

Algebra Review Notes

Name: Key

Simplifying Radical Expressions

Date: _____ Pd: _____

There are two properties we can use to rewrite radical expressions.

- A. The square root of a product equals the product of the square roots of its factors.

$$\sqrt{ab} = \sqrt{a} \cdot \sqrt{b} \quad \text{Product Property of Radicals}$$

- B. The square root of a quotient equals the quotient of the square roots of its numerator and denominator.

$$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}} \quad \text{Quotient Property of Radicals}$$

These properties can be used to write radical expressions in ***simplest radical form***. An expression with radicals is in ***simplest radical form*** if the following are true.

1. No radicands (expressions under radical signs) have perfect square factors other than 1.

$$\sqrt{8} = \sqrt{4 \cdot 2} = \sqrt{4} \cdot \sqrt{2} = 2\sqrt{2}$$

2. No radicands contain fractions.

$$\sqrt{\frac{3}{4}} = \frac{\sqrt{3}}{\sqrt{4}} = \frac{\sqrt{3}}{2}$$

3. No radicals appear in the denominator of a fraction.

$$\frac{5}{\sqrt{6}} = \frac{5}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{5\sqrt{6}}{\sqrt{36}} = \frac{5\sqrt{6}}{6}$$

Simplify each radical expression. Show all steps and circle your answer.

1. $\frac{\sqrt{75}}{\sqrt{25}\sqrt{3}}$
 $\frac{5\sqrt{3}}{5\sqrt{3}}$

2. $\frac{\sqrt{27}}{\sqrt{9}\sqrt{3}}$
 $\frac{3\sqrt{3}}{3\sqrt{3}}$

3. $\frac{\sqrt{180}}{\sqrt{36}\sqrt{5}}$
 $\frac{6\sqrt{5}}{6\sqrt{5}}$

4. $\frac{-\sqrt{200}}{-\sqrt{100}\sqrt{2}}$
 $\frac{-10\sqrt{2}}{-10\sqrt{2}}$

5. $\frac{\sqrt{49}}{\sqrt{121}}$
 $\frac{7}{11}$

6. $\frac{\sqrt{12}}{\sqrt{81}}$
 $\frac{\sqrt{12}}{\sqrt{81}}$
 $\frac{\sqrt{4}\sqrt{3}}{9}$
 $\frac{2\sqrt{3}}{9}$

7. $\frac{3}{\sqrt{12}}$
 $\frac{3}{\sqrt{4}\sqrt{3}}$
 $\frac{3}{2\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$
 $\frac{3\sqrt{3}}{6}$
 $\frac{\sqrt{3}}{2}$

8. $\frac{8}{\sqrt{18}}$
 $\frac{8}{\sqrt{9}\sqrt{2}}$
 $\frac{8}{3\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$
 $\frac{8\sqrt{2}}{6}$
 $\frac{4\sqrt{2}}{3}$

9. $\frac{\sqrt{1}}{\sqrt{8}}$
 $\frac{\sqrt{1}}{\sqrt{8}}$
 $\frac{1}{\sqrt{4}\sqrt{2}}$
 $\frac{1}{2\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$
 $\frac{\sqrt{2}}{4}$

10. $\frac{\sqrt{3}}{\sqrt{5}}$
 $\frac{\sqrt{3}}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$
 $\frac{\sqrt{15}}{5}$

Perform the indicated operations. Write your answers in SRF.

$$11. \frac{\frac{1}{3}\sqrt{63}}{\frac{\sqrt{9}\sqrt{7}}{3}}$$
$$\frac{3\sqrt{7}}{3}$$
$$\boxed{\sqrt{7}}$$

$$12. 3\sqrt{\frac{5}{6}}$$
$$\frac{3\sqrt{5}}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}}$$
$$\frac{3\sqrt{30}}{6}$$
$$\boxed{\frac{\sqrt{30}}{2}}$$

$$13. \frac{\sqrt{10} \cdot \sqrt{20}}{\sqrt{100} \sqrt{2}}$$
$$\boxed{10\sqrt{2}}$$

$$14. \frac{\sqrt{2} \cdot \sqrt{3} \cdot \sqrt{6}}{\sqrt{36}}$$
$$\boxed{6}$$

$$15. (7\sqrt{3})^2$$
$$49(3)$$
$$\boxed{147}$$

$$16. \left(\frac{2}{3}\sqrt{3}\right)^2$$
$$\frac{4}{9}(3)$$
$$\boxed{\frac{4}{3}}$$

$$17. \frac{2\sqrt{5}}{\sqrt{4}}$$
$$\frac{2\sqrt{5}}{2}$$
$$\boxed{\sqrt{5}}$$

$$18. \frac{6}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$$
$$\frac{6\sqrt{3}}{3}$$
$$\boxed{2\sqrt{3}}$$

$$19. \quad 3 \pm \sqrt{40}$$

$$3 \pm \sqrt{4} \sqrt{10}$$

$$\boxed{3 \pm 2\sqrt{10}}$$

$$20. \quad \frac{-4 \pm \sqrt{32}}{2}$$

$$\frac{-4 \pm \sqrt{16} \sqrt{2}}{2}$$

$$\frac{-4 \pm 4\sqrt{2}}{2}$$

$$\boxed{-2 \pm 2\sqrt{2}}$$

$$21. \quad \frac{-15 \pm \sqrt{50}}{10}$$

$$\frac{-15 \pm \sqrt{25} \sqrt{2}}{10}$$

$$\frac{-15 \pm 5\sqrt{2}}{10}$$

$$\boxed{\frac{-3 \pm \sqrt{2}}{2}}$$

$$22. \quad \frac{-2 \pm \sqrt{(2)^2 - 4(6)(-1)}}{8}$$

$$\frac{-2 \pm \sqrt{4 + 24}}{8}$$

$$\frac{-2 \pm \sqrt{28}}{8}$$

$$\frac{-2 \pm \sqrt{4} \sqrt{7}}{8}$$

$$\frac{-2 \pm 2\sqrt{7}}{8}$$

$$\boxed{\frac{-1 \pm \sqrt{7}}{4}}$$