

Algebra 2 - Radicals and Rational Exponents - Answer Key

Common Core N-RN.A.1, N-RN.A.2 · maths-pdf.fr/en/

Every worksheet problem on radicals and rational exponents is solved here, one step at a time. Compare your method as well as your final answer, because the steps show where swapping the root index and the power can go wrong. Final answers appear in bold so you can find them quickly when you only need a check.

Algebra 2 · Common Core State Standards: **N-RN.A.1, N-RN.A.2**

Exercise 1 - Radical form

The denominator 3 is the index of the root: $5^{1/3} = \sqrt[3]{5}$.

$$\sqrt[3]{5}$$

Exercise 2 - Exponent form

The index 4 becomes the denominator and the power 3 becomes the numerator.

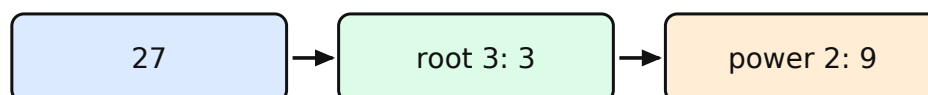
$$x^{3/4}$$

Exercise 3 - Square root

$$49^{1/2} = \sqrt{49} = 7.$$

$$7$$

Exercise 4 - Root then power



Evaluate $27^{2/3}$ in two moves: root first, then power.

$$\sqrt[3]{27} = 3, \text{ then } 3^2 = 9.$$

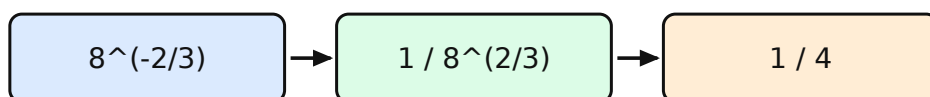
9

Exercise 5 - Fourth root

$$\sqrt[4]{16} = 2, \text{ then } 2^3 = 8.$$

8

Exercise 6 - Negative rational exponent



Reciprocal first, then root 2 and power 2.

$$8^{-2/3} = \frac{1}{8^{2/3}} = \frac{1}{(\sqrt[3]{8})^2} = \frac{1}{2^2}.$$

$\frac{1}{4}$

Exercise 7 - Fraction base

$$\sqrt{\frac{1}{25}} = \frac{1}{5}, \text{ then } \left(\frac{1}{5}\right)^3 = \frac{1}{125}.$$

$\frac{1}{125}$

Exercise 8 - Multiply powers

$$\text{Add the exponents: } \frac{2}{3} + \frac{1}{6} = \frac{4}{6} + \frac{1}{6} = \frac{5}{6}.$$

$x^{5/6}$

Exercise 9 - Power of a power

$$\text{Multiply the exponents: } \frac{3}{4} \cdot \frac{2}{3} = \frac{6}{12} = \frac{1}{2}.$$

$y^{1/2} = \sqrt{y}$

Exercise 10 - Divide powers

Subtract the exponents: $\frac{7}{6} - \frac{1}{2} = \frac{7}{6} - \frac{3}{6} = \frac{2}{3}$.

$$x^{2/3}$$

Exercise 11 - Power of a product

$81^{1/4} = 3$ and $(x^8)^{1/4} = x^2$.

$$3x^2$$

Exercise 12 - Two radicals

$x^{1/2} \cdot x^{1/3} = x^{3/6 + 2/6}$.

$$x^{5/6}$$

Exercise 13 - Two variables

For a : $\frac{2}{3} - (-\frac{1}{3}) = 1$. For b : $-\frac{1}{2} - \frac{1}{2} = -1$.

So the expression is $a^1 b^{-1}$.

$$\frac{a}{b}$$

Exercise 14 - Solve a power equation

Raise both sides to the reciprocal power $2/3$: $(x^{3/2})^{2/3} = 27^{2/3}$.

$x = (\sqrt[3]{27})^2 = 3^2 = 9$. Check: $9^{3/2} = 3^3 = 27$.

$$x = 9$$

Exercise 15 - Two solutions

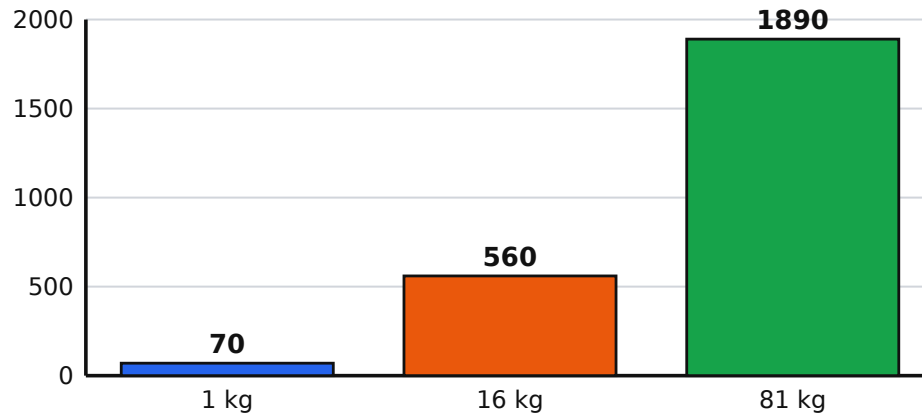
$(x+1)^{2/3} = (\sqrt[3]{x+1})^2 = 4$, so $\sqrt[3]{x+1} = 2$ or -2 .

Cube: $x+1 = 8$ or $x+1 = -8$.

Check $x = 7$: $8^{2/3} = 4$. Check $x = -9$: $(-8)^{2/3} = 4$.

$x = 7$ or $x = -9$

Exercise 16 - Metabolic rate



The 16 kg bar is 560.

$$16^{3/4} = (\sqrt[4]{16})^3 = 2^3 = 8.$$

$$R = 70 \cdot 8 = 560.$$

560 kilocalories per day

Exercise 17 - Orbit

a (AU)	T = a ^(3/2)
4	8 years
9	27 years

Completed periods.

$$4^{3/2} = (\sqrt{4})^3 = 2^3 = 8.$$

$$9^{3/2} = 3^3 = 27.$$

8 years and 27 years

Exercise 18 - Doubling

After 6 years: $(2^{1/3})^6 = 2^2 = 4$.

After 9 years: $(2^{1/3})^9 = 2^3 = 8$.

4 times after 6 years, 8 times after 9 years

Exercise 19 - Find the error

A fractional exponent is not multiplication. $16^{3/2} = (\sqrt{16})^3 = 4^3$.

64

Exercise 20 - Justify the definition

By the product rule $5^{1/2} \cdot 5^{1/2} = 5^{1/2+1/2} = 5^1 = 5$.

The positive number that multiplies by itself to give 5 is $\sqrt{5}$, so $5^{1/2} = \sqrt{5}$.

Verified

Exercise 21 - Mixed expression

Apply the power to each factor: $\frac{27^{2/3} x^2}{8^{2/3} y^4} = \frac{9x^2}{4y^4}$.

$$\frac{9x^2}{4y^4}$$