Chapter 2

Real Numbers and Monomials

2.1.A Powers and Exponents

Main Idea: Use powers and exponents to write large and small numbers.

A power =

a number written as

a base number with an exponent.

base exponent

Like this:

2^5 *say* 2 to the 5th power

Example: Write each expression using exponents

1) $7 \cdot 7 \cdot 7 \cdot 7 =$

2) $(-9)(-9)(-9) =$

3) $4 \cdot 4 \cdot 6 \cdot 6 \cdot 6 \cdot 6 \cdot 6 =$

4) $x \cdot y \cdot x \cdot y \cdot x \cdot x$

Example: Evaluate

1) $(-5)^2$

2) -5^2

3) $\left(\frac{1}{4}\right)^3$

Order of Operations Reminder

1) Grouping symbols first (start inside and work out)
2) Evaluate powers
3) Multiply and Divide in order from left to right
4) Add and subtract from left to right

Example: Evaluate

1) $a^2 \bullet b^6$ if $a = \frac{1}{2}$ and $b = 2$

2) $\left(c^3 + d^4\right)^2 - \left(c + d\right)^3$, if $c = -1$, and $d = 2$

Homework:

p.94 #22-50 even, 54, 55

2.1.B Multiply and Divide Monomials

Main Idea: Simplify real number expressions by multiplying and dividing monomials.

Monomial – a number, a variable, or a product of a number and one or more variables.

Product of Powers Property:

To multiply powers with the same base, add their exponents

Symbols: $a^m \cdot a^n = a^{m+n}$

Example: Simplify. Express using exponents.

1) $7^6 \cdot 7$

2) $r^4 \cdot r^6$

3) $-7x^2 \cdot 11x^4$

Quotient of Power Property

To divide powers with the same base, subtract their exponents.

Symbols: $\frac{a^m}{a^n} = a^{m-n}$, where $a \neq 0$

Example: Simplify.

1) $\dfrac{6^{12}}{6^{2}}$

2) $\dfrac{a^{14}}{a^{8}}$

3) $\dfrac{2^{4}\bullet 5^{3}\bullet 9^{2}}{2^{3}\bullet 5\bullet 9}$

Homework:

p. 100 # 18-40 even, 44-47

2.1.C Powers of Monomials

Main Idea: Use laws of exponents to find powers of monomials

Power of a Power Property

To find the power of a power, multiply the exponents

Symbols: $\left(a^{m}\right)^{n} = a^{m \cdot n}$

Example: Simplify

1) $\left(5^2\right)^8$

2) $\left(a^3\right)^7$

Power of a Product Property:

To find the power of a product, find the power of each factor and multiply.

Symbols: $(ab)^m = a^m b^m$

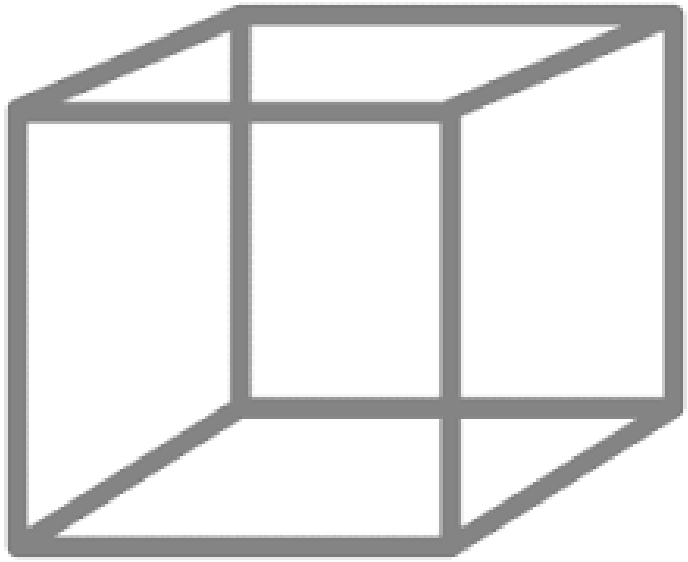
Example: Simplify.

1) $\left(3c^4\right)^3$

2) $\left(-4p^5q\right)^2$

Real World Example:

Find the volume of a cube with side lengths of $6mn^7$.
Express as a monomial.



Homework:

p. 104 #8 – 38 even, 39, 41, 42

2.A Negative Exponents

Main Idea: Write and evaluate expressions using negative exponents.

Zero Exponents: Any nonzero number to the zero power is 1.

