

Name: _____

Date: _____

Combining Square Roots with Addition and Subtraction Algebra 1

Today we will examine the addition and subtraction properties of square roots. The following exercise illustrates a property of square root arithmetic that is crucial to understand.

Exercise #1: Evaluate each of the following:

(a) $\sqrt{9} + \sqrt{16} =$

(b) $\sqrt{25} =$

ADDITION AND SUBTRACTION OF SQUARE ROOTS

If a and b are two positive real numbers, then in general:

$$\sqrt{a} + \sqrt{b} \neq \sqrt{a+b}$$

The same can be said about subtraction of square roots.

One of the major misconceptions in square root arithmetic is that you can add the radicands to combine square roots with addition, but this is not true as the above exercise illustrates. We can combine radicals in other ways, similar to when we combine like terms in polynomials.

Exercise #2: Combine the following expressions.

(a) $2x + 5x$

(b) $9x - 4x$

(c) $3x - 7x$

Exercise #3: Combine the following radical expressions.

(a) $2\sqrt{3} + 5\sqrt{3} =$

(b) $9\sqrt{2} - 4\sqrt{2} =$

(c) $3\sqrt{10} - 7\sqrt{10} =$

Exercise #4: Which of the following statements is not true?

(1) $2\sqrt{5} + 4\sqrt{5} = 6\sqrt{5}$

(3) $\sqrt{12} = 2\sqrt{3}$

(2) $\sqrt{5} \cdot \sqrt{3} = \sqrt{15}$

(4) $\sqrt{5} + \sqrt{8} = \sqrt{13}$

Combining Square Roots with Unlike Radicands

Combining square roots with like radicands is easy. Sometimes we can combine those without like radicands by simplifying radicals first.

Exercise #5: Combine the following square roots by first simplifying radicals.

(a) $\sqrt{50} - \sqrt{8}$

(b) $\sqrt{12} + \sqrt{3}$

(c) $\sqrt{20} - 5\sqrt{5}$

(d) $2\sqrt{27} - 5\sqrt{12}$

(e) $5\sqrt{45} + 2\sqrt{20}$

(f) $4\sqrt{32} - 2\sqrt{98}$

Exercise #6: Which of the following is equivalent to $\sqrt{8} + \sqrt{18}$?

(1) 6

(3) $\sqrt{26}$

(2) $5\sqrt{2}$

(4) $10\sqrt{2}$

Exercise #7: Which of the following is equivalent to $\sqrt{12} - \sqrt{48}$?

(1) $-2\sqrt{3}$

(3) $-\sqrt{36}$

(2) $-8\sqrt{3}$

(4) $2\sqrt{3}$

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Combining Square Roots Using Addition and Subtraction Algebra 1 Homework

Skills

Use addition or subtraction to combine the following square roots that have the same radicands.

1. $3\sqrt{10} - 9\sqrt{10}$

2. $8\sqrt{5} + 3\sqrt{5}$

3. $14\sqrt{7} - 7\sqrt{7}$

For problems 4 through 12, combine each of the following expressions by first simplifying the square roots and then combining like radicands. Express each answer in *simplest radical form*.

4. $\sqrt{8} - 5\sqrt{2}$

5. $3\sqrt{18} + 4\sqrt{2}$

6. $3\sqrt{20} + 2\sqrt{45}$

7. $\sqrt{28} - 5\sqrt{7}$

8. $2\sqrt{54} + 7\sqrt{24}$

9. $\sqrt{50} - \sqrt{200}$

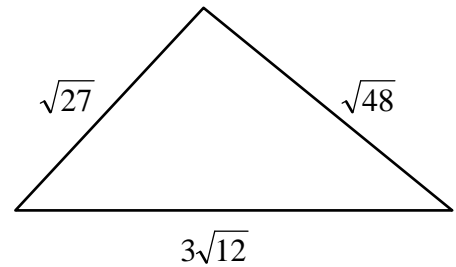
10. $7\sqrt{45} - \sqrt{80}$

11. $\sqrt{48} - \sqrt{27}$

12. $\sqrt{200} + 2\sqrt{18}$

Applications

13. The sides of a triangle are given below. Find the *perimeter* of the triangle in simplest radical form.



Reasoning

14. The sum of $\sqrt{50}$ and $x\sqrt{2}$ is $8\sqrt{2}$. Find the value of x . Show the work that leads to your answer.

15. The sum of $\sqrt{48}$ and $x\sqrt{3}$ is $9\sqrt{3}$. Find the value of x . Show the work that leads to your answer.

16. Which of the following statements is false? Explain your choice.

(1) $\sqrt{5} \cdot \sqrt{8} = 2\sqrt{10}$

(3) $\sqrt{5} + \sqrt{8} = \sqrt{13}$

(2) $\frac{\sqrt{8}}{\sqrt{2}} = 2$

(4) $\sqrt{8} - \sqrt{2} = \sqrt{2}$

17. Melanie performed the following square root addition problem incorrectly. Explain the mistake she made and show the correct solution.

$$\sqrt{8} + \sqrt{32} = \sqrt{40}$$

$$= \sqrt{4} \cdot \sqrt{10}$$

$$= 2\sqrt{10}$$