**Task on Adding and Subtracting Radicals** Name_____

There are three important rules when adding and subtracting radicals.

**Rule #1** - When adding or subtracting two radicals, you must **simplify the radicands first**.

1. What is the radicand of the following radical expression: $3\sqrt{5}$ ?

5

Throughout this task, we will be examining the following expression: $\sqrt{180}+7\sqrt{20}$.

As you can tell, this expression involves addition, so you will need to follow the rules.

Start with Rule #1 above. In order to add these two radicals, one must simplify the radicands first. That's what you will do in Questions 2 & 3.

2. Simplify $\sqrt{180}$. $\sqrt{36}\cdot\sqrt{5}$ $6\sqrt{5}$

3. Simplify $7\sqrt{20}$. Do not forget the '7'!!! $14\sqrt{5}$

4. Rewrite the original expression by substituting your answers from #2 and #3.

$\sqrt{180}+7\sqrt{20} = \underset{\#2}{6\sqrt{5}} + \underset{\#3}{14\sqrt{5}}$

**Rule #2** - In order to add or subtract two radicals, they must have the **same radicand**.

This is similar to saying that the two radicals must be "like terms".

5. The re-written expression in #4 should have produced the same radicand. So, these two radicals can be added. What is the new radicand that they have in common?

$6\sqrt{5}+14\sqrt{5}=?$ # under house

$6x+14x=?$ is a like term

For Questions 6-9, consider the radical expressions with already simplified radicands. Based on Rule #2, can these radicals be added/subtracted? **Your answer should be "yes" or "no".**

6. $3\sqrt{2}+2\sqrt{3}$ NO + like #'s under house - NO add

7. $4\sqrt{5}-\sqrt{5}$ Yes

8. $22\sqrt{7}-22\sqrt{6}$ NO

9. $10\sqrt{11}+24\sqrt{11}$ Yes

**Rule #3** - When adding or subtracting two radicals, **you only add the coefficients**. The radicand remains the same.

For example, one can compute $4\sqrt{10}+7\sqrt{10}$ because both radicals have the same radicand. In order to add them, you only add the coefficients (4 and 7). Thus, $4\sqrt{10}+7\sqrt{10}=11\sqrt{10}$.

10. Refer back to your answer to Question #4. Add the two radicals by only adding the coefficients. The radicand should stay the same.

$6\sqrt{5}+14\sqrt{5}=20\sqrt{5}$

Follow **all three rules** in order to simplify the expressions below.

11. $2\sqrt{15}+7\sqrt{15}$ $9\sqrt{15}$

12. $20\sqrt{3}+4\sqrt{3}-16\sqrt{3}$ $8\sqrt{3}$ (9, 3)

13. $17\sqrt{8}+5\sqrt{44}$ $34\sqrt{2}+10\sqrt{11}$ (4, 2, 11, 2, 2)

**Math 1**
**Notes on Adding and Subtracting Radicals** Name_____

**Standards Addresssed: MM1A2.**
**Students will simplify and operate with radical expressions, polynomials, and rational expressions.**
a. Simplify algebraic and numeric expressions involving square root.
b. Perform operations with square roots.

In order to add two monomials, the monomials must be like terms

Similarly, in order to add two radicals, the radicals must have the same radicand

For example, one cannot add $3\sqrt{6}$ and $2\sqrt{29}$ because their radicands are different.

When adding two monomials, you **only** add the coefficients

The same rule applies for adding two radicals!

To add $3\sqrt{2}$ and $8\sqrt{2}$, one adds the numbers on the outside only to get $11\sqrt{2}$.

**The Rules for Adding and Subtracting Radicals**

**Rule #1** - When adding or subtracting two radicals, you must *simplify the radicands first*.

**Rule #2** - In order to add or subtract two radicals, they must have the *same radicand*.

**Rule #3** - When adding or subtracting two radicals, *you only add the coefficients*. The radicand remains the same.

Simplify.

$10\sqrt{19}-7\sqrt{17}$

$8\sqrt{7}-12\sqrt{7}$ $-4\sqrt{7}$

$13\sqrt{6}$

$3\sqrt{6}+5\sqrt{24}$ (4, 6, 2, 2) $3\sqrt{6}+10\sqrt{6}$

**Homework on Adding and Subtracting Radicals** Name_____

Simplify completely. If the expression cannot be simplified, write "cannot be simplified".

1. $13\sqrt{19}+14\sqrt{19}$

$27\sqrt{19}$

2. $21\sqrt{21}-4\sqrt{21}$

$17\sqrt{21}$

3. $15\sqrt{13}-4\sqrt{7}+9\sqrt{13}$

$24\sqrt{13}-4\sqrt{7}$

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

$1\sqrt{2}-2\sqrt{2}$

$4\ 2$

$2\ 2$

$-\sqrt{2}$

5. $\sqrt{18}+\sqrt{12}$

$3\sqrt{2}+2\sqrt{3}$

$9\ 2\ 4\ 3$

$3\ 3\quad 2\ 2$

6. $10\sqrt{63}-2\sqrt{28}+\sqrt{7}$

$27\sqrt{7}$

$9\ 7\quad 4$

$3\ 3\quad 2\ 2$

$30\sqrt{7}-4\sqrt{7}+\sqrt{7}$

7. $4+6\sqrt{3}$ ← Final

2

3

8. $22\sqrt{5}+9\sqrt{75}-25\sqrt{5}$

9. $5\sqrt{13}\bullet 2\sqrt{6}$

10. $4\sqrt{2}\bullet 5\sqrt{2}$

11. $(\sqrt{3})(2\sqrt{5})(6\sqrt{10})$

12. $\sqrt{2}\bullet\sqrt{8}-\sqrt{3}\bullet\sqrt{9}$

13. $(5\sqrt{2})(9\sqrt{10})-4\sqrt{5}$

14. $\sqrt{7}(2-\sqrt{2})$

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

16. $6\sqrt{5}(3\sqrt{2}+4\sqrt{10})$

1. $27\sqrt{19}$
2. $17\sqrt{21}$
3. $24\sqrt{13}-4\sqrt{7}$
4. $-\sqrt{2}$
5. $3\sqrt{2}+2\sqrt{3}$
6. $27\sqrt{7}$
7. cannot be simplified
8. $45\sqrt{3}-3\sqrt{5}$
9. $10\sqrt{78}$
10. 40
11. $60\sqrt{6}$
12. $4-3\sqrt{3}$
13. $86\sqrt{5}$
14. $2\sqrt{7}-\sqrt{14}$
15. $6+9\sqrt{2}$
16. $18\sqrt{10}+120\sqrt{2}$
17. $63-28\sqrt{13}$
18. $8-2\sqrt{3}+4\sqrt{5}-\sqrt{15}$
19. $18+6\sqrt{2}+6\sqrt{6}+4\sqrt{3}$
20. 95