

Exponents, Roots and Scientific Notation

Name: _____

Date: _____

Concepts

- Exponential Notation
- Exponents - Secondary 3
- Operations (theory)
- Scientific Notation
- Square and Cubic Numbers - Secondary 3
- The Laws of Exponents
- The Root of a Number | Secondary 3

Exponential Notation

1. In parts (a) to (c), rewrite the product in exponential notation, then evaluate it. Part (d) asks for something different.

a) $7 \times 7 \times 7 \times 7$

b) $(-4) \times (-4) \times (-4)$

c) $\frac{2}{5} \times \frac{2}{5} \times \frac{2}{5}$

d) Evaluate $(-2)^6$ and -2^6 . The two answers are different — say what the exponent is applied to in each case.

Exponents — Secondary 3

2. Evaluate each power without a calculator. Give exact answers as fractions where they are not whole numbers.

- a) 9^0
- b) 2^{-5}
- c) $(-3)^{-2}$
- d) $\left(\frac{3}{4}\right)^{-2}$
- e) 10^{-3} , written both as a fraction and in decimal notation

Operations

3. The priority rules decide the order in which operations are carried out.

- a) Evaluate $\sqrt{81} + 2 \times (7 - 3)^2 - 5^0$, writing one line per step and naming the operation you did at each step.
- b) Marc claims that $2 \times (7 - 3)^2 = (2 \times 4)^2 = 64$. Which priority rule has he broken? Correct his step.

Scientific Notation

4. A class prepares a science-fair poster and must put every measurement into the same form.
- a) Write in scientific notation: 4 850 000; 0.000 062; 903.
 - b) Write in ordinary decimal notation: 7.4×10^{-4} ; 1.06×10^7 .
 - c) One student writes a length as 38×10^5 m. Explain why this is not scientific notation, and repair it.

Square and Cubic Numbers — Secondary 3

- 5.
- a) A square patio has an area of 196 m^2 . Find the length of one side.
 - b) A cubic recycling bin has a volume of 1728 cm^3 . Find the length of one edge.
 - c) From the list 64, 100, 125, 216, 400, say which numbers are perfect squares, which are perfect cubes, and which are both.

The Laws of Exponents

6. Simplify each expression using the laws of exponents. Leave every answer with positive exponents only.

a) $x^5 \cdot x^7$

b) $\frac{a^9}{a^4}$

c) $(y^3)^4$

d) $(2m^4)^3$

e) $\frac{12b^6}{4b^6}$

The Root of a Number | Secondary 3

7. Evaluate each root exactly.

a) $\sqrt{225}$

b) $\sqrt[3]{-64}$

c) $\sqrt[4]{81}$

d) $\sqrt{0.49}$

e) $\sqrt[3]{\frac{27}{125}}$

Synthesis — drawing on several sheets in this topic

8. A radio signal travels at 3×10^8 m/s. A ground station sends a signal to a drone 1.2×10^4 m away.

- a) How long does the signal take to reach the drone? Give the answer in scientific notation, and name the law of exponents you used on the powers of ten.
- b) How far does such a signal travel in 2×10^{-3} s? Give the answer in scientific notation.

Want the harder problems and the worked solutions?

The *Challenge Problems* set and the *Answer Keys* for Exponents, Roots and Scientific Notation — with the reasoning written out in full — are available at tutorinmontreal.ca.