



The  
*Insider's Guide*  
TO FRACTIONS



# YOUR CHILD SITS DOWN AT THE KITCHEN TABLE TO WORK ON MIXED NUMBERS, AND SUDDENLY...

Any calm left in your home dissolves into total frustration:

*Discouraged sighs.*

*Arms crossed in defiance.*

*Stressful bickering.*

*The occasional meltdown.*

(Sometimes your child's, sometimes your own!)

No matter how hard your child tries at fractions, something isn't clicking.

Your child's self-esteem is sinking faster than a rowboat full of water.



*You try helping with fractions, but you aren't a math teacher*

It's 100% normal to have forgotten the terminology and rules around fractions! Of course, this makes it really HARD to help with homework.

It just doesn't seem to be getting better.

***B-r-e-a-t-h-e ...***

*You're smart to look for ways to help your child break this endless cycle*

Why?

Because NOW is the time to get on track with fractions.

Taking action NOW will make all the difference in eliminating years of struggle ahead.

1. **Fractions aren't going away.** Fractions play a role from 2<sup>nd</sup> grade up through algebra 2 and beyond. They're here to stay.
2. **Teachers are moving quickly.** With today's school standards, teachers have to keep moving ahead, even if your child doesn't fully understand mixed numbers or variables. You have to take matters into your own hands.
3. **Fractions require a lot of work.** Just adding two fractions together can take A LOT of steps. Your child needs a strong foundation in different math skills — from basic multiplication to estimation — to solve fractions.
4. **You want your child to be happy and successful.** You'd love to see more smiles at homework time ... Better grades on tests ... Report cards to celebrate ... Less stress at home ... Enough said!

## It's time to get a basic foundation in fractions (*like teachers have*), so you can take more control

Think of this booklet as a teacher's reference guide ... **FOR PARENTS!**

In the pages to come, you've got the tools at your fingertips to:

- ✓ **Relieve the stress of not knowing the right terminology or rules around fractions.**  
Use this reference guide to refresh your own memory of fractions, so you feel more confident when your child has questions.
- ✓ **Get new insight into where your child is struggling with fractions.**  
In this guide, you'll see fractions broken down into steps. Which step is the child getting hung up on? For example, you may discover that your child needs more practice remembering multiplication tables.
- ✓ **Build a greater sense of ownership with fractions in an older child.**  
When your child reaches pre-algebra, you may want to share this guide with your son or daughter, so he or she can fill in the gaps from school.



Use this guide like a secret decoder ring.

It will help your family “translate” cryptic terminology and tough problems on homework assignments.

*And remember, you aren't alone in this ...*

If you want more ways to stop the daily battle over math assignments, get grades where they should be and restore calm at home, turn to page **5**.



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# THE INSIDER'S GUIDE TO FRACTIONS

## Equivalent Fractions

*Refresh time!*

*What is an Equivalent Fraction?*

These are fractions that may look different, but have the same value.

**Examples:**

$$\frac{1}{4} = \frac{5}{20} = \frac{25}{100}$$

*What is a Numerator?*

The numerator is the top part of a fraction. It shows how many equal parts of the denominator are represented.

*What is a Denominator?*

The denominator is the bottom part of a fraction. It shows how many equal parts that the item has been divided into.

To find equivalent fractions multiply or divide both the numerator and the denominator by the same number.

**Examples:**

$$\frac{3}{4} = \frac{3 \times 3}{4 \times 3} = \frac{9}{12}$$

$$\frac{4}{6} = \frac{4 \div 2}{6 \div 2} = \frac{2}{3}$$

## How do I write a fraction in simplest form?

To write a fraction in simplest form, write an equivalent fraction by dividing both the numerator and the denominator by the greatest common factor.

**Example:**

Write the fraction  $\frac{6}{9}$  in simplest form.

The greatest common factor of 6 and 9 is 3. Divide both the numerator and the denominator by 3.

$$\frac{6}{9} = \frac{6 \div 3}{9 \div 3} = \frac{2}{3}$$

# THE INSIDER'S GUIDE TO FRACTIONS

## Mixed Numbers

*Refresh time!*

*What is a Mixed Number?*

A number that is made up of a whole number plus a fraction.

**Examples:**

$$3 \frac{1}{4}$$

*What is an Improper Fraction?*

A fraction where the numerator is greater than the denominator.

To write a mixed number as an improper fraction, multiply the denominator of the fraction by the whole number and add the numerator to the product. Write the result over the denominator.

