

Multiplying Radical Binomials

Multiply and simplify each expression completely. Assume all variables are non-negative.

Multiplying Radical Binomials

Multiply every term in the first binomial by every term in the second. Simplify all radical products and combine like terms.

1. $(1 + \sqrt{2})(3 + \sqrt{2})$

5. $(\sqrt{3} + 4)(3 + \sqrt{3})$

2. $(3 + \sqrt{5})(2 + \sqrt{5})$

6. $(2\sqrt{3} + \sqrt{5})(\sqrt{3} + 2\sqrt{5})$

3. $(3 + \sqrt{5})(7 - 2\sqrt{5})$

7. $(3\sqrt{2} - 2\sqrt{5})(\sqrt{2} + \sqrt{5})$

4. $(5 - \sqrt{6})(2 - \sqrt{6})$

8. $(2\sqrt{3} + 3\sqrt{2})(\sqrt{6} - \sqrt{3})$

Squaring Radical Binomials

Expand each square as a product of two identical binomials. Simplify all products and combine like terms.

9. $(1 + \sqrt{2})^2$

13. $(2\sqrt{5} + 2\sqrt{3})^2$

10. $(2 + \sqrt{3})^2$

14. $(n + 4\sqrt{3})^2$

11. $(2\sqrt{5} + 1)^2$

15. $(\sqrt{5x + 3} + 7)^2$

12. $(3 - \sqrt{2})^2$

16. $(9\sqrt{2m} - 4\sqrt{6m})^2$

Conjugate Pairs

A conjugate pair has the same two terms with opposite signs. Multiply and simplify completely. Look for what happens to the middle terms.

17. $(1 + \sqrt{2})(1 - \sqrt{2})$

21. $(3\sqrt{7} + 4\sqrt{x})(3\sqrt{7} - 4\sqrt{x})$

18. $(7 - \sqrt{3})(7 + \sqrt{3})$

22. $(\sqrt{5x + 3} + 7)(\sqrt{5x + 3} - 7)$

19. $(4 - 9\sqrt{5})(4 + 9\sqrt{5})$

23. $(7 - \sqrt{x + 8})(7 + \sqrt{x + 8})$

20. $(3\sqrt{3} + x)(3\sqrt{3} - x)$

24. $(9\sqrt{2x + 3} - 4\sqrt{6x})(9\sqrt{2x + 3} + 4\sqrt{6x})$

Mixed Strategy Challenges

Multiply and simplify completely. Decide whether ordinary distribution, a binomial square, or a conjugate pattern gives you the easiest path.

25. $(\sqrt{3x} - 2)(2\sqrt{3x} + 5)$

26. $(\sqrt{x} + 3)(2\sqrt{x} - 4)$

27. $(2x\sqrt{3} + \sqrt{2x})^2$

28. $(x + 4\sqrt{x + 3})(x - 4\sqrt{x + 3})$

29. $(\sqrt{3} + 8)(2\sqrt{3} - 1) - \sqrt{3}(7\sqrt{3} - 4)$

30. $(3\sqrt{x} + 2)(4\sqrt{x} + 5) + (2\sqrt{x} - 1)(\sqrt{x} + 3)$

31. $(\sqrt{2x + 3} - 6)(\sqrt{2x + 3} + 6) + (\sqrt{x} + 2)^2$

32. $(3\sqrt{2x} - 2\sqrt{3})^2 - (3\sqrt{2x} + 2\sqrt{3})(3\sqrt{2x} - 2\sqrt{3})$