

Texas STAAR Grade 8 Math Step by Step

A Beginner Friendly Guide to Learning Math

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Here's what we'll explore together!

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Let's learn and have fun!

PREVIEW



CHAPTER

1

Irrational Numbers

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★ 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.

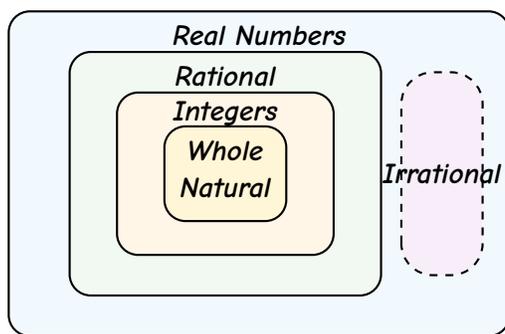


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Example: Classify 7, 0, -3 , $\frac{2}{3}$, and $\sqrt{5}$ into all real number subsets.

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.



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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.



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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? _____



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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

- Understand direct variation and the constant of proportionality
- Distinguish proportional from non-proportional relationships

📖 Words to Know

- ▶ **Direct Variation** — A proportional relationship with the equation $y = kx$.
- ▶ **Constant of Proportionality** — The value k in $y = kx$; also called the unit rate.

☰ How to Test for Direct Variation

- 1 From a table, divide $\frac{y}{x}$ for **every row**. If the ratio is always the same, the relationship is a direct variation.
- 2 From a graph, check whether the line is **straight** and passes through the **origin** $(0, 0)$.
- 3 If it is proportional, the constant ratio is k , and the equation is $y = kx$.



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Example: Is this a direct variation? Table: (2, 6), (4, 12), (6, 18).

Step 1 $\frac{6}{2} = 3$, $\frac{12}{4} = 3$, $\frac{18}{6} = 3$ — the ratio is constant.

Step 2 The ratios are the same and the pattern starts at (0, 0).

Step 3 Yes, it is a direct variation with $k = 3$. Equation: $y = 3x$.

✓ **Direct variation:** $y = 3x$

Example: Is this a direct variation? Table: (1, 5), (2, 8), (3, 11).

Step 1 $\frac{5}{1} = 5$, $\frac{8}{2} = 4$, $\frac{11}{3} \approx 3.67$ — the ratio changes.

Step 2 Since the ratio is not constant, this is **not** proportional.

Step 3 No direct variation — the equation is not in the form $y = kx$.

✓ **Not a direct variation**



A direct variation **always** passes through the origin. If the y -intercept is not 0, it is not proportional!



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Direct Variation Practice

Check the Ratio

1. Is $(1, 4)$, $(2, 8)$, $(3, 12)$ a direct variation? _____

Write the Equation

2. A car travels 150 miles in 3 hours. Write the equation. _____

Compare

3. Runner A: $y = 8x$. Runner B: 35 mi in 5 hr. Who is faster? _____
4. Is $(1, 4)$, $(2, 8)$, $(3, 13)$ proportional? _____

5. A recipe uses 2 cups of flour for every 3 cookies. Is this a direct variation? If so, find k .

Answer: _____



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