

Algebra 2 · Radicals and Rational Exponents · Worksheet

Common Core N-RN.A.1, N-RN.A.2, A-REI.A.2 · mathovore.fr

Name: _____ Date: ____/____/____ Score: _____

These 26 problems practice n th roots, rational exponents, simplifying radicals and solving radical equations, following Common Core N-RN.A.1, N-RN.A.2 and A-REI.A.2. The early problems evaluate roots and convert between radical and exponent forms.

The middle problems simplify and combine radicals and solve equations while checking for extraneous solutions. The last six apply radicals to pendulums, falling objects, skid marks, horizons, boxes and bike values.

Algebra 2 Common Core: N-RN.A.1 · N-RN.A.2 · A-REI.A.2

Problem 1: Evaluate n th roots

Find each root.

- a. $\sqrt{169}$
- b. $\sqrt[3]{-64}$
- c. $\sqrt[4]{16}$
- d. $\sqrt[5]{-32}$

Problem 2: Real or not real

Find each root, or state that it is not a real number.

- a. $\sqrt{-49}$
- b. $\sqrt[3]{-343}$
- c. $\sqrt[4]{-81}$
- d. $\sqrt[5]{-1}$

Problem 3: Radical to exponent form

Write each expression with a rational exponent.

- a. $\sqrt[3]{x}$
- b. $\sqrt[5]{y^2}$

- c. $(4\sqrt{2})^3$
 d. $\sqrt[4]{7^3}$

Problem 4: Exponent to radical form

Write each expression as a radical.

- a. $5^{1/2}$
 b. $x^{2/3}$
 c. $(3a)^{3/4}$
 d. $2m^{1/3}$

Problem 5: Evaluate rational exponents

Evaluate each expression without a calculator.

- a. $25^{1/2}$
 b. $64^{1/3}$
 c. $16^{3/4}$
 d. $8^{2/3}$
 e. $32^{3/5}$

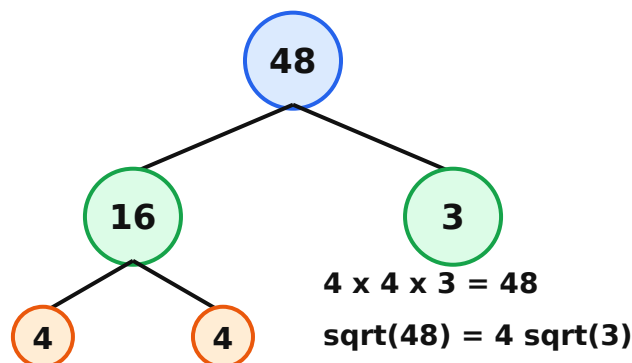
Problem 6: Negative rational exponents

Evaluate each expression.

- a. $9^{-1/2}$
 b. $27^{-2/3}$
 c. $16^{-3/4}$
 d. $\left(\frac{1}{4}\right)^{-3/2}$

Problem 7: Simplify square roots

Write each radical in simplest form. The factor tree helps with part a.



Factor tree for 48.

- a. $\sqrt{48}$
- b. $\sqrt{90}$
- c. $\sqrt{200}$
- d. $\sqrt{75}$

Problem 8: Simplify higher roots

Write each radical in simplest form.

- a. $\sqrt[3]{24}$
- b. $\sqrt[3]{250}$
- c. $\sqrt[3]{-54}$
- d. $\sqrt[4]{48}$

Problem 9: Radicals with variables

Simplify. Assume every variable is positive.

- a. $\sqrt{18x^5}$
- b. $\sqrt[3]{16y^7}$
- c. $\sqrt{50a^3b^4}$
- d. $\sqrt[3]{54m^5n^9}$

Problem 10: Multiply radicals

Multiply and simplify.

- a. $\sqrt{6} \cdot \sqrt{10}$
- b. $\sqrt[3]{4} \cdot \sqrt[3]{6}$
- c. $(3\sqrt{2})(5\sqrt{14})$
- d. $(2\sqrt{3})(\sqrt{6})$

Problem 11: Add and subtract radicals

Simplify each radical first, then combine like radicals.

- a. $3\sqrt{12} + \sqrt{27}$
- b. $5\sqrt{8} - 2\sqrt{18}$
- c. $\sqrt[3]{16} + \sqrt[3]{54}$
- d. $\sqrt{20} - \sqrt{45} + \sqrt{5}$

Problem 12: Rationalize denominators

Rationalize the denominator and simplify.

- a. $\frac{6}{\sqrt{3}}$
- b. $\frac{5}{\sqrt{10}}$
- c. $\frac{4}{\sqrt{7}-\sqrt{3}}$
- d. $\frac{3}{\sqrt[3]{2}}$

Problem 13: Exponent properties

Simplify. Assume every variable is positive.

