

Exponents and Radicals

First & Last Name: _____ Class: _____

If you did not get full points on the *Exponents and Radicals* section of the “Pre-Review” test, attempt all of the (non-challenge) questions on this handout. Check your answers using the answer key. If you did not get a correct answer, use Khan Academy to review and master the topic.

Honor Students: you are expected to master the challenge questions.

Section 1: Multiply and divide powers (integer exponents) (KA link)

1. Rewrite the following expressions in the form b^n .

a. $\frac{y^5}{y^8}$ b. $\frac{7^{-3}}{7^{15}}$ c. $\frac{x^3}{x^7}$ d. $(7^{-3})(7^{15})$ e. $z^{-9} \cdot z^{-21}$ f. $y^{-3}y^2$

Section 2: Powers of products and quotients (integer exponents) (KA link)

1. Simplify the following expressions as much as possible.

a. $(x^{-5} \cdot y^{-4})^{-6}$ b. $(x^3 \cdot y^6)^{-3}$

2. Select the expression equivalent to $(4^4 \cdot 5^5)^{-3}$

a. $\frac{5^{15}}{4^{12}}$ b. $\frac{4^{12}}{5^{15}}$ c. $\frac{1}{4^{12} \cdot 5^{15}}$

Section 3: Properties of exponents challenge (integer exponents) (KA link)

1. Explain the mistake in simplifying the following expression, if any:

$$(5^{-3} \cdot 5^{-4})^3 = (5^{-7})^3 = 5^{-4} = \frac{1}{5^4}$$

Section 4: Square roots (KA link)

1. Simplify the following square root expressions.

a. $\sqrt{169}$ b. $\sqrt{225}$ c. $\sqrt{\pi^2}$ d. $\sqrt{\sqrt{16}}$

Section 5: Cube roots (KA link)

1. Simplify the following cube root expressions.

a. $\sqrt[3]{216}$ b. $\sqrt[3]{64}$ c. $\sqrt[3]{1728}$ d. $\sqrt[3]{y^3}$

Section 6: Roots of decimals and fractions (KA link)

1. Simplify the following square root expressions.

a. $\sqrt{\frac{169}{25}}$ b. $\sqrt{.04}$ c. $\sqrt{1.21}$ d. $\sqrt{\frac{196}{81}}$

Section 7: 4th and 5th roots (KA link)

1. Simplify the following radical expressions.

a. $\sqrt[4]{1296}$ b. $\sqrt[4]{.0081}$ c. $\sqrt[5]{1024}$ d. $\sqrt[5]{\frac{32}{243}}$

Section 8: Unit-fraction exponents (KA link)

1. Rewrite the following radical expressions in exponential form.

a. \sqrt{t} b. $\sqrt[4]{x}$ c. $\sqrt[5]{1/y}$ d. $\sqrt[6]{x/y}$

Section 9: Fractional exponents (KA link)

1. Rewrite the following radical expressions in exponential form.

a. $\sqrt{t^3}$ b. $\sqrt[4]{x^5}$ c. $\sqrt[5]{1/y^2}$ d. $\sqrt[6]{(x/y)^4}$

Section 10: Rational exponents challenge (KA link)

1. Which expressions are equivalent to $(w^{-1})^{1/7}$? Choose all answers that apply.

a. $(\sqrt[7]{w})^{-1}$ b. $w^{-1/7}$ c. $(w^{1/7})^{-1}$ d. None of these.

2. Which expressions are equivalent to $\sqrt[5]{v^{-3}}$? Choose all answers that apply.

a. $(\frac{1}{v^{-3}})^{-1/5}$ b. $(\sqrt[3]{v})^{-5}$ c. $v^{-3/5}$ d. None of these.

Section 11: Properties of exponents (rational exponents) (KA link)

1. Rewrite the following expressions in the form z^n .

a. $\frac{1}{z^{-1/3}}$ b. $\frac{z^{-1/7}}{z^2}$ c. $z^{3/5} z^{1/3}$ d. $(z^{-4/3})^{-6/7}$

Section 12: Properties of exponents challenge (rational exponents) (KA link)

1. Rewrite the following expressions in the form kx^n .

a. $3\sqrt{r} \cdot 5r^{-7/2}$ b. $\frac{8\sqrt[4]{w}}{3w^3}$ c. $\frac{y^{-1/2}}{\sqrt[3]{1/y^2}}$

2. Rewrite the following expressions as a sum of terms, where each term is in the form kx^n .

a. $\sqrt[3]{x} \left(2x^3 - \frac{4}{x}\right)$ b. $\frac{5x^6 - 3x^2 + x}{\sqrt[3]{x}}$ c. $\frac{2\sqrt{x} - x^{-1/2}}{\sqrt[3]{8x}}$

Section 13: Evaluate radical expressions challenge (KA link)

1. Evaluate.

a. $\sqrt[5]{\frac{1}{4}} \cdot \sqrt[5]{128}$ b. $1875^{1/4} \sqrt[4]{\frac{1}{3}}$ c. $\sqrt[3]{-686} \cdot 2^{1/3}$ d. $\frac{32^{-29/30}}{32^{-1/6}}$

Section 14: Simplify square roots (KA link)

1. Simplify (remove all the perfect squares from inside the square root).

a. $\sqrt{80}$ b. $\sqrt{363}$ c. $\sqrt{1764}$ d. $\sqrt{588}$

Section 15: Simplify square roots (variables) (KA link)

1. Simplify (remove all the perfect squares from inside the square root).

a. $\sqrt{98x^5}$ b. $\sqrt{30z^9}$ c. $\sqrt{32y^{11}}$

Section 16: Simplify square-root expressions (KA link)

1. Simplify.

a. $\sqrt{72x^5y^7}$ b. $\sqrt{32y^{13}z^9}$ c. $\sqrt{3y^4} \cdot \sqrt{7x^3} \cdot \sqrt{15}$