $A = 1000 + 1000r = 1000(1 + r)$   
Substituting  $r = 0.12$ :  $A = 1000(1 + 0.12) = 1000(1.12) = \$1,120$
69. a. Factoring:  $A = 1,000,000 + 1,000,000r = 1,000,000(1 + r)$   
b. Substituting  $r = 0.30$ :  $A = 1,000,000(1 + 0.3) = 1,300,000$  bacteria
71. Multiplying using the FOIL method:  $(x - 7)(x + 2) = x^2 - 7x + 2x - 14 = x^2 - 5x - 14$
73. Multiplying using the FOIL method:  $(x - 3)(x + 2) = x^2 - 3x + 2x - 6 = x^2 - x - 6$
75. Multiplying using the column method:
- $$\begin{array}{r} x^2 - 3x + 9 \\ \quad \quad x + 3 \\ \hline x^3 - 3x^2 + 9x \\ \quad \quad \quad 3x^2 - 9x + 27 \\ \hline x^3 + 27 \end{array}$$
77. Multiplying using the column method:
- $$\begin{array}{r} x^2 + 4x - 3 \\ \quad \quad 2x + 1 \\ \hline 2x^3 + 8x^2 - 6x \\ \quad \quad \quad x^2 + 4x - 3 \\ \hline 2x^3 + 9x^2 - 2x - 3 \end{array}$$
79. Multiplying:  $3x^4(6x^3 - 4x^2 + 2x) = 3x^4 \cdot 6x^3 - 3x^4 \cdot 4x^2 + 3x^4 \cdot 2x = 18x^7 - 12x^6 + 6x^5$
81. Multiplying:  $\left(x + \frac{1}{3}\right)\left(x + \frac{2}{3}\right) = x^2 + \frac{2}{3}x + \frac{1}{3}x + \frac{2}{9} = x^2 + x + \frac{2}{9}$
83. Multiplying:  $(6x + 4y)(2x - 3y) = 12x^2 - 18xy + 8xy - 12y^2 = 12x^2 - 10xy - 12y^2$
85. Multiplying:  $(9a + 1)(9a - 1) = 81a^2 - 9a + 9a - 1 = 81a^2 - 1$
87. Multiplying:  $(x - 9)(x - 9) = x^2 - 9x - 9x + 81 = x^2 - 18x + 81$
89. Multiplying:
- $$\begin{aligned} (x + 2)(x^2 - 2x + 4) &= x(x^2 - 2x + 4) + 2(x^2 - 2x + 4) \\ &= x^3 - 2x^2 + 4x + 2x^2 - 4x + 8 \\ &= x^3 + 8 \end{aligned}$$

