

Radicals and Rational Exponents Made Clear

Grade 11 – Algebra 2 math · Worksheet · Standards: N-RN.A.1, N-RN.A.2, A-REI.A.2

Name: _____ Date: _____ Class: _____

These problems build skill with n th roots and rational exponents, and then use them to solve radical equations. They follow Common Core standards N-RN.A.1, N-RN.A.2, and A-REI.A.2.

The set moves from evaluating and converting forms to simplifying radicals and exponent expressions, then to equations in which squaring can create an extraneous solution. Always substitute candidates back into the original equation.

Standards: N-RN.A.1, N-RN.A.2, A-REI.A.2 · **Level:** Grade 11 Algebra 2

Problem 1 Evaluating roots (easy)

Evaluate each root.

- a. $\sqrt[3]{-125}$
- b. $\sqrt[4]{81}$
- c. $\sqrt[49]{64}$
- d. $\sqrt[5]{32}$

Problem 2 Evaluating rational exponents (easy)

Evaluate each expression without a calculator.

- a. $25^{1/2}$
- b. $8^{2/3}$
- c. $16^{3/4}$
- d. $49^{3/2}$

Problem 3 Radical form to exponent form (easy)

Rewrite each expression using a rational exponent.

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

Problem 4 Exponent form to radical form (easy)

Rewrite each expression as a radical.

- a. $x^{1/3}$
- b. $y^{5/2}$
- c. $7^{3/4}$

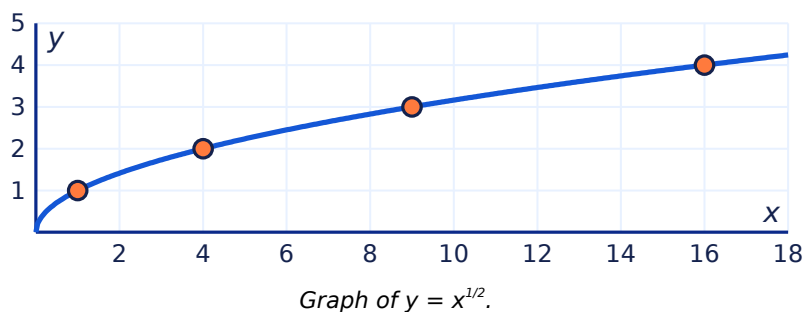
Problem 5 Simplifying numeric radicals (easy)

Simplify each radical.

- a. $\sqrt{162}$
- b. $\sqrt[3]{40}$
- c. $\sqrt{(1,176)}$

Problem 6 Reading a root graph (medium)

The graph of $y = x^{1/2}$ is shown. Use it to find $9^{1/2}$ and $4^{1/2}$. Then state two consecutive integers between which $12^{1/2}$ lies, and check with a calculation.



Problem 7 Properties of rational exponents (medium)

Simplify each expression. Assume $x > 0$.

- a. $x^{1/2} \cdot x^{1/3}$
- b. $(x^{2/3})^{3/4}$
- c. $x^{3/4} / x^{1/4}$

Problem 8 Radicals with variables (medium)

Simplify. Assume all variables are positive.

- a. $\sqrt{(18x^5)}$
- b. $\sqrt[3]{(54a^4)}$

Problem 9 Combining like radicals (medium)

Simplify $5\sqrt{12} - 2\sqrt{27} + \sqrt{75}$.

Problem 10 Multiplying radical expressions (medium)

Multiply and simplify.

