

Working with Exponents, Roots and Fractional Powers

Grade 9 – Algebra 1 math · Worksheet · Standards: N-RN.A.1, N-RN.A.2

Name: _____ Date: _____ Class: _____

These problems train the integer exponent rules with variables, the meaning of rational exponents such as $8^{(2/3)}$, and rewriting between radical and exponent forms (N-RN.A.1 and N-RN.A.2). Simplifying square roots is included. The last six problems use exponents and radicals in contexts: file sizes, garden fences, half-life, falling objects and a ladder. Give exact answers first, then decimals.

Standards: N-RN.A.1, N-RN.A.2 · **Level:** Grade 9 Algebra 1

Problem 1 Product of powers (easy)

Simplify $x^3 \cdot x^5$.

Problem 2 Quotient of powers (easy)

Simplify x^9 / x^4 .

Problem 3 Power of a power (easy)

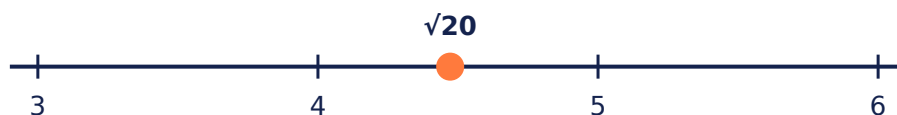
Simplify $(x^2)^6$.

Problem 4 Negative exponent (easy)

Write 3^{-2} as a fraction.

Problem 5 Between two integers (easy)

Between which two consecutive integers does $\sqrt{20}$ lie? Use the number line.



The point $\sqrt{20}$ on the number line.

Problem 6 Multiply monomials (medium)

Simplify $(3x^2y^3)(4x^5y)$.

Problem 7 Divide monomials (medium)

Simplify $18a^7b^2/6a^3b^5$ using positive exponents.

Problem 8 Power of a product (medium)

Simplify $(2x^3)^4$ and $(-3x^2)^3$.

Problem 9 Positive exponents only (medium)

Rewrite $(x^{-3}y^2)/(z^{-4})$ with only positive exponents.

Problem 10 Rational exponent evaluation (medium)

Evaluate $8^{2/3}$ and $16^{3/4}$.

Problem 11 Radical and exponent forms (medium)

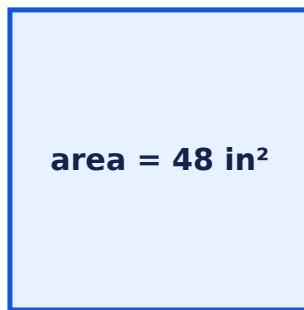
Rewrite in the other form. (a) $\sqrt[3]{x^5}$ (b) $\sqrt{x}$ (c) $y^{3/2}$.

Problem 12 Simplify a square root (medium)

Simplify $\sqrt{72}$.

Problem 13 Square side length (medium)

A square has area 48 square inches. Find its side length in simplest radical form and to the nearest hundredth.



side = ?

A square with the given area.

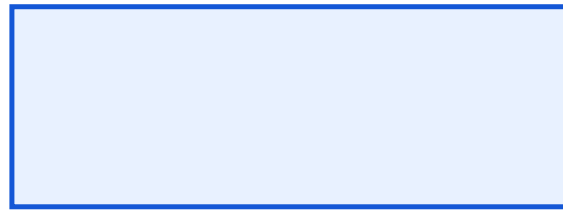
Problem 14 Radical with a variable (medium)

Simplify $\sqrt{18x^6}$ for $x \geq 0$.

Problem 15 Rectangle with radical sides (hard)

A rectangle has width $\sqrt{8}$ feet and length $\sqrt{18}$ feet. Find its exact area and exact perimeter.

$\sqrt{8}$ ft



$\sqrt{18}$ ft

A rectangle with radical side lengths.

Problem 16 File sizes (hard)

A file of 2^{13} bytes is copied 2^7 times. How many bytes in total, written as a power of 2 and as a number? Then divide the total evenly among 2^5 drives.

Problem 17 Square garden fence (hard)

A square garden has area 200 square feet. Find its side length and the length of fence needed around it, in simplest radical form and to the nearest hundredth.

Problem 18 Half-life (hard)

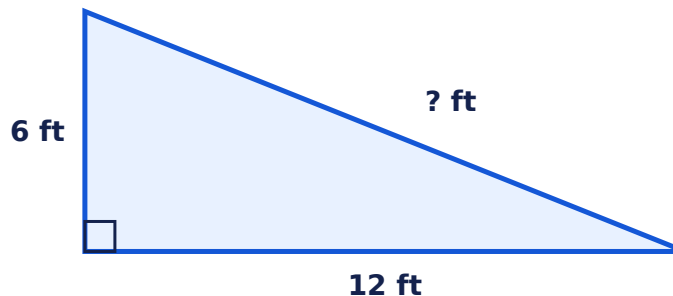
A sample's mass in grams is $A = 64(1/2)^{t/6}$ after t days. Find the mass at $t = 18$ and at $t = 9$ in exact form, and approximate the second.

Problem 19 Falling object (hard)

The time in seconds for an object to fall d feet is $t = \sqrt{d/16}$. Find t for a 72-foot drop in simplest radical form and to the nearest hundredth, and for a 100-foot drop.

Problem 20 Ladder against a wall (hard)

A ladder rests against a wall. Its base is 6 feet from the wall and it reaches 12 feet up the wall. Find the length of the ladder in simplest radical form and to the nearest hundredth.



A right triangle.