

SIMPLIFYING SQUARE ROOTS EXAMPLES



1. Definition of a “**simplified form**” for a square root → The square root of a positive integer is in “**simplest form**” if the “**radicand**” has no perfect square factor other than one.
2. Have students analyze the following to see if it is true or false: (**ALL ARE TRUE.**)

$$\sqrt{40} = \sqrt{4 \cdot 10} = \sqrt{4} \cdot \sqrt{10} = 2\sqrt{10}$$



3. For any numbers “a” and “b,” where $a \geq 0$ and $b \geq 0$, $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$.

4. **Example:** Simplify → $\sqrt{72}$

The Product Property of Square Roots and prime factorization can be used to simplify radical expressions in which the radicand is not a perfect square.

$$\begin{aligned} &\sqrt{72} \\ &\sqrt{2 \cdot 2 \cdot 2 \cdot 3 \cdot 3} \\ &\sqrt{2} \cdot \sqrt{2^2} \cdot \sqrt{3^2} \\ &\sqrt{2} \cdot 2 \cdot 3 \\ &6\sqrt{2} \end{aligned}$$

Product Property (points to the step $\sqrt{2} \cdot \sqrt{2^2} \cdot \sqrt{3^2}$)

Prime factorization (points to the step $\sqrt{2 \cdot 2 \cdot 2 \cdot 3 \cdot 3}$)

5. **Example:** Simplify → $\sqrt{150}$

The Product Property of Square Roots and prime factorization can be used to simplify radical expressions in which the radicand is not a perfect square.

$$\begin{aligned} &\sqrt{150} \\ &\sqrt{2 \cdot 3 \cdot 5 \cdot 5} \\ &\sqrt{2} \cdot \sqrt{3} \cdot \sqrt{5^2} \\ &\sqrt{2 \cdot 3} \cdot 5 \\ &5\sqrt{6} \end{aligned}$$

Product Property (points to the step $\sqrt{2} \cdot \sqrt{3} \cdot \sqrt{5^2}$)

Prime factorization (points to the step $\sqrt{2 \cdot 3 \cdot 5 \cdot 5}$)

6. When finding the positive square root of an expression containing variables, you must be sure that the result is not negative. **Consider that $5^2 = 25$ and $(-5)^2 = 25$.** When you find $\sqrt{25}$, however, you want only the “**principal square root.**” Therefore, “**absolute values**” are used as needed to ensure “**nonnegative**” results.

$$\sqrt{x^2} = |x|$$

$$\sqrt{x^3} = x\sqrt{x}$$

$$\sqrt{x^4} = x^2$$

$$\sqrt{x^6} = |x^3|$$

7. Point out that to “**simplify**” a square root with a variable, “**absolute value**” symbols are necessary when the variable has an “**even**” exponent and the exponent of its square root is “**odd.**” For example in $\sqrt{x^4} = x^2$, since “**x**” is squared in the answer, it will automatically be positive. In $\sqrt{x^6} = x^3$, in order to guarantee that x^3 is positive, $|x^3|$ is necessary.



8. **Example:** Simplify $\rightarrow \sqrt{81y^2}$

The Product Property of Square Roots and prime factorization can be used to simplify radical expressions in which the radicand is not a perfect square.

Product Property	$\sqrt{81y^2}$	Prime factorization
	$\sqrt{9^2 \cdot y^2}$	
	$\sqrt{9^2} \cdot \sqrt{y^2}$	
	$9 y $	

9. **Example:** Simplify $\rightarrow \sqrt{200a^4b^3}$

The Product Property of Square Roots and prime factorization can be used to simplify radical expressions in which the radicand is not a perfect square.

