Washington SBA Grade 8 Math Step by Step

A Beginner Friendly Guide to Learning Math

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PREVIEW

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Here's what we'll explore together!

Let's learn and have fun!

PREVIEW

CHAPTER

1

Irrational Numbers

What's Inside

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**.

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 π.

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 *$\pi = 3.14159\ldots$ 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 π is irrational.*

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

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 $1.010010001\ldots$ 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

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

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