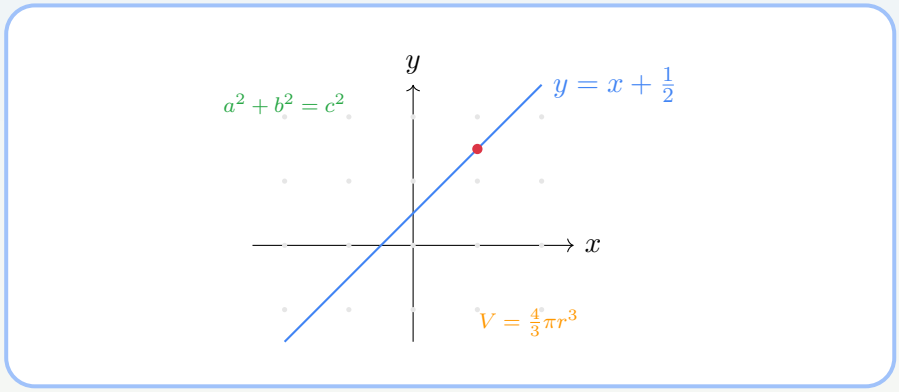
Nebraska NSCAS
8th Grade Math Workbook

Comprehensive Practice, Challenging Exercises, and Strategic Guidance for Complete Test-Day Confidence



Reza Nazari

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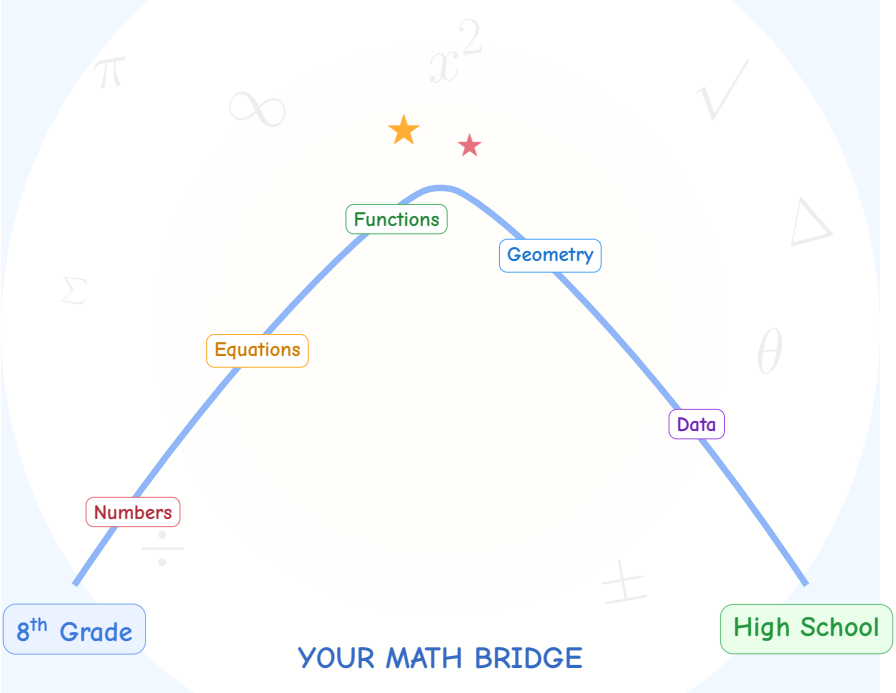
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Welcome, 8th Grader!

The Bridge Between Middle School and High School Starts Here



Dear Eighth Grader,

Welcome! This is *your* year. Everything you have built so far — working with fractions, decimals, ratios, and basic geometry — has been preparing you for this moment. Eighth-grade math is where all of those skills come together and open the door to high school and beyond.

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CHAPTER

1

Real Numbers & Number Sense

1. Rational and Irrational Numbers 8.N.1
2. Turning Repeating Decimals into Fractions 8.A.1
3. Estimating Irrational Numbers 8.N.1
4. Estimating Expressions with Irrational Numbers 8.N.1

1.1 Rational and Irrational Numbers

8.N.1

Quick Review and Helpful Hints

Rational Numbers	Irrational Numbers
$\frac{3}{4} = 0.75$ (terminates)	$\sqrt{2} = 1.41421356\ldots$ (no pattern)
$\frac{1}{3} = 0.\overline{3}$ (repeating block)	$\pi = 3.14159265\ldots$ (no pattern)
$\sqrt{25} = 5$ (perfect square)	$\sqrt{7} = 2.64575\ldots$ (no pattern)
$-\frac{9}{5} = -1.8$ (terminates)	$\sqrt[3]{11} = 2.22398\ldots$ (no pattern)

Rational: $\frac{p}{q}$, integers p and $q \neq 0$; decimal *terminates* or *repeats forever*.

Irrational: Cannot be written as $\frac{p}{q}$; decimal *never terminates* and *never repeats*.