Product Property	$\sqrt{200a^4b^3}$	Prime factorization
	$\sqrt{2 \cdot 2 \cdot 2 \cdot 5 \cdot 5 \cdot a \cdot a \cdot a \cdot a \cdot b \cdot b \cdot b}$	
	$\sqrt{2} \cdot 2 \cdot 5 \cdot a^2 \cdot b \cdot \sqrt{b}$	
	$10a^2b\sqrt{2b}$	

10. **Example:** Simplify $\rightarrow \sqrt{10} \cdot \sqrt{20}$

$$\begin{aligned} & \sqrt{10} \cdot \sqrt{20} \\ & \sqrt{10 \cdot 20} \\ & \sqrt{10 \cdot 10 \cdot 2} \\ & 10\sqrt{2} \end{aligned}$$



Name: _____

Date: _____

Class: _____

SIMPLIFYING SQUARE ROOTS WORKSHEET

Simplify. Use absolute value symbols when necessary.

1. $\sqrt{8}$

2. $\sqrt{12}$

3. $\sqrt{20}$

4. $\sqrt{24}$

5. $\sqrt{m^2}$

6. $\sqrt{y^6}$

7. $\sqrt{x^5}$

8. $\sqrt{8a^3}$

9. $\sqrt{9a^4}$

10. $\sqrt{4} \cdot \sqrt{9}$

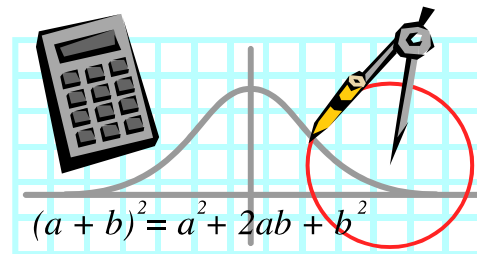
11. $\sqrt{8} \cdot \sqrt{3}$

12. $\sqrt{5} \cdot \sqrt{10}$

13. $\sqrt{11} \cdot \sqrt{11}$

14. $\sqrt{80a^2b^3}$

15. $4\sqrt{5} \cdot 3\sqrt{15}$



SIMPLIFYING SQUARE ROOTS WORKSHEET KEY

Simplify. Use absolute value symbols when necessary.

1. $\sqrt{8}$

$$\begin{array}{l} \sqrt{2 \cdot 2 \cdot 2} \\ \sqrt{2^2 \cdot 2} \\ 2\sqrt{2} \end{array}$$

2. $\sqrt{12}$

$$\begin{array}{l} \sqrt{2 \cdot 2 \cdot 3} \\ \sqrt{2^2 \cdot 3} \\ 2\sqrt{3} \end{array}$$

3. $\sqrt{20}$

$$\begin{array}{l} \sqrt{2 \cdot 2 \cdot 5} \\ \sqrt{2^2 \cdot 5} \\ 2\sqrt{5} \end{array}$$

4. $\sqrt{24}$

$$\begin{array}{l} \sqrt{2 \cdot 2 \cdot 2 \cdot 3} \\ \sqrt{2^3 \cdot 3} \\ 2\sqrt{2 \cdot 3} \\ 2\sqrt{6} \end{array}$$

5. $\sqrt{m^2}$

$$|m|$$

6. $\sqrt{y^6}$

$$\boxed{|y^3|}$$

7. $\sqrt{x^5}$

$$\boxed{\begin{array}{l} \sqrt{x^4 \cdot x} \\ x^2 \sqrt{x} \end{array}}$$

8. $\sqrt{8a^3}$

$$\boxed{\begin{array}{l} \sqrt{2^2 \cdot 2 \cdot a^2 \cdot a} \\ 2a\sqrt{2a} \end{array}}$$

9. $\sqrt{9a^4}$

$$\boxed{\begin{array}{l} \sqrt{3^2 \cdot a^4} \\ 3a^2 \end{array}}$$

10. $\sqrt{4} \cdot \sqrt{9}$

$$\boxed{\begin{array}{l} 2 \cdot 3 \\ 6 \end{array}}$$

11. $\sqrt{8} \cdot \sqrt{3}$

$$\boxed{\begin{array}{l} \sqrt{8 \cdot 3} \\ \sqrt{2^2 \cdot 2 \cdot 3} \\ 2\sqrt{6} \end{array}}$$

12. $\sqrt{5} \cdot \sqrt{10}$

$$\boxed{\begin{array}{l} \sqrt{5 \cdot 10} \\ \sqrt{50} \\ \sqrt{5^2 \cdot 2} \\ 5\sqrt{2} \end{array}}$$