**Example:**

$$3 \frac{2}{5} = \frac{3 \times 5 + 2}{5} = \frac{17}{5}$$

To write an improper fraction as a mixed number, divide the numerator by the denominator. The quotient is the whole portion of the mixed number. The remainder is the numerator and the divisor is the denominator of the fraction portion.

**Example:**

$$\frac{14}{5} = 2 \frac{4}{5} \quad 14 \div 5 = 2 \text{ R}4$$

## Reciprocals

*Refresh time!*

*What is a Reciprocal?*

The reciprocal of a fraction is when the numerator and denominator are switched. When you multiply the reciprocal with the original number, you always get the number 1. All numbers have a reciprocal except for 0.

**Example:**

The reciprocal of the fraction  $\frac{2}{3}$  is  $\frac{3}{2}$  because  $\frac{2}{3} \times \frac{3}{2} = \frac{6}{6} = 1$ .

# THE INSIDER'S GUIDE TO FRACTIONS

## Reciprocals (cont.)

Write a mixed number as an improper fraction to find its reciprocal.

**Example:**

The reciprocal of the mixed number  $2\frac{3}{4}$  is  $\frac{4}{11}$  because  $2\frac{3}{4} = \frac{11}{4}$  and

$$\frac{11}{4} \times \frac{4}{11} = \frac{44}{44} = 1.$$

## Converting a Fraction to a Decimal

To convert a fraction to a decimal, divide the numerator by the denominator.

**Examples:**

The decimal equivalent of the fraction  $\frac{3}{8}$  is 0.375 because  $8 \overline{)3.000} \begin{matrix} 0.375 \\ \underline{0.375} \\ 0 \end{matrix}$ .

The decimal equivalent of the mixed number  $2\frac{3}{4}$  is 2.75 because  $4 \overline{)3.00} \begin{matrix} 0.75 \\ \underline{0.75} \\ 0 \end{matrix}$ .

## Converting a Decimal to a Fraction

To convert a decimal number to a fraction, write the digits to the right of the decimal point as the numerator of the fraction. The denominator of the fraction is the place value of the last digit. Write the fraction in simplest form.

**Example:**

The fractional equivalent of the decimal number 0.125 is  $\frac{1}{8}$  because the digits to the right of the decimal point are 125 and the 5 is in the thousandths place.

$$\frac{125}{1000} = \frac{1}{8}$$

To convert a decimal number greater than 1 to a mixed number, write the digits to the left of the decimal point as the whole number portion of the mixed number. Convert the digits to the right of the decimal point to a fraction.

**Example:**

The fractional equivalent of the decimal number 3.42 is  $3\frac{21}{50}$  because the digits to the right of the decimal point are 42 and the 2 is in the hundreds place.

$$3.42 = 3\frac{42}{100} = 3\frac{21}{50}$$

# THE INSIDER'S GUIDE TO FRACTIONS

## Adding Fractions

### *Like Denominators*

**Step 1:** Add the numerators and write the sum over the denominator.

**Step 2:** Write the answer in simplest form.

**Example:**

Add:  $\frac{3}{8} + \frac{1}{8}$

Step 1: Add the numerators and write the sum over the denominator.

$$\frac{3}{8} + \frac{1}{8} = \frac{4}{8}$$

Step 2: Write the answer in simplest form.

$$\frac{4}{8} = \frac{1}{2}$$

### *Unlike Denominators*

For adding fractions that have unlike denominators, we will have to find the least common denominator (LCD).

**Step 1:** Find the least common denominator (LCD). The LCD is the smallest multiple that the denominators have in common.

**Step 2:** Write equivalent fractions using the LCD.

**Step 3:** Add the numerators and write the sum over the denominator.

**Step 4:** Write the answer in simplest form.

**Example:**

Add:  $\frac{1}{3} + \frac{3}{4}$

Step 1: Find the LCD.

The smallest multiple that 3 and 4 have in common is 12.

