

Section 5.9 Adding and Subtracting Square Roots

1. Combining Similar Square Roots: We add or subtract square roots in the same way that we add similar terms. Two square roots can be added or subtracted if the expressions under the square root are **identical**. The addition or subtraction is performed by using the distributive property.

Example 1: Simplify. Give exact answers.

a. $4\sqrt{2} + 3\sqrt{2} = 4 \cdot \sqrt{2} + 3 \cdot \sqrt{2} = (4 + 3)\sqrt{2} = 7\sqrt{2}$

b. $5\sqrt{3} + 7\sqrt{3}$

c. $7\sqrt{5} - 11\sqrt{5}$

d. $21\sqrt{11} - \sqrt{11}$

e. $\sqrt{13} + \sqrt{11}$

2. Adding and Subtracting Square Roots When Simplification is Required First: If the expressions under the square root are not identical, then the square roots can't be added or subtracted. However, sometimes the square roots can be simplified and then added or subtracted.

Example 2: Simplify. Give exact answers.

a. $\sqrt{12} + \sqrt{27}$

b. $\sqrt{50x} - \sqrt{32x}$

c. $8\sqrt{48} + 2\sqrt{12}$

3. Using Your Calculator to Find an Approximation: If an expression contains square roots that can't be added or subtracted because they aren't similar, you can use your calculator to find an approximation for the quantity. Round your answer to the decimal place indicated in the directions.

Example 3: Use your calculator to find an approximation for each expression. Round your answer to the nearest thousandth (three decimal places).

a. $\sqrt{21}$

b. $\sqrt{13} + \sqrt{11}$

c. $7\sqrt{5}$

d. $\sqrt{13} - 5\sqrt{11}$

Practice Problems:

Simplify each of the following. Give an exact answer.

a. $9\sqrt{3} - 5\sqrt{3}$

b. $4\sqrt{7} - 6\sqrt{7}$

c. $\sqrt{19} + \sqrt{10}$

d. $5\sqrt{40} - 2\sqrt{90} + 3\sqrt{10}$

e. $\sqrt{8x} - \sqrt{18x}$

Use a calculator to find an approximation for the given expression.

Round your answer to three decimal places.

f. $2\sqrt{57} - \sqrt{88}$

Answers to Practice Problems:

a. $4\sqrt{3}$; b. $-2\sqrt{7}$; c. Can't add these unless you approximate

with a calculator; d. $7\sqrt{10}$; e. $-\sqrt{2x}$; f. 5.719