13. $\sqrt{11} \cdot \sqrt{11}$

$$\begin{array}{c} \sqrt{11^2} \\ 11 \end{array}$$

14. $\sqrt{80a^2b^3}$

$$\begin{array}{l} \sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 5 \cdot a^2 \cdot b^2 \cdot b} \\ \sqrt{2^4 \cdot 5 \cdot a^2 \cdot b^2 \cdot b} \\ 4|a|b\sqrt{5b} \end{array}$$

15. $4\sqrt{5} \cdot 3\sqrt{15}$

$$\begin{array}{l} 4 \cdot 3 \cdot \sqrt{5} \cdot \sqrt{15} \\ 12 \cdot \sqrt{75} \\ 12 \cdot \sqrt{5^2 \cdot 3} \\ 12 \cdot 5\sqrt{3} \\ 60\sqrt{3} \end{array}$$

Student Name: _____

Date: _____

SIMPLIFYING SQUARE ROOTS CHECKLIST

1. On question 1, did the student simplify correctly and use absolute value symbols when necessary?
 - a. Yes (15 points)
 - b. Did not use absolute value symbols (10 points)
 - c. Simplified partially (5 points)

2. On question 2, did the student simplify correctly and use absolute value symbols when necessary?
 - a. Yes (15 points)
 - b. Did not use absolute value symbols (10 points)
 - c. Simplified partially (5 points)

3. On question 3, did the student simplify correctly and use absolute value symbols when necessary?
 - a. Yes (15 points)
 - b. Did not use absolute value symbols (10 points)
 - c. Simplified partially (5 points)

4. On question 4, did the student simplify correctly and use absolute value symbols when necessary?
 - a. Yes (15 points)
 - b. Did not use absolute value symbols (10 points)
 - c. Simplified partially (5 points)

5. On question 5, did the student simplify correctly and use absolute value symbols when necessary?
 - a. Yes (15 points)
 - b. Did not use absolute value symbols (10 points)
 - c. Simplified partially (5 points)

6. On question 6, did the student simplify correctly and use absolute value symbols when necessary?
 - a. Yes (15 points)
 - b. Did not use absolute value symbols (10 points)
 - c. Simplified partially (5 points)

7. On question 1, did the student simplify correctly and use absolute value symbols when necessary?
 - a. Yes (15 points)
 - b. Did not use absolute value symbols (10 points)
 - c. Simplified partially (5 points)

8. On question 8, did the student simplify correctly and use absolute value symbols when necessary?
 - a. Yes (15 points)
 - b. Did not use absolute value symbols (10 points)
 - c. Simplified partially (5 points)

9. On question 9, did the student simplify correctly and use absolute value symbols when necessary?
 - a. Yes (15 points)
 - b. Did not use absolute value symbols (10 points)
 - c. Simplified partially (5 points)

10. On question 10, did the student simplify correctly and use absolute value symbols when necessary?
 - a. Yes (15 points)
 - b. Did not use absolute value symbols (10 points)
 - c. Simplified partially (5 points)

11. On question 11, did the student simplify correctly and use absolute value symbols when necessary?
 - a. Yes (15 points)
 - b. Did not use absolute value symbols (10 points)
 - c. Simplified partially (5 points)

12. On question 12, did the student simplify correctly and use absolute value symbols when necessary?
 - a. Yes (15 points)
 - b. Did not use absolute value symbols (10 points)
 - c. Simplified partially (5 points)

13. On question 13, did the student simplify correctly and use absolute value symbols when necessary?

- a. Yes (15 points)
- b. Did not use absolute value symbols (10 points)
- c. Simplified partially (5 points)

14. On question 14, did the student simplify correctly and use absolute value symbols when necessary?

- a. Yes (15 points)
- b. Did not use absolute value symbols (10 points)
- c. Simplified partially (5 points)

15. On question 15, did the student simplify correctly and use absolute value symbols when necessary?

- a. Yes (15 points)
- b. Did not use absolute value symbols (10 points)
- c. Simplified partially (5 points)

Total Number of Points _____