- a. $x^{1/2} \cdot x^{1/3}$
- b. $(y^{2/3})^{3/4}$
- c. $\frac{x^{5/4}}{x^{1/4}}$
- d. $(8a^3)^{2/3}$

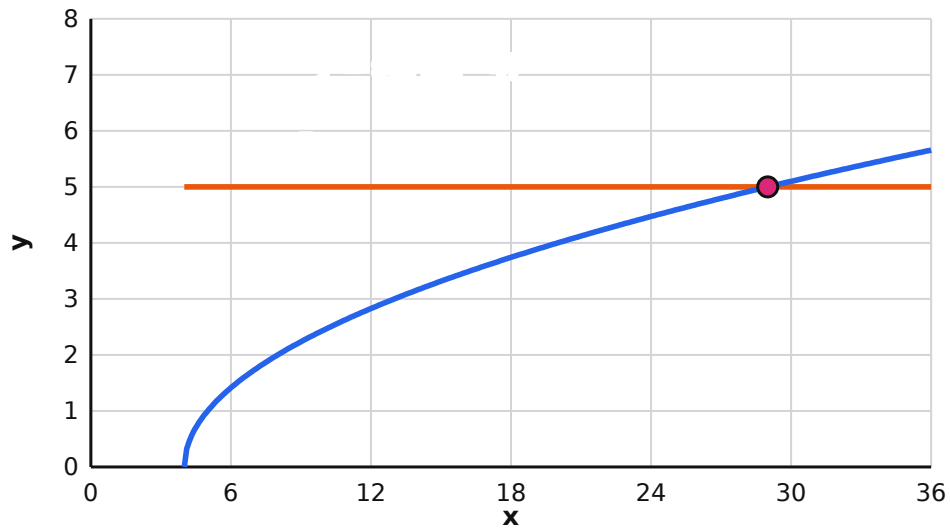
Problem 14: Change the index

Simplify each expression. Assume x is positive.

- a. $\sqrt[6]{x^4}$
- b. $\sqrt[4]{9}$
- c. $\sqrt[3]{\sqrt{64}}$
- d. $\sqrt{\sqrt[3]{x^{12}}}$

Problem 15: One-step radical equations

Solve each equation. The graph shows part c.



The curve $y = \sqrt{x-4}$ meets the line $y = 5$ at one point.

- a. $\sqrt{x} = 7$
- b. $\sqrt[3]{x} = -3$
- c. $\sqrt{x-4} = 5$
- d. $\sqrt{2x+1} = 9$

Problem 16: Check for extraneous solutions

Solve $\sqrt{3x+4} = x$ and check every answer in the original equation.

Problem 17: Radical on the right

Solve $x-2 = \sqrt{x+4}$. Identify any extraneous solution.

Problem 18: Isolate the radical first

Solve each equation, or state that there is no solution.

- a. $\sqrt{x+5} - 3 = 4$
- b. $2\sqrt{x-1} + 3 = 11$
- c. $\sqrt[3]{2x-5} + 1 = 4$
- d. $\sqrt{x+7} + 5 = 3$

Problem 19: Rational exponent equations

Solve each equation. Check every answer.

- a. $x^{3/2} = 27$
- b. $x^{2/3} = 16$
- c. $x^{1/4} = 3$

d. $(x-1)^{2/3} = 4$

Problem 20: Equations with two radicals

Solve each equation and check.