Step 2: Write equivalent fractions using a denominator of 12.

$$\frac{1}{3} = \frac{4}{12} \quad \frac{3}{4} = \frac{9}{12}$$

Step 3: Add the numerators and write the sum over the denominator.

$$\frac{4}{12} + \frac{9}{12} = \frac{13}{12}$$

Step 4: Write the answer in simplest form.

$$\frac{13}{12} = 1\frac{1}{12}$$





# THE INSIDER'S GUIDE TO FRACTIONS

## Addition Problem

Write the problem here:

### Step 1: Find the least common denominator (LCD)

List multiples of the 1st denominator here:

List multiples of the 2nd denominator here:

The LCD is:

### Step 2: Write equivalent fractions using the LCD

1st fraction

2nd Fraction

### Step 3: Find the sum of the numerators

### Step 4: Express the answer in simplest form

# THE INSIDER'S GUIDE TO FRACTIONS

## Subtracting Fractions

### *Like Denominators*

**Step 1:** Subtract the numerators and write the difference over the denominator.

**Step 2:** Write the answer in simplest form.

**Example:**

Subtract:  $\frac{5}{8} - \frac{3}{8}$

Step 1: Subtract the numerators and write the difference over the denominator.

$$\frac{5}{8} - \frac{3}{8} = \frac{2}{8}$$

Step 2: Write the answer in simplest form.

$$\frac{2}{8} = \frac{1}{4}$$

### *Unlike Denominators*

For subtracting fractions that have unlike denominators, we will have to find the least common denominator (LCD).

**Step 1:** Find the least common denominator (LCD). The LCD is the smallest multiple that the denominators have in common.

**Step 2:** Write equivalent fractions using the LCD.

**Step 3:** Subtract the numerators and write the difference over the denominator.

**Step 4:** Write the answer in simplest form.

**Example:**

Subtract:  $\frac{4}{5} - \frac{2}{3}$

Step 1: Find the LCD.

The smallest multiple that 5 and 3 have in common is 15.

Step 2: Write equivalent fractions using a denominator of 15

$$\frac{4}{5} = \frac{12}{15} \quad \frac{2}{3} = \frac{10}{15}$$

Step 3: Subtract the numerators and write the difference over the denominator.

$$\frac{12}{15} - \frac{10}{15} = \frac{2}{15}$$

Step 4: Write the answer in simplest form.

The answer  $\frac{2}{15}$  is in simplest form.



# THE INSIDER'S GUIDE TO FRACTIONS

## Subtraction Problem

Write the problem here:

### Step 1: Find the least common denominator (LCD)

List multiples of the 1st denominator here:

List multiples of the 2nd denominator here:

The LCD is:

### Step 2: Write equivalent fractions using the LCD

1st fraction

2nd Fraction

### Step 3: Find the difference of the numerators

### Step 4: Express the answer in simplest form

# THE INSIDER'S GUIDE TO FRACTIONS

## Multiplying Fractions

### *Multiply a Fraction by a Fraction*

**Step 1:** Multiply the numerators.

**Step 2:** Multiply the denominators.

**Step 3:** Write the answer in simplest form.

**Example:**

Multiply:  $\frac{3}{4} \times \frac{2}{3}$

Step 1: Multiply the numerators.

$$\frac{3}{4} \times \frac{2}{3} = \frac{6}{12}$$

Step 2: Multiply the denominators.

$$\frac{3}{4} \times \frac{2}{3} = \frac{6}{12}$$

Step 3: Write the answer in simplest form.

$$\frac{6}{12} = \frac{1}{2}$$

### *Multiply Mixed Numbers*

**Step 1:** Write the mixed numbers as improper fractions.

**Step 2:** Multiply the numerators.

**Step 3:** Multiply the denominators.

**Step 4:** Write the answer in simplest form.

**Example:**

Multiply:  $3\frac{1}{3} \times 2\frac{1}{2}$

Step 1: Write the mixed numbers as improper fractions.

$$3\frac{1}{3} = \frac{10}{3} \qquad 2\frac{1}{2} = \frac{5}{2}$$

Step 2: Multiply the numerators.

$$\frac{10}{3} \times \frac{5}{2} = \frac{50}{6}$$

Step 3: Multiply the denominators.

$$\frac{10}{3} \times \frac{5}{2} = \frac{50}{6}$$

Step 4: Write the answer in simplest form.

$$\frac{50}{6} = 8\frac{2}{6} = 8\frac{1}{3}$$



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# THE INSIDER'S GUIDE TO FRACTIONS

## Multiplication Problem

Write the problem here:

## Step 1: Multiply the numerators

The product of the numerators is:

## Step 2: Multiply the denominators

The product of the denominators is:

## Step 3: Write a fraction using the products

## Step 4: Express the answer in simplest form

# THE INSIDER'S GUIDE TO FRACTIONS

## Dividing Fractions

### Divide a Fraction by a Fraction

**Step 1:** Write the division expression as a multiplication expression using the reciprocal of the divisor.

**Hint:** *The divisor is the second fraction in the equation.*

**Step 2:** Multiply the numerators and the denominators.

**Step 3:** Write the answer in simplest form.

**Example:**

Divide:  $\frac{5}{8} \div \frac{3}{4}$

Step 1: Write the division expression as a multiplication expression using the reciprocal of the divisor.

