

Algebra 1 · Exponent Rules, Radicals and Rational Exponents · Worksheet

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

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

These twenty-five problems practice Common Core standards N-RN.A.1 and N-RN.A.2. Simplify expressions with integer exponents and variables, move between radical and rational exponent forms, and evaluate powers such as $8^{2/3}$. Square roots are simplified by hand.

The last six problems are word problems and multi-step tasks. Work from easiest to hardest and check each answer.

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

Problem 1: Evaluate powers

Evaluate each expression.

- a. 3^4
- b. $(-2)^3$
- c. -5^2

Problem 2: Pattern of powers of 10

Complete the table of powers of 10. Each step to the right divides by 10.

n	3	2	1	0	-1	-2
10^n	1,000	100	10	?	?	?



Powers of 10 with three unknown values.

Problem 3: Product rule

Simplify each expression.

- a. $x^6 \cdot x^3$
- b. $a \cdot a^4$
- c. $y^2 \cdot y^5 \cdot y$

Problem 4: Quotient rule

Simplify each expression. Assume no variable equals 0.

- a. $\frac{x^{12}}{x^5}$
- b. $\frac{m^7}{m^8}$
- c. $\frac{b^6}{b^6}$

Problem 5: Power of a power

Simplify each expression.

- a. $(y^4)^3$
- b. $(x^5)^2$
- c. $(z^2)^6$

Problem 6: Power of a product

Simplify each expression.

- a. $(2a^3)^4$
- b. $(-3x^2)^3$
- c. $(5pq^2)^2$

Problem 7: Coefficients and variables

Simplify each product.

- a. $3x^2 \cdot 4x^5$
- b. $(-2a^3b)(5ab^4)$
- c. $(7y^2)(-y^6)$

Problem 8: Dividing monomials

Simplify each quotient. Assume no variable equals 0.

- a. $\frac{20m^8}{5m^3}$
- b. $\frac{36x^5y^4}{12xy^2}$
- c. $\frac{-18a^9}{6a^9}$

Problem 9: Negative exponents

Rewrite each expression with positive exponents and simplify.

- a. $4x^{-3}$
- b. $\frac{5}{m^{-2}}$
- c. 2^{-5}

Problem 10: Mixed exponent rules

Simplify. Write each answer with positive exponents.

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

Problem 11: Unit-fraction exponents

Evaluate each expression.

- a. $25^{1/2}$
- b. $64^{1/3}$
- c. $81^{1/4}$

Problem 12: Radicals to exponents

Write each expression using a rational exponent.

- a. $\sqrt{7}$
- b. $\sqrt[3]{x^5}$
- c. $(\sqrt[4]{a})^3$

Problem 13: Exponents to radicals

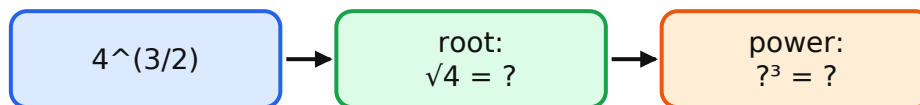
Write each expression as a radical.

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

Problem 14: Rational powers

Evaluate each expression. Use the figure for part (b).

- a. $8^{2/3}$
- b. $4^{3/2}$
- c. $81^{3/4}$



Two steps: root first, then power.

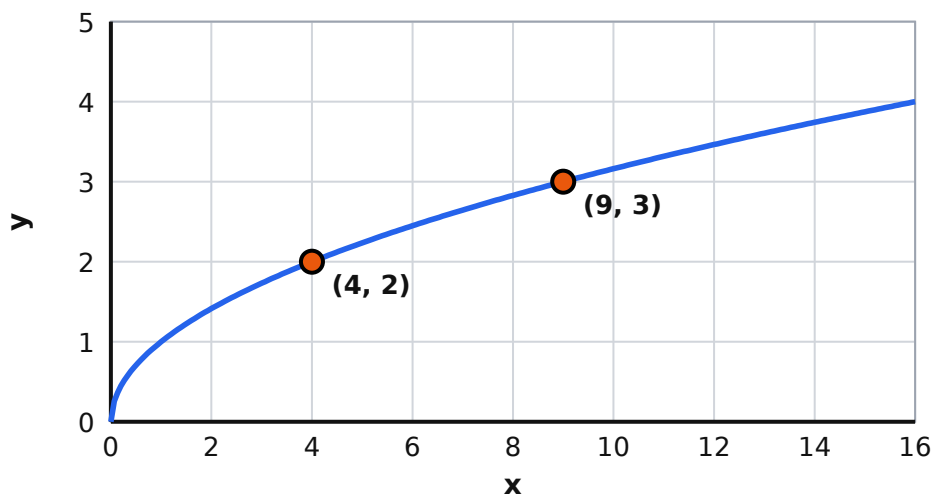
Problem 15: Negative rational powers

Evaluate each expression.

- a. $27^{-2/3}$
- b. $16^{-1/2}$
- c. $32^{-3/5}$

Problem 16: Reading a graph

The graph shows $y = x^{1/2}$.



