# Oklahoma OSTP Grade 8 Math Step by Step

*A Beginner Friendly Guide to Learning Math*

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*Here's what we'll explore together!*



*Let's learn and have fun!*

CHAPTER

# 1

# Irrational Numbers

## What's Inside

# 1.1 Rational and Irrational Numbers

## What You'll Learn

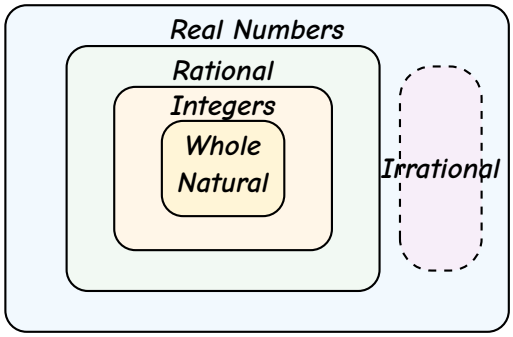
- Classify a real number as rational or irrational
- List all real number subsets a number belongs to

## Words to Know

- **Real Number** — Any number on the number line.
- **Integer** — A whole number or its opposite, such as $-3$, $0$, or $8$.
- **Whole Number** — $0$ or any positive counting number.
- **Natural Number** — A positive counting number such as $1$, $2$, or $3$.

## How to Classify a Real Number into Subsets

1. Decide first whether the number is rational or irrational.
2. If it is rational, check whether it is also an integer, a whole number, or a natural number.
3. Remember that every rational number and every irrational number is also a real number.
4. List every set that fits the number, not just one of them.




## *Example: Classify $7$, $0$, $-3$, $\frac{2}{3}$, and $\sqrt{5}$ into all real number subsets.*

**Step 1** *Decide whether each number is rational or irrational. The numbers $7$, $0$, $-3$, and $\frac{2}{3}$ are rational. The number $\sqrt{5}$ is irrational.*

**Step 2** *Check the rational numbers more closely. The number $7$ is an integer, whole number, and natural number. The number $0$ is an integer and whole number. The number $-3$ is an integer. The number $\frac{2}{3}$ is not an integer.*

**Step 3** *Every one of these numbers is real because all rational and irrational numbers are real.*

**Step 4** *List every set that fits each number.*

✔ *$7$: natural, whole, integer, rational, real; $0$: whole, integer, rational, real; $-3$: integer, rational, real; $\frac{2}{3}$: rational, real; $\sqrt{5}$: irrational, real.*

## *Example: Classify $\sqrt{49}$ and $0.\overline{3}$ into all real number subsets.*

**Step 1** *Rewrite the numbers in a helpful form: $\sqrt{49} = 7$ and $0.\overline{3} = \frac{1}{3}$.*

**Step 2** *Since $7$ is a counting number, it fits the natural, whole, integer, rational, and real sets.*

**Step 3** *Since $\frac{1}{3}$ is a repeating decimal, it is rational, and all rational numbers are real.*

**Step 4** *The decimal $0.\overline{3}$ is not an integer, whole number, or natural number.*

✔ *$\sqrt{49}$ is natural, whole, integer, rational, and real. The number $0.\overline{3}$ is rational and real.*

⚠ ***Watch Out!*** *The number $0$ is whole, integer, rational, and real, but it is usually not counted as a natural number in this book.*

# Real Number Subsets Practice

## Rational or Irrational

**1.** Is $\sqrt{49}$ rational or irrational? _____

**2.** Is $\sqrt{11}$ rational or irrational? _____

## List All Subsets

**3.** Classify $-8$ into all real number subsets.

_____

**4.** Classify $0.\overline{3}$ into all real number subsets.

_____

## Check Perfect Squares

**5.** Classify $\sqrt{64}$ into all real number subsets. _____

## Use the Diagram Idea

**6.** A student says every whole number is also rational. Is the student correct? _____

CHAPTER

# 2

# Lines and Linear Equations

## What's Inside

# 2.1 Graphing Proportional Relationships

## What You'll Learn

- Graph proportional relationships and interpret the unit rate as slope
- Compare proportional relationships shown in different ways

## Words to Know

- **Proportional Relationship** — A relationship where $y = kx$ and the line passes through the origin.
- **Unit Rate** — The constant $k$ in $y = kx$; also called the constant of proportionality.

## How to Find and Compare Unit Rates

1. Pick any point $(x, y)$ on the line or from the table and divide: $k = \frac{y}{x}$.
2. Write the equation $y = kx$.
3. To compare two relationships, find $k$ for each and see which is larger or smaller.

**Example: A car travels $150$ miles in $3$ hours at constant speed. Find the unit rate and write the equation.**

**Step 1** $k = \frac{150}{3} = 50$ miles per hour.

**Step 2** The equation is $y = 50x$.

**Step 3** Not comparing here — just one relationship.

✔ **Unit rate $= 50$ mph; equation: $y = 50x$**

**Example: Runner A: $y = 8x$. Runner B covers $35$ miles in $5$ hours. Who is faster?**

**Step 1** Runner A: $k = 8$. Runner B: $k = \frac{35}{5} = 7$.

**Step 2** Runner A: $y = 8x$. Runner B: $y = 7x$.

**Step 3** Compare: $8 > 7$, so Runner A is faster.

✔ **Runner A is faster ($8$ mph vs. $7$ mph).**

A proportional relationship always passes through the origin $(0, 0)$. If it doesn't, it's not proportional!

# Graphing Proportional Relationships Practice

## Find the Unit Rate

**1.** A graph passes through $(4, 12)$. What is $k$? _____

**2.** A table shows $(5, 20)$. What is $k$? _____

## Write the Equation

**3.** Store A charges \$3 per pound. Write the equation. _____

## Compare

**4.** Store A: $y = 3x$. Store B charges \$2.50 per pound. Which is cheaper? _____

**5.** A recipe uses $2$ cups of flour for every $3$ cookies. How many cups are needed for $12$ cookies?

**Answer:** _____ cups

THANK YOU

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