2 Square Roots and Cube Roots

[redacted]

A **square root** of a is a number b such that $b^2 = a$. A **cube root** of a is a number b such that $b^3 = a$.

Examples:

$$\sqrt{25} = \_\_\_\_, \qquad \sqrt[3]{-27} = \_\_\_\_$$

[redacted]

Evaluate:

$$\sqrt{49}, \quad \sqrt[3]{125}, \quad \sqrt[3]{-8}$$

3 Simplifying Radicals

[redacted]

Factor the radicand into perfect squares/cubes. Example: $\sqrt{50} = \_\_\_\_\_$

[redacted]

Simplify:

$$\sqrt{72}, \quad \sqrt[3]{54}, \quad \sqrt{18x^2}$$

4 Exponential Notation

[redacted]

Radicals can be written as fractional exponents:

$$\sqrt[n]{a} = a^{1/n}$$

Examples:

$$\sqrt{a} = a^{1/2}, \qquad \sqrt[3]{a^2} = a^{2/3}$$

[redacted]

$$a^m \cdot a^n = a^{m+n}, \quad (a^m)^n = a^{mn}$$

[redacted]

Write in exponential form:

$$\sqrt[4]{x^3}, \quad \sqrt{y^5}$$

5 Rational vs Irrational Numbers

[redacted]

Rational: can be written as $\frac{p}{q}$ with $q \neq 0$. **Irrational:** cannot be expressed as a fraction.

[redacted]

Proof that $\sqrt{2}$ is irrational: (Students complete outline of contradiction proof.)

[redacted]

Classify:

$$\sqrt{9}, \quad \sqrt{7}, \quad 0.333\ldots, \quad \pi$$

6 Imaginary Numbers

[redacted]

Define $i = \sqrt{-1}$. Then $i^2 = -1$.

Examples:

$$\sqrt{-9} = \text{\_\_\_\_}, \qquad i^3 = \text{\_\_\_\_}, \qquad i^4 = \text{\_\_\_\_}$$

[redacted]

Simplify:

$$\sqrt{-25}, \quad i^3, \quad i^4$$

7 Number Systems

[redacted]

- $\mathbb{N}$: natural numbers
- $\mathbb{Z}$: integers
- $\mathbb{Q}$: rationals
- Irrationals
- $\mathbb{R}$: reals
- $\mathbb{C}$: complex numbers

Diagram: (Students draw a Venn diagram of number systems.)