The graph of $y = x^{1/2}$.

- a. Find $9^{1/2}$ from the graph.
- b. Use the graph to estimate $10^{1/2}$.
- c. Find the value of x when $y = 4$.

Problem 17: Simplify numeric square roots

Write each radical in simplest form.

- a. $\sqrt{50}$

- b. $\sqrt{48}$
- c. $\sqrt{200}$

Problem 18: Rational exponent rules

Simplify. Assume $x > 0$.

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

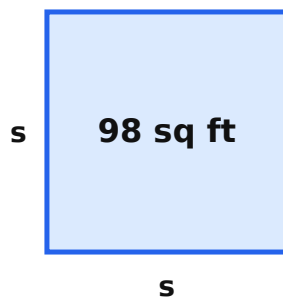
Problem 19: Square roots with variables

Simplify. Assume every variable is positive.

- a. $\sqrt{x^6}$
- b. $\sqrt{18x^4}$
- c. $\sqrt{75a^5}$

Problem 20: Square garden

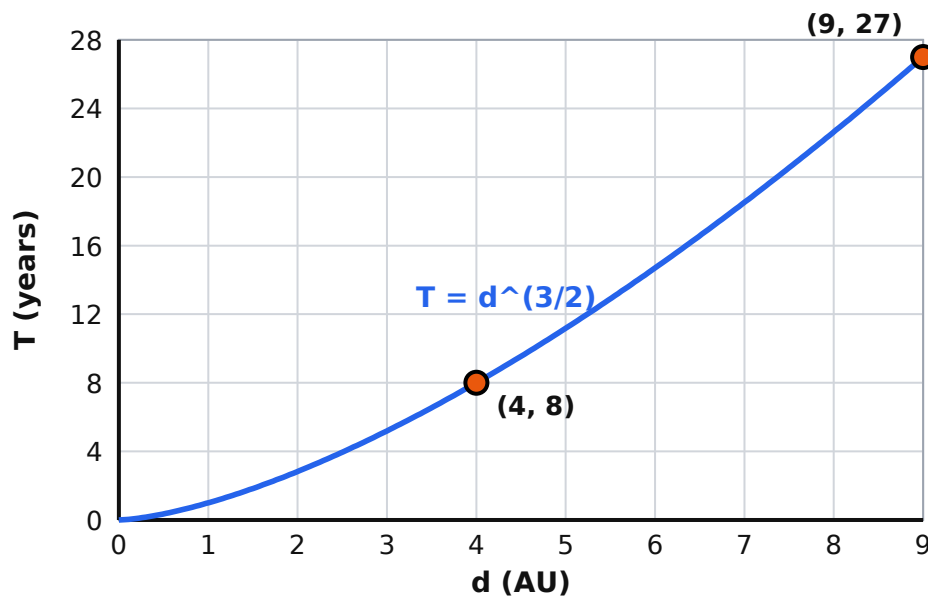
Maya's square garden has an area of 98 square feet. Find the side length in simplest radical form and to the nearest tenth of a foot. Then find the length of fencing needed to go around the garden, to the nearest tenth.



Maya's garden: area 98 square feet.

Problem 21: Orbit model

In a model of a distant star system, a planet that orbits at distance d astronomical units (AU) from its star has a period of $T = d^{3/2}$ years.

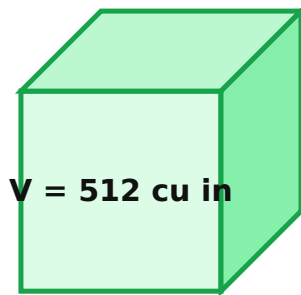


Orbital period T (years) against distance d (AU).

- Find T when $d = 4$ and when $d = 9$. Compare with the graph.
- A second planet has a period of 64 years. Find its distance d .

Problem 22: Cube crate

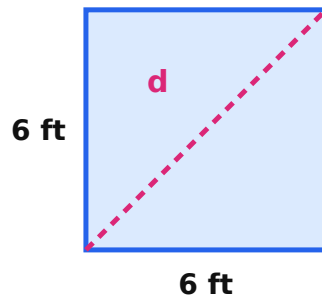
A cube-shaped crate holds 512 cubic inches. Find the edge length using a rational exponent. Then find the total outside surface area of the crate.



A cube-shaped crate.

Problem 23: Patio diagonal

Ethan lays a square patio with 6-foot sides. He wants a rope along the diagonal. Use the Pythagorean theorem to find the diagonal length in simplest radical form and to the nearest tenth.



A square patio, 6 ft on each side.

Problem 24: Find the errors

Two students made mistakes. Explain each mistake and give the correct answer.

- a. Jamal wrote $(2x^3)^3 = 6x^9$.
- b. Aisha wrote $16^{3/2} = 24$ because $16 \cdot \frac{3}{2} = 24$.

Problem 25: Cube with a variable edge

A cube has volume $27x^6$ cubic units, where $x > 0$. Find the edge length as a simplified expression. Then write the surface area of the cube.