$$\frac{5}{8} \div \frac{3}{4} = \frac{5}{8} \times \frac{4}{3}$$

Step 2: Multiply the numerators and the denominators.

$$\frac{5}{8} \times \frac{4}{3} = \frac{20}{24}$$

Step 3: Write the answer in simplest form.

$$\frac{20}{24} = \frac{5}{6}$$

### Divide Mixed Numbers

**Step 1:** Write the mixed numbers as improper fractions.

**Step 2:** Write the division expression as a multiplication expression using the reciprocal of the divisor.

**Step 3:** Multiply the numerators and the denominators.

**Step 4:** Write the answer in simplest form.

**Example:**

Divide:  $2\frac{2}{3} \div 1\frac{1}{5}$

Step 1: Write the mixed numbers as improper fractions.

$$2\frac{2}{3} = \frac{8}{3} \quad 1\frac{1}{5} = \frac{6}{5}$$

Step 2: Write the division expression as a multiplication expression using the reciprocal of the divisor.

$$\frac{8}{3} \div \frac{6}{5} = \frac{8}{3} \times \frac{5}{6}$$

Step 3: Multiply the numerators and the denominators.

$$\frac{8}{3} \times \frac{5}{6} = \frac{40}{18}$$

Step 4: Write the answer in simplest form.

$$\frac{40}{18} = 2\frac{4}{18} = 2\frac{2}{9}$$



# THE INSIDER'S GUIDE TO FRACTIONS

## Division Problem

Write the problem here:

## Find the reciprocal of the divisor

Write the divisor here:

Write the reciprocal of the divisor here:

## Step 1: Write the division problem as a multiplication problem using the reciprocal

## Step 2: Find the product

Write the product of the numerators:

Write the product of the denominators:

Write a fraction using the products

## Step 3: Express the answer in simplest form

# THE INSIDER'S GUIDE TO FRACTIONS

## Equivalent Algebraic Fractions

*Refresh time!*

*What is an Equivalent Fraction?*

These are fractions that may look different, but have the same value.

To find equivalent algebraic fractions multiply or divide the numerator and the denominator by the same term.

**Examples:**

$$\frac{3x}{5y} = \frac{3x \cdot 2x}{5y \cdot 2x} = \frac{6x^2}{10xy} \qquad \frac{9x^2y^2}{6xy^3} = \frac{9x^2y^2 \div 3xy^2}{6xy^3 \div 3xy^2} = \frac{3x}{2y}$$

To write an algebraic fraction in simplest form, write an equivalent fraction by dividing the numerator and the denominator by the greatest common factor.

**Example:**

Write the algebraic fraction  $\frac{8m^2n^2}{6mn^3}$  in simplest form.

The greatest common factor of  $8m^2n^2$  and  $6mn^3$  is  $2mn^2$ . Divide both the numerator and the denominator by  $2mn^2$ .

$$\frac{8m^2n^2}{6mn^3} = \frac{8m^2n^2 \div 2mn^2}{6mn^3 \div 2mn^2} = \frac{4m}{3n}$$



# THE INSIDER'S GUIDE TO FRACTIONS

## Least Common Denominator (LCD) – Algebraic Fractions

The least common denominator (LCD) is the smallest multiple that the denominators have in common. Factor each denominator and find the least common multiple.

**Example:**

Find the LCD of  $\frac{3}{6x^2}$  and  $\frac{x}{4x^2 - 12x}$ .

Factor the denominators.

$$6x^2 = 2 \cdot 3 \cdot x \cdot x$$

$$4x^2 - 12x = 4x(x - 3) = 2 \cdot 2 \cdot x \cdot (x - 3)$$

The smallest multiple that is common to both denominators is

$$2 \cdot 2 \cdot 3 \cdot x \cdot x \cdot (x - 3) = 12x^2(x - 3)$$

The LCD is  $12x^2(x - 3)$ .

