

Unit 3 - Rational Exponents and Radicals Test Review

Simplify the following expressions. Your answers should contain only positive exponents.

$$\begin{aligned}
 1. & 4a^{-3} \cdot 2a^2r^4 \\
 & 4 \cdot 2 a^{-3} a^2 r^4 \\
 & 8a^{-3+2} r^4 \\
 & 8a^{-1} r^4 \\
 & \boxed{\frac{8r^4}{a}}
 \end{aligned}$$

$$\begin{aligned}
 2. & \frac{18y^{-5}}{9y^2} \\
 & \frac{18}{9} \frac{y^{-5}}{y^2} \\
 & 2y^{-5-2} \\
 & 2y^{-7} \\
 & \boxed{\frac{2}{y^7}}
 \end{aligned}$$

$$\begin{aligned}
 3. & (3x^{-3})^{-3} \\
 & 3^{1 \cdot -3} \cdot x^{-3 \cdot -3} \\
 & 3^{-3} \cdot x^9 \\
 & \boxed{\frac{x^9}{3^3} \text{ or } \frac{x^9}{27}}
 \end{aligned}$$

$$\begin{aligned}
 4. & a^{\frac{1}{4}} \cdot a^{\frac{2}{3}} \\
 & a^{\frac{1}{4} + \frac{2}{3}} \\
 & a^{\frac{11}{12}}
 \end{aligned}$$

$$\begin{aligned}
 5. & \frac{p^1}{p^{\frac{1}{9}}} \\
 & p^{1 - \frac{1}{9}} \\
 & \boxed{p^{\frac{8}{9}}}
 \end{aligned}$$

$$\begin{aligned}
 6. & \left(x^{\frac{2}{7}}\right)^{-\frac{3}{4}} \\
 & x^{\frac{2}{7} \cdot -\frac{3}{4}} \\
 & x^{-\frac{3}{14}} \\
 & \boxed{\frac{1}{x^{\frac{3}{14}}}}
 \end{aligned}$$

Simplify each radical expression.

7. $4\sqrt{32x^3}$ Index is 2

$x \cdot x \cdot x$
yellow calculator

$4\sqrt{32}$

$16\sqrt{2}$

$16x\sqrt{2x}$

8. $\sqrt[3]{54m^5}$ Index of 3

look on prime sheet factor

$\sqrt[3]{54m^5}$

~~$2 \cdot 3 \cdot 3 \cdot 3$~~ ~~$m \cdot m \cdot m \cdot m \cdot m$~~

$3m\sqrt[3]{2m^2}$

9. $-3\sqrt{45}$

~~$3 \cdot 3$~~ $\cdot 5$

$-3 \cdot 3 \sqrt{5}$

$-9\sqrt{5}$

10. $\sqrt{120}$

$12 \cdot 10$

~~$2 \cdot 2$~~ $\cdot 3 \cdot 2 \cdot 5$

$2\sqrt{30}$

11. $\sqrt{81}$

9

yellow calculator

12. $\sqrt{324x^3y^4}$

Index is 2

$\sqrt{324x^3y^4}$

$18xy^2\sqrt{x}$

13. $3\sqrt{56x^5y^2}$

Index is 2

$3\sqrt{56}$ $\sqrt{\cancel{x}\cancel{x}\cancel{x}\cancel{x}y^2}$

$6\sqrt{14}$ $x^2y\sqrt{x}$

$6x^2y\sqrt{14x}$

14. $\sqrt[3]{40x^3y^8}$

Index of 3

$2 \cdot 2 \cdot 2 \cdot 5 \cancel{x}\cancel{x}\cancel{x}$
 $\cancel{y}\cancel{y}\cancel{y}\cancel{y}\cancel{y}\cancel{y}$

$2xy^2\sqrt[3]{5y^2}$

Rewrite each expression in radical form, then simplify if possible.

15. $4^{\frac{5}{2}}$
 ← power
 ← index
 base

$$\sqrt[2]{4^5}$$

$$\sqrt{4 \cdot 4 \cdot 4 \cdot 4 \cdot 4}$$

32

16. $2(ab)^{\frac{2}{7}}$
 ← power
 ← index
 outside inside

$2\sqrt[7]{(ab)^2}$

Rewrite each expression using a rational exponent.

17. $\sqrt[4]{7r}$
 Index ↓ power is 1 (fraction)
 inside

$(7r)^{\frac{1}{4}}$

power index

18. $9\sqrt[3]{x^7}$
 outside

$$9(x)^{\frac{7}{3}}$$

$$9x^{\frac{7}{3}}$$

Rewrite using rational exponents, use the rules of exponents to simplify, then write your answer in radical form.

19. $\sqrt[8]{r^4}$

$$\sqrt[8]{r^4}$$

$$r^{\frac{4}{8}}$$

calculator

$$\frac{4}{8} = \frac{1}{2}$$

$$r^{\frac{1}{2}}$$

\sqrt{r} or $\sqrt[2]{r^1}$

20. $\sqrt[5]{t^4} \cdot \sqrt[10]{t}$

$$\sqrt[5]{t^4} \cdot \sqrt[10]{t}$$

$$t^{\frac{4}{5}} \cdot t^{\frac{1}{10}}$$

$$t^{\frac{4}{5} + \frac{1}{10}}$$

$$t^{\frac{9}{10}}$$

$\sqrt[10]{t^9}$

Add or subtract. Simplify by combining like radical terms, if possible.

21. $\sqrt{75} - 5\sqrt{3}$

$$5\sqrt{3} - 5\sqrt{3}$$

$$\boxed{0}$$

22) $2\sqrt{45} - 9\sqrt{3} + 3\sqrt{20}$

$$6\sqrt{5} - 9\sqrt{3} + 6\sqrt{5}$$

$$\boxed{12\sqrt{5} - 9\sqrt{3}}$$

23. $\sqrt{7} + \sqrt{28} - \sqrt{63}$

$$1\sqrt{7} + 2\sqrt{7} - 3\sqrt{7}$$

$$\boxed{0}$$

Multiply and simplify.

$$\begin{aligned}
 24. \quad & 4\sqrt{3}(5+\sqrt{6}) \\
 & 20\sqrt{3} + 4\sqrt{18} \\
 & 20\sqrt{3} + 12\sqrt{2} \\
 & \boxed{20\sqrt{3} + 12\sqrt{2}}
 \end{aligned}$$

$$\begin{aligned}
 25. \quad & (5+\sqrt{3})(5-\sqrt{3}) \\
 & \begin{array}{cc|cc}
 & 5 & +\sqrt{3} & & \\
 5 & 25 & 5\sqrt{3} & & \\
 -\sqrt{3} & -5\sqrt{3} & -\sqrt{9} & & \\
 & & & -3 & \\
 \hline
 & 25 & +5\sqrt{3} & -5\sqrt{3} & -3 \\
 & & & & 25-3 \\
 & & & & \boxed{22}
 \end{array}
 \end{aligned}$$

$$\begin{aligned}
 26. \quad & (-6\sqrt{12})(2\sqrt{3}) \\
 & -6 \cdot \sqrt{12} \cdot 2\sqrt{3} \\
 & -6 \cdot 2 \cdot \sqrt{12} \cdot 3 \\
 & -12\sqrt{36} \\
 & -12 \cdot 6 \\
 & \boxed{-72}
 \end{aligned}$$