

Factor out the greatest common factor. See Examples 1-6.

[09-09-15-L8]

1. $15k + 30$
3. $6p^2 + 4p$
5. $8m^2p - 4mp^2$
7. $5xy - 8xy^2$
9. $8m^4 + 6m^3 - 4m^2$
11. $10t^5 - 8t^4 - 16t^3$
13. $6r^2s - 3rs^2 - 9r^3s$
15. $2x^2y - 3xy^2 + 4x^2y^2$
17. $12km^3 - 24k^3m^2 + 36k^2m^4$
19. $144z^{11}m^4 + 16z^3m^5 - 32z^3m^5$
21. $16z^2n^6 + 64zn^7 - 32z^3n^3$
23. $15a^3b + 12a^2c - 3ad^4$
25. $9x^2y^2z^4 - 18x^3y^2z$
27. $12p^5q^6 + 5r^2s^2 + 24p^3r^2$
29. $14a^3b^2 + 7a^2b - 21a^5b^3 + 42ab^4$
31. $-15m^3p^3 - 6m^3p^4 - 9mp^3 + 30m^2p^3$
33. $(m - 9)(m + 1) + (m - 9)(m + 2)$
35. $(3k - 7)(k + 2) + (3k - 7)(k + 5)$
37. $(r - 6)(2r + 1) - (r - 6)(r + 3)$
2. $7m - 21$
4. $12a^3 + 9a^2$
6. $12z^2 - 6zw^3$
8. $4ab + 2a^2b$
10. $2p^5 + 4p^6 - 8p^3$
12. $6p^3 - 18p^2 + 9p^4$
14. $5p^3t^2 + 25p^2t^3 + 10p^3t^4$
16. $14a^3b^2 + 7a^2b - 21a^5b^3$
18. $15m^3p^3 - 6m^3p^4 + 9mp^3$
20. $39a^5b^3 - 26a^7b^2 + 52a^8b^5$
22. $5r^3s^5 + 10r^2s^2 - 15r^4s^2$
24. $20m^4y + 30m^2y^2 + 50m^3z^2$
26. $30m^5p^5q^3 + 20m^6p^4q^2$
28. $2m^8k^8 + 7q^4p^5 + 14m^6p^3$
30. $12km^3 - 24k^3m^2 + 36k^2m^4 - 60k^4m^3$
32. $-25x^3y^2 - 20x^4y^3 + 15x^5y^4 - 50x^6y^2$
34. $(a + 5)(a - 6) + (a + 5)(a - 1)$
36. $(5m - 11)(2m + 5) + (5m - 11)(m + 5)$
38. $(y + 2)(2y + 3) - (y + 2)(y + 1)$

Do Board Example Similar.

39. $m^5(r + s) + m^5(t + u)$
41. $4(3 - x)^2 - (3 - x)^3 + 3(3 - x)$
43. $15(2z + 1)^3 + 10(2z + 1)^2 - 25(2z + 1)$
45. $5(m + p)^3 - 10(m + p)^2 - 15(m + p)^4$
40. $z^3(k + m) + z^3(p + q)$
42. $2(t - s) + 4(t - s)^2 - (t - s)^3$
44. $6(a + 2b)^2 - 4(a + 2b)^3 + 12(a + 2b)^4$
46. $-9a^2(p + q) - 3a^3(p + q)^2 + 6a(p + q)^3$

Factor each of the following polynomials twice. First, use a common factor with a positive coefficient, and then use a common factor with a negative coefficient. See Example 6.

47. $24z^2 - 48z$
49. $-2x^5 + 6x^3 + 4x^2$
51. $-32a^4m^5 - 16a^2m^3 - 64a^5m^6$
48. $39p^3 - 65p^4$
50. $-5a^3 + 10a^4 - 15a^5$
52. $-144z^{11}n^5 + 16z^3n^{11} - 32z^4n^7$

Factor by grouping. See Examples 7-9.

