

Special Types  
of Factoring

Difference of two squares	$x^2 - y^2 = (x + y)(x - y)$
Perfect square trinomial	$x^2 + 2xy + y^2 = (x + y)^2$
	$x^2 - 2xy + y^2 = (x - y)^2$
Differences of two cubes	$x^3 - y^3 = (x - y)(x^2 + xy + y^2)$
Sum of two cubes	$x^3 + y^3 = (x + y)(x^2 - xy + y^2)$

## 3.7 Exercises

Factor each of the following. See Examples 1–4.

- |                             |                              |                           |
|-----------------------------|------------------------------|---------------------------|
| 1. $x^2 - 25$               | 2. $9 - p^2$                 | 3. $36m^2 - 25$           |
| 4. $4x^2 - 49$              | 5. $16y^2 - 81q^2$           | 6. $9m^2 - 100r^2$        |
| 7. $16 - 25a^2b^2$          | 8. $49 - 64x^2z^2$           | 9. $a^4 - 4b^4$           |
| 10. $m^2p^2 - 49r^2s^2$     | 11. $x^2 + 4x + 4$           | 12. $y^2 + 6y + 9$        |
| 13. $a^2 - 10a + 25$        | 14. $b^2 - 8b + 16$          | 15. $9r^2 - 6rs + s^2$    |
| 16. $4a^2 - 20ab + 25b^2$   | 17. $25x^2y^2 - 20xy + 4$    | 18. $9k^2q^2 + 24kq + 16$ |
| 19. $72m^2 - 120mp + 50p^2$ | 20. $100y^2 - 100yz + 25z^2$ | 21. $8a^3 + 1$            |
| 22. $125a^3 - 1$            | 23. $27x^3 - 64y^3$          | 24. $8a^3 + 125m^3$       |
| 25. $64x^3 + 125y^3$        | 26. $216z^3 - x^3$           | 27. $125m^3 - 8p^3$       |
| 28. $64y^3 - 1331x^3$       | 29. $1000 + 27r^3s^3$        | 30. $343 + 1000a^3b^3$    |
| 31. $64y^6 + 1$             | 32. $m^6 - 8$                |                           |

Factor each of the following.

- |                                |                                |                                 |
|--------------------------------|--------------------------------|---------------------------------|
| 33. $(x + y)^2 - 16$           | 34. $(a + b)^2 - 100$          | 35. $25 - (r + 3s)^2$           |
| 36. $81 - (2k + z)^2$          | 37. $m^2 - (3p - 5)^2$         | 38. $w^2 - (2z - 3)^2$          |
| 39. $(a + b)^2 - (a - b)^2$    | 40. $(c - d)^2 - (c + d)^2$    | 41. $(a + b)^2 + 2(a + b) + 1$  |
| 42. $(x + y)^2 + 6(x + y) + 9$ | 43. $(m - p)^2 + 4(m - p) + 4$ | 44. $(w - r)^2 + 8(w - r) + 16$ |
| 45. $p^2 - 6p + 9 - r^2$       | 46. $k^2 - 10k + 25 - z^2$     | 47. $9y^2 - 30y + 25 - 16x^2$   |
| 48. $25a^2 - 20a + 4 - 9b^2$   | 49. $r^2 - 16s^2 + 24s - 9$    | 50. $t^2 - 16u^2 + 8u - 1$      |
| 51. $64 - (a - b)^3$           | 52. $(r + 1)^3 - 1$            | 53. $(p - 5)^3 + 125$           |
| 54. $m^3 + (m + 3)^3$          | 55. $a^3 - (a - 4)^3$          | 56. $(p + q)^3 - (p - q)^3$     |

Find a value of  $b$  or  $c$  so that the following will be perfect squares.

- |                       |                       |                       |
|-----------------------|-----------------------|-----------------------|
| 57. $p^2 + 6p + c$    | 58. $y^2 - 14y + c$   | 59. $9z^2 - 30z + c$  |
| 60. $16r^2 + 24r + c$ | 61. $16q^2 + bq + 25$ | 62. $36x^2 + bx + 25$ |

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

- |                               |                                |                             |
|-------------------------------|--------------------------------|-----------------------------|
| 63. $16m^{4x} - 9$            | 64. $100m^{2q} - 81$           | 65. $64r^{8z} - 1$          |
| 66. $4 - 49x^{4y}$            | 67. $100m^{2z} - 9p^{8z}$      | 68. $16k^{8b} - 25m^{4b}$   |
| 69. $9a^{4z} - 30a^{2z} + 25$ | 70. $121p^{8k} + 44p^{4k} + 4$ | 71. $x^{3n} - 8$            |
| 72. $216 + b^{3k}$            | 73. $27z^{12y} + 125x^{6y}$    | 74. $1000k^{15r} - m^{21r}$ |

**Section 3.7 (page 137)**

1.  $(x + 5)(x - 5)$       3.  $(6m + 5)(6m - 5)$       5.  $(4y + 9q)(4y - 9q)$       7.  $(4 + 5ab)(4 - 5ab)$   
9.  $(a^2 + 2b^2)(a^2 - 2b^2)$       11.  $(x + 2)^2$       13.  $(a - 5)^2$       15.  $(3r - s)^2$       17.  $(5xy - 2)^2$   
19.  $2(6m - 5p)^2$       21.  $(2a + 1)(4a^2 - 2a + 1)$       23.  $(3x - 4y)(9x^2 + 12xy + 16y^2)$   
25.  $(4x + 5y)(16x^2 - 20xy + 25y^2)$       27.  $(5m - 2p)(25m^2 + 10mp + 4p^2)$   
29.  $(10 + 3rs)(100 - 30rs + 9r^2s^2)$       31.  $(4y^2 + 1)(16y^4 - 4y^2 + 1)$       33.  $(x + y + 4)(x + y - 4)$   
35.  $(5 + r + 3s)(5 - r - 3s)$       37.  $(m + 3p - 5)(m - 3p + 5)$       39.  $4ab$       41.  $(a + b + 1)^2$   
43.  $(m - p + 2)^2$       45.  $(p - 3 + r)(p - 3 - r)$       47.  $(3y - 5 + 4x)(3y - 5 - 4x)$   
49.  $(r + 4s - 3)(r - 4s + 3)$       51.  $(4 - a + b)(16 + 4a - 4b + a^2 - 2ab + b^2)$   
53.  $p(p^2 - 15p + 75)$       55.  $4(3a^2 - 12a + 16)$       57. 9      59. 25      61. 40 or -40  
63.  $(4m^{2x} + 3)(4m^{2x} - 3)$       65.  $(8r^{4z} + 1)(8r^{4z} - 1)$       67.  $(10m^z + 3p^{4z})(10m^z - 3p^{4z})$
69.  $(3a^{2z} - 5)^2$       71.  $(x^n - 2)(x^{2n} + 2x^n + 4)$       73.  $(3z^{4y} + 5x^{2y})(9z^{8y} - 15z^{4y}x^{2y} + 25x^{4y})$   
75.  $8y(2y - 3 + 4y^2)$       77.  $(x + 2)(y + 4)$       79.  $(y + 2)(y - 1)$       81.  $(3r - z)(2r + 7z)$