

Review: Roots and Powers

- **Demonstrate an understanding of irrational numbers by representing, identifying, simplifying and ordering irrational numbers.**

1. Sort the following numbers into rational and irrational numbers:

$$\sqrt{4}, \frac{2}{3}, \sqrt[3]{85}, 8.\overline{23}, \sqrt{\frac{64}{121}}, \sqrt[4]{32}, \sqrt[3]{\frac{16}{25}}, 6.23123112311123\dots, -\sqrt{0.81}, 0.75$$

2. Estimate (without a calculator) the value of the given irrational numbers to one decimal place.

a) $\sqrt{45}$

b) $\sqrt[3]{75}$

3. Arrange the following irrational numbers from least to greatest. $\sqrt{22}$, $\sqrt[3]{-50}$, $\sqrt[3]{\frac{4}{5}}$, $\sqrt[4]{12}$, $\sqrt{\frac{1}{3}}$

4. Draw a diagram showing how the following number systems are related: *Real numbers, rational numbers, irrational numbers, integers, whole numbers, and natural numbers.*

5. Simplify each radical without a calculator.

a) $\sqrt{45}$

b) $\sqrt[3]{256}$

c) $\sqrt[4]{1250}$

6. Write each as an entire radical without a calculator.

a) $6\sqrt{5}$

b) $3\sqrt[3]{2}$

c) $2\sqrt[4]{9}$

7. a) Express the side length of a square, with area 252 ft², as a radical in simplest form.

b) Determine the perimeter of that square as a radical in simplest form.

- **Demonstrate an understanding of powers with integral and rational exponents.**

8. Using patterns, explain why $a^{-n} = \frac{1}{a^n}$, $a \neq 0$.

9. Evaluate each power without a calculator.

a) $16^{\frac{1}{2}}$

b) $8^{\frac{4}{3}}$

c) $-\left(\frac{4}{25}\right)^{\frac{3}{2}}$

d) $0.36^{1.5}$

10. Write each radical as a power.

a) $\sqrt{8^3}$ b) $(\sqrt[3]{-1.5})^2$ c) $(\sqrt{\frac{1}{8}})^5$

11. Here is a student's solution for evaluating a power. Identify the errors the student made. Write a correct solution.

$$\begin{aligned} 1.96^{\frac{3}{2}} &= (\sqrt[3]{1.96})^2 \\ &= (1.2514\dots)^2 \\ &= 1.5661\dots \end{aligned}$$

12. Evaluate each power without a calculator. Do not leave decimals in your answers.

a) $4^{-\frac{1}{2}}$ b) $(-7)^{-2}$ c) $(\frac{1}{5^{-3}})$ d) $(-0.027)^{-\frac{2}{3}}$

e) $(-\frac{64}{125})^{-\frac{5}{3}}$ f) $32^{-0.4}$

13. Simplify. Do not leave negative exponents in your answers.

a) $(a^5b)(a^4b^{-9})$ b) $(\frac{a^2}{b^3})^{-4}$ c) $(3x^{-2}y^4z)^3$

d) $\frac{-9a^{-4}b^{\frac{3}{4}}}{3a^2b^{\frac{1}{4}}}$ e) $(-\frac{3}{8})^{\frac{2}{3}} \cdot (-\frac{3}{8})^{\frac{1}{3}}$ f) $(\frac{-64a^6}{b^{-9}})^{\frac{1}{3}}$

14. Identify any error(s) in this solution for simplifying an expression. Write a correct solution.

$$\begin{aligned} \left(\frac{5a^2}{\frac{1}{b^2}}\right)^{-2} &= \frac{-10a^{-4}}{b^{-1}} \\ &= \frac{-10b}{a^4} \end{aligned}$$