

# Rational Exponents – Word Problems Worksheet

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## Instructions

Solve all questions. Show full working. Write answers using positive exponents where possible.

## Level 1: Understanding

1. A bacteria culture shrinks by a factor of  $2^{-3}$ . What fraction represents this decrease?
2. A scientist writes a measurement as  $10^{-2}$ . What is this value as a decimal?
3. A square has a side length of  $x^{-1}$  meters. Write this length without a negative exponent.

## Level 2: Application

4. A computer processes data at a rate of  $2^5$  units per second, but operates at  $2^{-3}$  times slower. What is the new processing rate?
5. A signal strength is represented by  $x^6$ , but interference reduces it by  $x^{-2}$ . What is the resulting signal strength?
6. A device stores data in units of  $10^4$ , but compression reduces it by  $10^{-6}$ . What is the final storage size?

## Level 3: Higher Order Thinking

7. A lab experiment involves  $(2^{-2} \times 2^5) \div 2^{-1}$ . Simplify.
8. The brightness of a star is modeled as  $(3^{-2})^3$ . Rewrite using positive exponents and simplify.
9. A digital system processes data according to  $x^{-4} \div x^{-1}$ . Explain and simplify.

## Challenge

10. In nanotechnology, a length is measured as  $5 \times 10^{-9}$  meters.
  - (a) Write as a decimal.
  - (b) Explain what the negative exponent means.