53. $pq + 3rq + pm + 3rm$
55. $2b + 2c + ab + ac$
57. $p^2 + pq - 3py - 3yq$
59. $a^2b^2 + 2b^2 - 5a^2 - 10$
61. $x^2 - 3x + 2x - 6$
63. $3r^2 - 2r + 15r - 10$
65. $21y^2 + 14y - 15y - 10$
67. $16p^2 + 6pq - 8pq - 3q^2$
69. $14m^2 + 21mq - 2mq - 3q^2$
71. $3a^3 + 3ab^2 + 2a^2b + 2b^3$
73. $1 - a + ab - b$
75. $8 - 6y^3 - 12y + 9y^4$
54. $5x + 5a + 9bx + 9ab$
56. $3am + 3ap + 2bm + 2bp$
58. $r^2 + 6rs - 3rt - 18st$
60. $m^2r^2 + 8r^2 - 3m^2 - 24$
62. $y^2 - 8y + 4y - 32$
64. $2a^2 - 6a + 7a - 21$
66. $18q^2 + 9q - 4q - 2$
68. $8r^2 + 6rs - 12rs - 9s^2$
70. $10y^2 + 4yz - 5y - 2z$
72. $16m^3 - 4m^2p^2 - 4mp + p^3$
74. $2ab^2 - 8b^2 + a - 4$
76. $x^3y^2 + x^3 - 3y^2 - 3$

Factor each of the following polynomials. Assume that all variables used as exponents represent positive integers.

77. $p^{6m} - 2p^{4m}$
79. $q^{3k} + 2q^{2k} + 3q^k$
81. $y^{r+5} + y^{r+4} + y^{r+2}$
83. $(3k - 7)(k + 2) - (7 - 3k)(2k + 1)$
78. $4r^{3z} + 8r^{5z}$
80. $z^{2x} - z^x + z^{3x}$
82. $8k^{2z+3} + 2k^{2z+1} + 12k^{2z}$
84. $(5z + 1)(3z - 5) + (2z - 7)(5 - 3z)$
86. $6r^2k^2 - 10rk^2 - 3r^2c^2 + 5c^2$

Section 3.5 (page 126)

1. $15(k + 2)$ 3. $2p(3p + 2)$ 5. $4mp(2m - p)$ 7. $xy(5 - 8y)$ 9. $2m^2(4m^2 + 3m - 2)$
 11. $2t^3(5t^2 - 4t - 8)$ 13. $3rs(2r - s - 3r^2)$ 15. $xy(2x - 3y + 4xy)$
 17. $12km^2(m - 2k^2 + 3km^2)$ 19. $16z^3m^4(9z^8 + m - 2zm)$ 21. $16zn^3(zn^3 + 4n^4 - 2z^2)$
 23. $3a(5a^2b + 4ac - d^4)$ 25. $9x^2y^2z(z^3 - 2x)$ 27. No common factor other than 1
 29. $7ab(2a^2b + a - 3a^4b^2 + 6b^3)$ 31. $3mp^3(-5m^2 - 2m^2p - 3 + 10m)$ or
 $-3mp^3(5m^2 + 2m^2p + 3 - 10m)$ 33. $(m - 9)(2m + 3)$ 35. $(3k - 7)(2k + 7)$
 37. $(r - 6)(r - 2)$ 39. $m^5(r + s + t + u)$ 41. $(3 - x)(6 + 2x - x^2)$
 43. $20z(2z + 1)(3z + 4)$ 45. $5(m + p)^2(m + p - 2 - 3m^2 - 6mp - 3p^2)$
 47. $24z(z - 2)$ or $-24z(-z + 2)$ 49. $2x^2(-x^3 + 3x + 2)$ or $-2x^2(x^3 - 3x - 2)$
 51. $16a^2m^3(-2a^2m^2 - 1 - 4a^3m^3)$ or $-16a^2m^3(2a^2m^2 + 1 + 4a^3m^3)$ 53. $(p + 3r)(q + m)$
 55. $(b + c)(2 + a)$ 57. $(p + q)(p - 3y)$ 59. $(a^2 + 2)(b^2 - 5)$ 61. $(x - 3)(x + 2)$
 63. $(3r - 2)(r + 5)$ 65. $(3y + 2)(7y - 5)$ 67. $(8p + 3q)(2p - q)$ 69. $(2m + 3q)(7m - q)$
 71. $(a^2 + b^2)(3a + 2b)$ 73. $(1 - a)(1 - b)$ 75. $(4 - 3y^3)(2 - 3y)$ 77. $p^{4m}(p^{2m} - 2)$
 79. $q^k(q^{2k} + 2q^k + 3)$ 81. $y^{r+2}(y^3 + y^2 + 1)$ 83. $3(3k - 7)(k + 1)$ 85. $(r^p + q^p)(m^p - z^p)$
 87. $m^{-5}(3 + m^2)$ or $(m^2 + 3)/m^5$ 89. $p^{-3}(3 + 2p - 4p^2)$ or $(-4p^2 + 2p + 3)/p^3$ 91. $6m^2 + m - 2$
 93. $16r^2 - 14rs - 15s^2$ 95. $18z^2 + 31za - 35a^2$ 97. $14r^2 - 29rs - 15s^2$