● Vocabulary Builder

binomial (adjective) **by NOH mee ul**

Definition: A binomial expression is an expression made up of two terms.

Related Words: monomial, binomial expression, trinomial

Examples: monomial: $a, x^2, -3, 17c^3, \sqrt{5}$

binomial: $a - 7, x^2 + 0.9, -3 - ab, 17c^3 + 1, b - \sqrt{5}$

trinomial: $a - 7 + x, x^2 + x + 0.9, -3 - ab + a, 17c^3 = c^2 + 1,$
$b^3 + b - \sqrt{5}$

take note

Property   Combining Radical Expressions: Sums and Differences

Use the Distributive Property to add or subtract like radicals.

$$a\sqrt[n]{x} + b\sqrt[n]{x} = (a + b)\sqrt[n]{x} \qquad a\sqrt[n]{x} - b\sqrt[n]{x} = (a - b)\sqrt[n]{x}$$

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AND radicand must match to add or subtract

✓ Problem 1   Adding and Subtracting Radical Expressions

Got It? What is the simplified form of each expression?

$7\sqrt[3]{5} - 4\sqrt{5}$

Simplest form

$3x\sqrt{xy} + 4x\sqrt{xy}$

$7x\sqrt{xy}$

Problem 3 Simplifying Before Adding or Subtracting

Got It? What is the simplified form of the expression $\sqrt[3]{250} + \sqrt[3]{54} - \sqrt[3]{16}$?

1
8
27
64
125
216

$$\sqrt[3]{250} + \sqrt[3]{54} - \sqrt[3]{16}$$

$$\sqrt[3]{125}\,\sqrt[3]{2} + \sqrt[3]{27}\,\sqrt[3]{2} - \sqrt[3]{8}\,\sqrt[3]{2}$$

$$5\sqrt[3]{2} + 3\sqrt[3]{2} - 2\sqrt[3]{2}$$

$$6\sqrt[3]{2}$$

Problem 4 Multiplying Binomial Radical Expressions

Got It? What is the product $(3 + 2\sqrt{5})(2 + 4\sqrt{5})$?

$$6 + 12\sqrt{5} + 4\sqrt{5} + 8\sqrt{25}$$

$$6 + 16\sqrt{5} + 8(5)$$

$$6 + 16\sqrt{5} + 40$$

$$46 + 16\sqrt{5}$$

✓ **Problem 5** **Multiplying Conjugates**

Got It? What is the product of the expression $(6 - \sqrt{12})(6 + \sqrt{12})$?

$$36 + 6\sqrt{12} - 6\sqrt{12} - 12$$

$$\boxed{24}$$

✓ **Problem 6** **Rationalizing the Denominator**

Got It? How can you write the expression $\dfrac{2\sqrt{7}}{\sqrt{3} - \sqrt{5}}$ with a rationalized denominator?

If you add/subtract radicals in the denominator, multiply by the conjugate.

$$\frac{2\sqrt{7}}{(\sqrt{3} - \sqrt{5})} \cdot \frac{(\sqrt{3} + \sqrt{5})}{(\sqrt{3} + \sqrt{5})} = \frac{2\sqrt{21} + 2\sqrt{35}}{3 + \sqrt{15} - \sqrt{15} - 5} = \frac{2\sqrt{21} + 2\sqrt{35}}{-2}$$

$$= \frac{2\sqrt{21}}{-2} + \frac{2\sqrt{35}}{-2}$$

$$= -\sqrt{21} - \sqrt{35}$$

6-3 Binomial Radical Expressions

6.3 problems

A Practice

Simplify if possible.

10. $5\sqrt{6} + \sqrt{6}$

11. $6\sqrt[3]{3} - 2\sqrt[3]{3}$
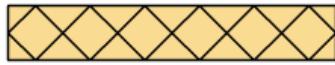
12. $4\sqrt{3} + 4\sqrt[3]{3}$

13. $3\sqrt{x} - 5\sqrt{x}$

14. $14\sqrt{x} + 3\sqrt{y}$

15. $7\sqrt[3]{x^2} - 2\sqrt[3]{x^2}$

16. The design of a garden path uses stone pieces shaped as squares with a side length of 15 in. Find the length of the path.

Simplify.

17. $6\sqrt{18} + 3\sqrt{50}$

18. $14\sqrt{20} - 3\sqrt{125}$

19. $\sqrt{18} + \sqrt{32}$

20. $\sqrt[3]{54} + \sqrt[3]{16}$

21. $3\sqrt[3]{81} - 2\sqrt[3]{54}$

22. $\sqrt[4]{32} + \sqrt[4]{48}$

Multiply.

23. $(3 + \sqrt{5})(1 + \sqrt{5})$

24. $(2 + \sqrt{7})(1 + 3\sqrt{7})$

25. $(3 - 4\sqrt{2})(5 - 6\sqrt{2})$.

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

27. $(\sqrt{13} + 6)^2$

28. $(2\sqrt{5} + 3\sqrt{2})^2$

Multiply each pair of conjugates.

29. $(5 - \sqrt{11})(5 + \sqrt{11})$

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

31. $(2\sqrt{6} + 8)(2\sqrt{6} - 8)$

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

Rationalize each denominator. Simplify your answer.

33. $\dfrac{4}{1 + \sqrt{3}}$

34. $\dfrac{4}{3\sqrt{3} - 2}$

35. $\dfrac{5 + \sqrt{3}}{2 - \sqrt{3}}$

36. $\dfrac{3 + \sqrt{8}}{2 - 2\sqrt{8}}$

35.) $\dfrac{(5 + \sqrt{3})(2 + \sqrt{3})}{(2 - \sqrt{3})(2 + \sqrt{3})} = \dfrac{10 + 5\sqrt{3} + 2\sqrt{3} + 3}{4 + 2\sqrt{3} - 2\sqrt{3} - 3} = \dfrac{13 + 7\sqrt{3}}{1}$

$= 13 + 7\sqrt{3}$