- a. $(3 + \sqrt{5})(3 - \sqrt{5})$
- b. $(2\sqrt{3} + 1)^2$

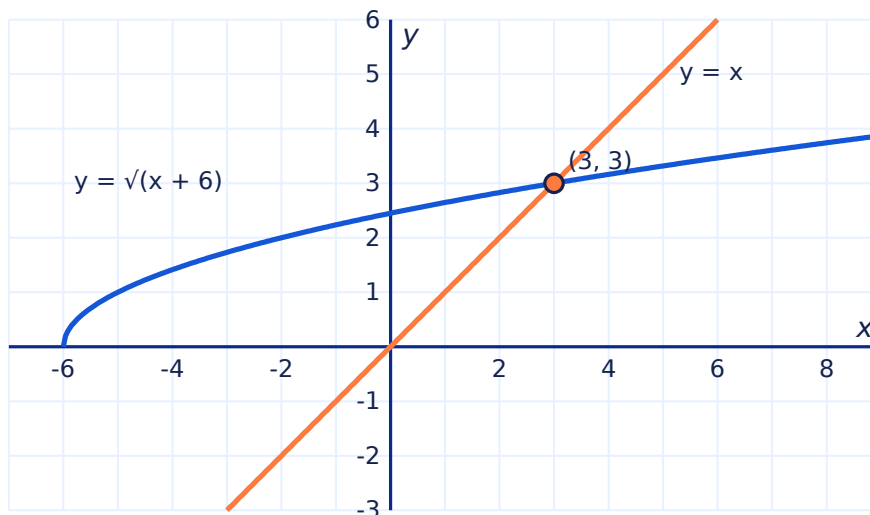
Problem 11 Rationalizing denominators (medium)

Write each expression with a rational denominator.

- a. $\frac{6}{\sqrt{8}}$
- b. $\frac{5}{(\sqrt{7} - 2)}$

Problem 12 Solving with a graph (medium)

Solve $\sqrt{x + 6} = x$ algebraically. Use the figure to explain which candidate is extraneous.



Graphs of $y = \sqrt{x + 6}$ and $y = x$.

Problem 13 Single radical equations (medium)

Solve each equation and check.

- a. $\sqrt{3x - 5} = 4$
- b. $\sqrt[3]{2x + 1} = -3$

Problem 14 An extraneous solution (hard)

Solve $\sqrt{2x + 9} = x + 3$. Check every answer.

Problem 15 Isolating a radical first (hard)

Solve $\sqrt{x + 14} - x = 2$.

Problem 16 Two radicals (hard)

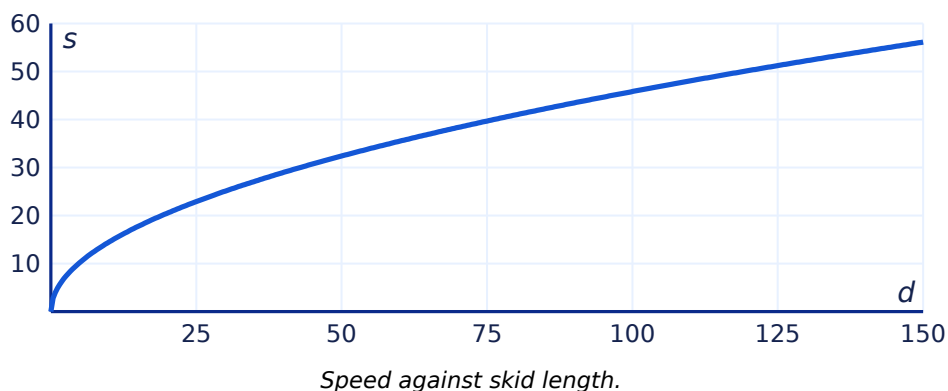
Solve $\sqrt{x + 5} + \sqrt{x} = 5$.

Problem 17 A rational exponent equation (hard)

Solve $(x - 4)^{2/3} = 9$. Check each answer in the original equation.

Problem 18 Skid marks and speed (hard)

An investigator estimates a car's speed s (mph) from the length d (feet) of its skid with $s = \sqrt{21d}$. Find the skid length for a speed of 42 mph and the exact speed, in simplest radical form, for a 147-foot skid.

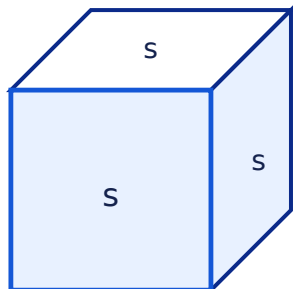
**Problem 19 Distance to the horizon** (hard)

From a lookout that is h feet above the ground, the distance to the horizon is $d = \sqrt{1.5h}$ miles. A ranger on a fire tower sees the horizon 12 miles away. How tall is the tower? How far is the horizon for a hiker whose eyes are 6 feet above the ground?

Problem 20 Side of a cube (hard)

A shipping crate shaped like a cube holds 2,744 cubic inches. Use a cube root, written as a

rational exponent, to find the side length, and then find the surface area of the crate.



$$\text{volume} = s^3$$

A cube with side s .