

# Georgia Georgia Milestones Grade 8 Math

## Step by Step

*A Beginner Friendly Guide to Learning Math*

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Published by View Math Education

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

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*Let's learn and have fun!*



CHAPTER

1

# *Irrational Numbers*

## ★ *What's Inside* ★

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## ★ 1.1 Rational and Irrational Numbers ★

### What You'll Learn

- Tell whether a number is rational or irrational
- Use decimals, fractions, and square roots to justify your answer

### Words to Know

- ▶ **Rational Number** — A number that can be written as  $\frac{a}{b}$  where  $a$  and  $b$  are integers and  $b \neq 0$ .
- ▶ **Irrational Number** — A number that cannot be written as a fraction of two integers.
- ▶ **Decimal Expansion** — The decimal form of a number, such as terminating, repeating, or nonrepeating.

### How to Classify a Number as Rational or Irrational

- 1 Check whether the number is already a fraction, an integer, a terminating decimal, or a repeating decimal.
- 2 If it can be written as  $\frac{a}{b}$ , then it is **rational**.
- 3 If its decimal never ends and never repeats, then it is **irrational**.
- 4 Use a short reason, such as **repeats**, **terminates**, or **not a perfect square**.



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**Example: Classify**  $-4$ ,  $0.375$ ,  $0.\overline{18}$ , and  $\sqrt{7}$ .

**Step 1** Look at each number's form.  $-4$  is an integer,  $0.375$  is a terminating decimal,  $0.\overline{18}$  is a repeating decimal, and  $\sqrt{7}$  is a square root.

**Step 2** Write the rational numbers as fractions when possible:  $-4 = \frac{-4}{1}$ ,  $0.375 = \frac{375}{1000} = \frac{3}{8}$ , and  $0.\overline{18} = \frac{18}{99} = \frac{2}{11}$ .

**Step 3** Since 7 is not a perfect square,  $\sqrt{7}$  has a decimal that never ends and never repeats.

**Step 4** So  $-4$ ,  $0.375$ , and  $0.\overline{18}$  are rational, and  $\sqrt{7}$  is irrational.

✓  $-4$ ,  $0.375$ , and  $0.\overline{18}$  are rational;  $\sqrt{7}$  is irrational.

**Example: Classify**  $\sqrt{49}$  and  $\pi$ .

**Step 1** Decide whether each number can be rewritten in a simpler form.

**Step 2**  $\sqrt{49} = 7$ , and  $7 = \frac{7}{1}$ , so it is rational.

**Step 3**  $\pi = 3.14159 \dots$  never ends and never repeats, so it is irrational.

**Step 4** A square root is only irrational when the number under the root is **not** a perfect square.

✓  $\sqrt{49}$  is rational, but  $\pi$  is irrational.

**Watch Out!** Not every square root is irrational. For example,  $\sqrt{64} = 8$ , so it is rational.



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## Rational and Irrational Numbers Practice

### Spot the Form

1. Is  $\frac{5}{12}$  rational or irrational? \_\_\_\_\_
2. Is 0.81 rational or irrational? \_\_\_\_\_

### Use the Decimal Pattern

3. Is  $0.\overline{6}$  rational or irrational? \_\_\_\_\_
4. Is 1.010010001... rational or irrational?  
\_\_\_\_\_

### Check Square Roots

5. Is  $\sqrt{36}$  rational or irrational? \_\_\_\_\_

### Explain Your Choice

6. A student says  $\sqrt{15}$  is rational because it is a square root. Is the student correct? \_\_\_\_\_



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CHAPTER

2

## *Lines and Linear Equations*

### ★ *What's Inside* ★

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## ★ 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.



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*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!



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## 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



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