Quick Test: $\sqrt{n}$ is rational *only when* n is a perfect square $(1, 4, 9, 16, 25, 36, 49, 64, 81, 100, \ldots)$. All other square roots are irrational.

Example: Classify each number as rational or irrational: $\sqrt{81}$, $\sqrt{5}$, $0.\overline{72}$, π.

$\sqrt{81} = 9$, a whole number, so it is **rational**. $\sqrt{5}$ is not the square root of a perfect square—its decimal never repeats, so it is **irrational**. $0.\overline{72}$ repeats the block "72" forever, so it is **rational**. $\pi = 3.14159\ldots$ has no repeating block and is one of the most famous irrational numbers.

Answer: Rational, Irrational, Rational, Irrational

Practice Problems

Evaluate or classify each. Write Rational or Irrational (or the value) on the line.

1. $\sqrt{9} =$ _____
2. $\sqrt{49} =$ _____
3. $-\sqrt{144} =$ _____
4. Type of $0.\overline{3}$ _____
5. Type of $\sqrt{3}$ _____
6. *Type of* π _____
7. Type of $-\frac{7}{4}$ _____
8. Type of $\sqrt{50}$ _____
9. Type of $\sqrt{121}$ _____

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Topic 4 • Estimating Expressions with Irrational Numbers

1) ≈ 6.28
2) ≈ 4.14
3) ≈ 5.64
4) ≈ 3.73
5) ≈ 4.42
6) 2
7) ≈ 6.21
8) ≈ 5.86
9) ≈ 1.86
10) ≈ 3.81
11) 5
12) ≈ 2.44
13) $\approx 9.4\ \text{m}^2$
14) Rope A; ≈ 0.55 m longer
15) Total $\approx 4.5 + 3.14 = 7.64$ km; time $\approx 7.64 \div 5 \times 60 \approx 92$ min
16) Perimeter $\approx 2(4.24 + 4.24) \approx 16.96$ in; cost $\approx \$25.44$
17) $r \approx 4.0$ m; $C \approx 25.1$ m

Answers and Explanations on page: 144
Full worked solutions for Chapter 1 are waiting there.

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CHAPTER

2

Exponents, Roots, & Scientific Notation

1. Properties of Integer Exponents 8.N.2
2. Square Roots and Cube Roots 8.G.2
3. Understanding Scientific Notation 8.N.2
4. Operations with Scientific Notation 8.D.2

2.1 Properties of Integer Exponents

8.N.2

Quick Review and Helpful Hints

Rule	Formula	Example
Product Rule	$a^m \cdot a^n = a^{m+n}$	$2^3 \cdot 2^4 = 2^7$
Quotient Rule	$a^m \div a^n = a^{m-n}$	$5^6 \div 5^2 = 5^4$
Power Rule	$(a^m)^n = a^{mn}$	$(3^2)^4 = 3^8$
Zero Exponent	$a^0 = 1 \quad (a \neq 0)$	$7^0 = 1$
Negative Exp.	$a^{-n} = \dfrac{1}{a^n}$	$4^{-2} = \frac{1}{16}$

$a^m \cdot a^n = a^{m+n}$ $\qquad$ $\dfrac{a^m}{a^n} = a^{m-n}$ $\qquad$ $(a^m)^n = a^{mn}$ $\qquad$ $(ab)^n = a^n b^n$

$a^0 = 1 \ (a \neq 0)$ $\qquad$ $a^{-n} = \dfrac{1}{a^n}$ $\qquad$ $\left(\dfrac{a}{b}\right)^{-n} = \left(\dfrac{b}{a}\right)^n$

Example: Simplify $\dfrac{3^5 \cdot 3^{-2}}{3^4}$ and write as a single power.

Apply the product rule in the numerator first: $3^5 \cdot 3^{-2} = 3^{5+(-2)} = 3^3$. Now apply the quotient rule: $\dfrac{3^3}{3^4} = 3^{3-4} = 3^{-1}$. Convert to fraction form: $3^{-1} = \dfrac{1}{3}$.

Answer: $3^{-1} = \dfrac{1}{3}$

Practice Problems

Simplify each expression. Write answers as integers or fractions in lowest terms.

1. $2^3 \cdot 2^4 =$ _____
2. $5^6 \div 5^3 =$ _____
3. $(3^2)^3 =$ _____
4. $4^{-1} =$ _____
5. $7^0 =$ _____
6. $(-2)^0 =$ _____
7. $3^{-2} =$ _____
8. $\left(\frac{1}{2}\right)^{-3} =$ _____
9. $2^4 \cdot 2^{-6} =$ _____
10. $\dfrac{6^5}{6^7} =$ _____
11. $(5^{-1})^2 =$ _____
12. $\left(\frac{3}{4}\right)^{-2} =$ _____

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