a. $\sqrt{2x+3} = \sqrt{x+7}$

b. $\sqrt[3]{x+4} = \sqrt[3]{3x-10}$

c. $\sqrt{5x-1} = \sqrt{2x+8}$

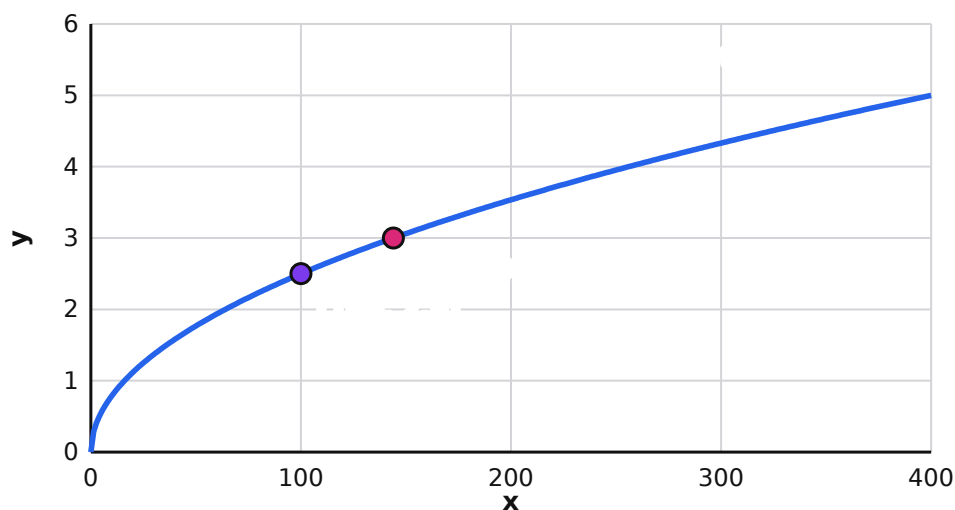
Problem 21: Pendulum period

The period T (in seconds) of a pendulum of length L feet is $T = 2\pi\sqrt{\frac{L}{32}}$. Mei's clock pendulum is 8 feet long.

- Find the exact period and round it to the nearest hundredth.
- Find the length with period 2π seconds.
- Find the length with period 4π seconds.

Problem 22: Free fall time

An object dropped from a height of h feet hits the ground after $t = \sqrt{\frac{h}{16}}$ seconds. Liam drops a ball from a roof.



Fall time t (seconds) against height h (feet).

- Find the fall time from 144 feet.
- The ball takes 2.5 seconds. Find the height.
- Find the fall time from 400 feet.

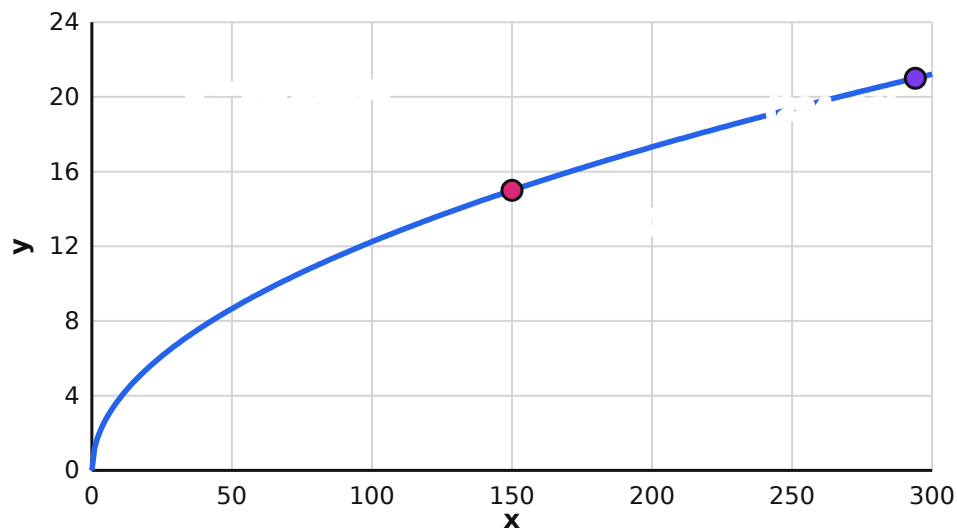
Problem 23: Skid marks

Police estimate a car's speed s (mph) from its skid distance d (feet) and the road's friction factor f using $s = \sqrt{30fd}$.

- Find the speed when $f = 0.75$ and $d = 40$.
- A car was going 45 mph on a road with $f = 0.6$. Find the skid distance.
- Find the exact speed, and the speed to the nearest hundredth, when $f = 0.8$ and $d = 30$.

Problem 24: Distance to the horizon

A lookout at height h feet can see $d = \sqrt{1.5h}$ miles to the horizon.



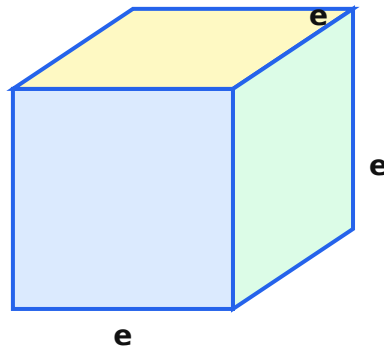
Distance d (miles) against height h (feet).

- How far can Aisha see from a tower 150 feet high?
- How high must a tower be to see 21 miles?
- How far can a sailor see from a deck 6 feet above the water?

Problem 25: Cube-shaped box

A cube-shaped storage box holds 250 cubic inches. Ethan needs its edge length e .

$$V = 250 \text{ cubic inches}$$



A cube with volume 250 in^3 .

- Write the exact edge length in simplest radical form.
- Round the edge length to the nearest hundredth of an inch.
- Find the area of one face, exactly and rounded to the nearest hundredth.

Problem 26: Bike value

Noah's bike is worth $V = 900(0.64)^{t/2}$ dollars after t years.

- Find its value after 1 year.
- Find its value after 3 years.
- After how many years is it worth \$576?
- Find its value after 5 years, to the nearest cent.