Negative Exponents: Any nonzero number to a negative power is the multiplicative inverse of its nth power.

Symbols: $x^{-n} = \frac{1}{x^n}, x \neq 0$

Example: Write each expressing using a positive exponent.

1) 4^{-4}

2) c^{-7}

Example: Evaluate the expression

1) 5^{-2}

2) $(-8)^{-2}$

Homework:

p.111 #22 – 64 even, 65

2.B Scientific Notation

Main Idea: Use scientific notation to write large and small numbers.

Scientific Notation:

A compact way of writing very large or very small numbers.

Write numbers in standard form:

6.32×10^{5}

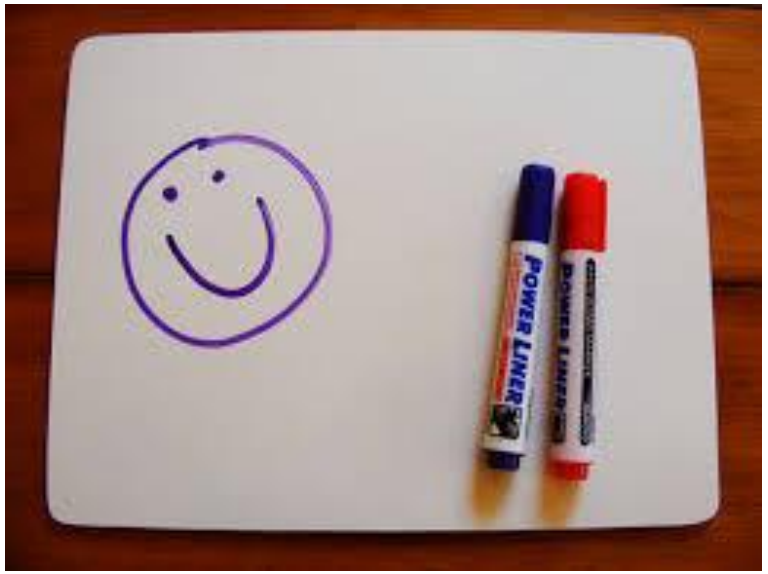
2.34×10^{-3}

Write numbers in scientific notation:

- 931,500,000

- 0.00443

Activity



Homework:

Workbook p.31

2.C Compute with Scientific Notation

Main Idea: Use powers and exponents to write large and small numbers.

Evaluate each expression. Express the result in scientific notation.

$(4.2 \times 10^3)(1.6 \times 10^4)$

$$\frac{1.449\times10^{6}}{2.1\times10^{3}}$$

Addition and subtraction: need to line up place values (shown by exponent)

$$\left(6.89\times10^{4}\right)+\left(9.24\times10^{5}\right)$$

$$\left(8.23\times10^{6}\right)-\left(6.91\times10^{5}\right)$$

Homework:

Workbook p.33

Chapter 2 MidchapterTest

3.A Roots

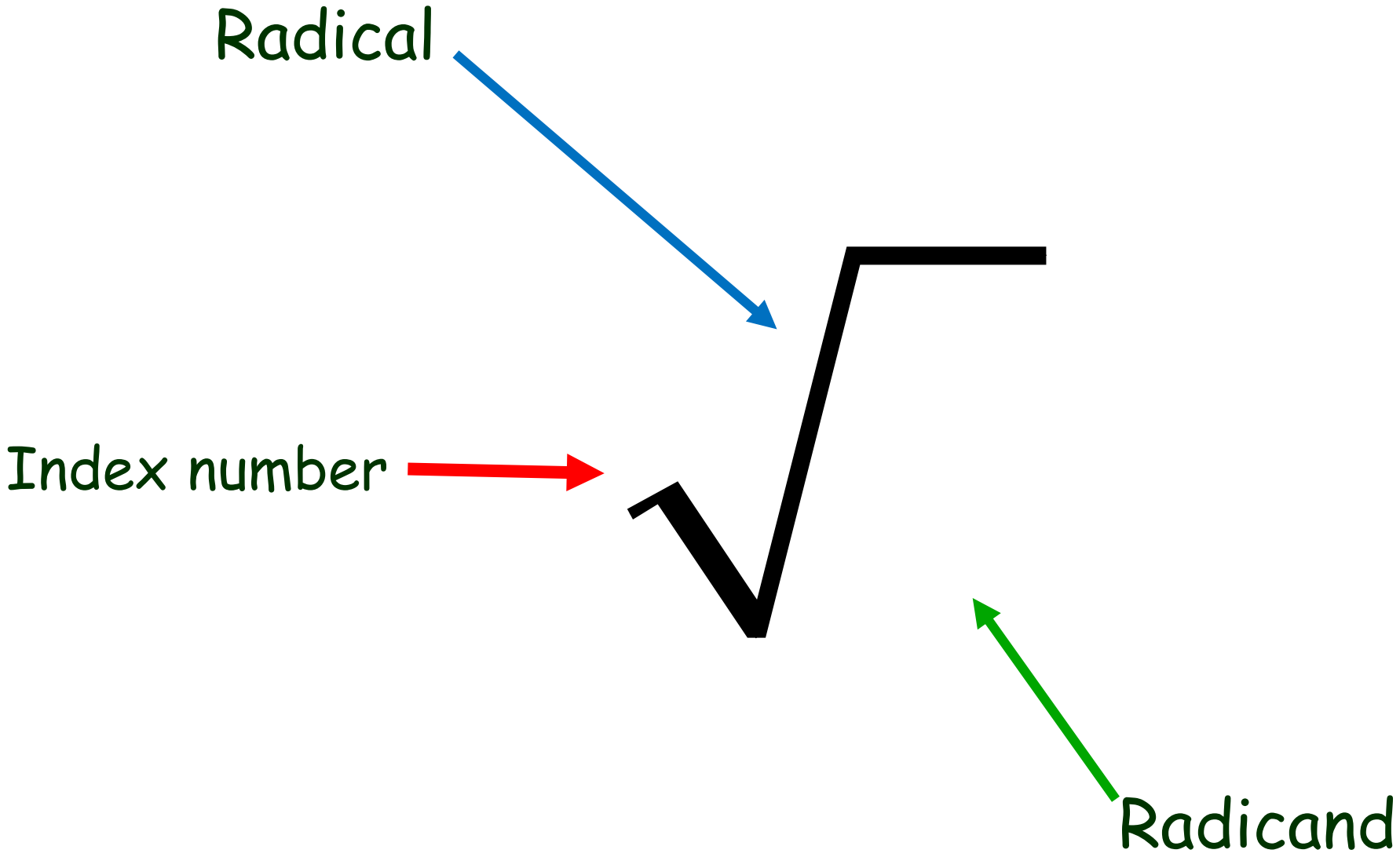
Main Idea: Find square roots and cube roots.

Vocabulary:

Perfect squares – squares of integers

Square root – one of its two equal factors

Radical sign – used to indicate a root of a number; every positive number has both a negative and a positive square root.


Radical
Index number
Radicand

Example: Find the square root.

1) $\sqrt{81}$

2) $\pm\sqrt{1.44}$

3) $-\sqrt{\frac{16}{81}}$

4) $\sqrt{-49}$

Real World Example: A group of 196 students needs to be seated in a square formation for a yearbook photo. How many students should be in each row?

Cube Roots: a cube root of a number is one of its three equal factors.

$\sqrt[3]{}$

Examples:

1) $\sqrt[3]{125}$

2) $\sqrt[3]{-27}$

Homework:

p. 127 #18 – 54 even, 58

3.C Estimate Roots

Main Idea: Use roots to estimate solutions.

Estimate Square Roots: estimating the square roots of numbers that are not perfect squares (can use a number line)

Estimate $\sqrt{18}$

- Can use a number line
- Write inequality
- Estimate to closest whole number

Example: estimate to the nearest whole number

$$\sqrt{21.5}$$

Real World Example: To estimate the time in seconds it will take an object to fall h feet, you can use the expression $\frac{\sqrt{h}}{4}$

About how long will it take an object to fall from a height of 38 feet?

Homework:

worksheet

3.D Compare Real Numbers

Main Idea: Compare mathematical expressions involving real numbers.

Vocabulary:

Irrational numbers: number that cannot be expressed as a ratio with integers

Real numbers: set of rational and irrational numbers

Classify: name all sets to which each real number belongs

1) 0.09090909…

2) $\sqrt{25}$

3) $-\sqrt{12}$

Compare: use <, >, = to make a true statement.

1) $\sqrt{15} \_\_\_\_ 3\frac{7}{8}$

2) $12.3\% \_\_\_\_\_ \sqrt{0.01}$

Example: Order the numbers from least to greatest. Verify your answer by graphing on a number line.

$$\sqrt{15}, 3, 4\frac{1}{2}, 5.3\overline{6}$$

Homework:

worksheet

Chapter 2 Test