

5.8 Greatest Common Factor and Factoring by Grouping

Section 5.8 Practice Exercises

1. (a) product
(b) prime
(c) greatest common factor
(d) prime
(e) greatest common factor (GCF)
(f) grouping
3. 7
5. 6
7. y
9. $4w^2z$
11. $2xy^4z^2$
13. $(x - y)$
15. (a) $3(x - 2y) = 3x - 3(2y) = 3x - 6y$
(b) $3x - 6y = 3x - 3(2y) = 3(x - 2y)$
17. $4p + 12 = 4p + 4 \cdot 3 = 4(p + 3)$
19. $5c^2 - 10c + 15 = 5 \cdot c^2 - 5 \cdot 2c + 5 \cdot 3$
 $= 5(c^2 - 2c + 3)$
21. $x^5 + x^3 = x^3x^2 + x^3$
 $= x^3(x^2 + 1)$
23. $t^4 - 4t + 8t^2 = tt^3 - 4t + 8tt$
 $= t(t^3 - 4 + 8t)$
25. $2ab + 4a^3b = 2ab + 2ab(2a^2)$
 $= 2ab(1 + 2a^2)$
27. $38x^2y - 19x^2y^4 = 19x^2y(2) - 19x^2y(y^3)$
 $= 19x^2y(2 - y^3)$
29. $6x^3y^5 - 18xy^9z = 6xy^5(x^2 - 3y^4z)$
31. $5 + 7y^3$ is prime because it is not factorable.
33. $42p^3q^2 + 14pq^2 - 7p^4q^4$
 $= 7pq^2(6p^2 + 2 - p^3q^2)$
35. $t^5 + 2rt^3 - 3t^4 + 4r^2t^2$
 $= t^2(t^3 + 2rt - 3t^2 + 4r^2)$
37. (a) $-2x^3 - 4x^2 + 8x = -2x(x^2 + 2x - 4)$
(b) $-2x^3 - 4x^2 + 8x = 2x(-x^2 - 2x + 4)$
39. $-8t^2 - 9t - 2 = -1(8t^2 + 9t + 2)$
41. $-15p^3 - 30p^2 = -15p^2(p + 2)$
43. $-12p^3t + 2p^2t^3 + 6pt^2$
 $= -2pt(6p^2 - pt^2 - 3t)$
45. $-7x - 6y - 2z = -1(7x + 6y + 2z)$
47. $13(a + 6) - 4b(a + 6) = (a + 6)(13 - 4b)$
49. $8v(w^2 - 2) + (w^2 - 2)$
 $= 8v(w^2 - 2) + 1(w^2 - 2)$
 $= (w^2 - 2)(8v + 1)$
51. $21x(x + 3) + 7x^2(x + 3)$
 $= 7x(x + 3)(3 + x)$
 $= 7x(x + 3)^2$
53. $8a^2 - 4ab + 6ac - 3bc$
 $= 4a(2a - b) + 3c(2a - b)$
 $= (2a - b)(4a + 3c)$
55. $3q + 3p + qr + pr = 3(q + p) + r(q + p)$
 $= (q + p)(3 + r)$
57. $6x^2 + 3x + 4x + 2 = 3x(2x + 1) + 2(2x + 1)$
 $= (2x + 1)(3x + 2)$
59. $2t^2 + 6t - t - 3$
 $= 2t(t + 3) + (-1)(t + 3)$
 $= (2t - 1)(t + 3)$

$$\begin{aligned}
 61. \quad & 6y^2 - 2y - 9y + 3 \\
 & = 2y(3y - 1) + (-3)(3y - 1) \\
 & = (3y - 1)(2y - 3)
 \end{aligned}$$

$$\begin{aligned}
 63. \quad & b^4 + b^3 - 4b - 4 \\
 & = b^3(b + 1) + (-4)(b + 1) \\
 & = (b + 1)(b^3 - 4)
 \end{aligned}$$

$$\begin{aligned}
 65. \quad & 3j^2k + 15k + j^2 + 5 \\
 & = 3k(j^2 + 5) + 1(j^2 + 5) \\
 & = (j^2 + 5)(3k + 1)
 \end{aligned}$$

$$\begin{aligned}
 67. \quad & 14w^6x^6 + 7w^6 - 2x^6 - 1 \\
 & = 7w^6(2x^6 + 1) + (-1)(2x^6 + 1) \\
 & = (2x^6 + 1)(7w^6 - 1)
 \end{aligned}$$

$$\begin{aligned}
 69. \quad & ay + bx + by + ax = ay + ax + by + bx \\
 & = a(y + x) + b(y + x) \\
 & = (a + b)(y + x)
 \end{aligned}$$

$$\begin{aligned}
 71. \quad & vw^2 - 3 + w - 3wv = vw^2 - 3wv + w - 3 \\
 & = vw(w - 3) + 1(w - 3) \\
 & = (vw + 1)(w - 3)
 \end{aligned}$$

$$\begin{aligned}
 73. \quad & 15x^4 + 15x^2y^2 + 10x^3y + 10xy^3 \\
 & = 5x(3x^3 + 3xy^2 + 2x^2y + 2y^3) \\
 & = 5x(3x(x^2 + y^2) + 2y(x^2 + y^2)) \\
 & = 5x(x^2 + y^2)(3x + 2y)
 \end{aligned}$$

$$\begin{aligned}
 75. \quad & 4abx - 4b^2x - 4ab + 4b^2 \\
 & = 4b(ax - bx - a + b) \\
 & = 4b(x(a - b) - 1(a - b)) \\
 & = 4b(a - b)(x - 1)
 \end{aligned}$$

$$\begin{aligned}
 77. \quad & 6st^2 - 18st - 6t^4 + 18t^3 \\
 & = 6t(st - 3s - t^3 + 3t^2) \\
 & = 6t(s(t - 3) - t^2(t - 3)) \\
 & = 6t(t - 3)(s - t^2)
 \end{aligned}$$

$$\begin{aligned}
 79. \quad & P = 2l + 2w \\
 & P = 2(l + w)
 \end{aligned}$$

$$\begin{aligned}
 81. \quad & S = 2\pi r^2 + 2\pi rh \\
 & S = 2\pi r(r + h)
 \end{aligned}$$

$$\begin{aligned}
 83. \quad & \frac{1}{7}x^2 + \frac{3}{7}x - \frac{5}{7} \\
 & = \frac{1}{7}(x^2 + 3x - 5)
 \end{aligned}$$

$$\begin{aligned}
 85. \quad & \frac{5}{4}w^2 + \frac{3}{4}w + \frac{9}{4} \\
 & = \frac{1}{4}(5w^2 + 3w + 9)
 \end{aligned}$$

87. Answers may vary. For example:

$$6x^2 + 9x$$

89. Answers may vary. For example:

$$16p^4q^2 + 8p^3q - 4p^2q$$