## Adding and Subtracting Algebraic Fractions

### *Like Denominators*

**Step 1:** Add or subtract the numerators and write the result over the denominator.

**Step 2:** Write the answer in simplest form.

**Example:**

Add:  $\frac{3}{4x} + \frac{5}{4x}$

Step 1: Add the numerators and write the sum over the denominator.

$$\frac{3}{4x} + \frac{5}{4x} = \frac{8}{4x}$$

Step 2: Write the answer in simplest form.

$$\frac{8}{4x} = \frac{2}{x}$$

# THE INSIDER'S GUIDE TO FRACTIONS

## Unlike Denominators

**Step 1:** Factor the denominators and find the least common denominator (LCD).

**Step 2:** Write equivalent fractions using the LCD.

**Step 3:** Add or subtract the numerators and write the result over the denominator.

**Step 4:** Write the answer in simplest form.

**Example:**

Add:  $\frac{3}{4x^2} + \frac{x}{3x^2 - 12x}$

Step 1: Find the LCD.

Factor the second denominator:  $3x^2 - 12x = 3x(x - 4)$ . The smallest multiple that  $4x^2$  and  $3x(x - 4)$  have in common is  $12x^2(x - 4)$ .

Step 2: Write equivalent fractions using a denominator of  $12x^2(x - 4)$ .

$$\frac{3}{4x^2} \cdot \frac{3(x-4)}{3(x-4)} = \frac{9(x-4)}{12x^2(x-4)} = \frac{9x-36}{12x^2(x-4)}$$

$$\frac{x}{3x(x-4)} \cdot \frac{4x}{4x} = \frac{4x^2}{12x^2(x-4)}$$

Step 3: Add the numerators and write the sum over the denominator.

$$\frac{9x-36}{12x^2(x-4)} + \frac{4x^2}{12x^2(x-4)} = \frac{9x-36+4x^2}{12x^2(x-4)}$$

Step 4: Write the answer in simplest form.

$$\frac{4x^2 + 9x - 36}{12x^3 - 48x^2}$$

# THE INSIDER'S GUIDE TO FRACTIONS

## Multiplying Algebraic Fractions

**Step 1:** Multiply the numerators.

**Step 2:** Multiply the denominators.

**Step 3:** Write the answer in simplest form.

**Example:**

Multiply:  $\frac{3a^2}{2b} \cdot \frac{4}{ab}$

Step 1: Multiply the numerators.

$$\frac{3a^2}{2b} \cdot \frac{4}{ab} = \frac{12a^2}{2ab^2}$$

Step 2: Multiply the denominators.

$$\frac{3a^2}{2b} \cdot \frac{4}{ab} = \frac{12a^2}{2ab^2}$$

Step 3: Write the product in simplest form.

$$\frac{12a^2}{2ab^2} = \frac{6a}{b^2}$$

## Dividing Algebraic Fractions

**Step 1:** Write the division expression as a multiplication expression using the reciprocal of the divisor.

**Step 2:** Multiply the numerators and the denominators.

**Step 3:** Write the answer in simplest form.

**Example:**

Divide:  $\frac{5y^2}{x+2} \div \frac{y}{2}$

Step 1: Write the division expression as a multiplication expression using the reciprocal of the divisor.

$$\frac{5y^2}{x+2} \div \frac{y}{2} = \frac{5y^2}{x+2} \cdot \frac{2}{y}$$

Step 2: Multiply the numerators and the denominators.

$$\frac{5y^2}{x+2} \cdot \frac{2}{y} = \frac{10y^2}{y(x+2)}$$

Step 3: Write the answer in simplest form.

$$\frac{10y^2}{y(x+2)} = \frac{10y}{x+2}$$

# THE INSIDER'S GUIDE TO FRACTIONS

## Simplifying Complex Fractions

*Refresh time!*

*What is a Complex Fraction?*

A complex fraction is a fraction where the numerator and/or denominator are a fraction.

**Step 1:** Simplify the numerator.

**Step 2:** Simplify the denominator.

**Step 3:** Write the simplified expression as a multiplication expression using the reciprocal of the divisor (the denominator of the complex fraction).

**Step 4:** Write the answer in simplest form.

**Example:**

$$\text{Simplify: } \frac{\frac{3}{5} + 2\frac{1}{2}}{\frac{2}{3} - \frac{1}{2}}$$

Step 1: Simplify the numerator.

$$\frac{3}{5} + 2\frac{1}{2} = \frac{3}{5} + \frac{5}{2} = \frac{6}{10} + \frac{25}{10} = \frac{31}{10}$$

Step 2: Simplify the denominator.

$$\frac{2}{3} - \frac{1}{2} = \frac{4}{6} - \frac{3}{6} = \frac{1}{6}$$

Step 3: Write the simplified expression as a multiplication expression using the reciprocal of the divisor.

$$\frac{\frac{31}{10}}{\frac{1}{6}} = \frac{31}{10} \cdot \frac{6}{1} = \frac{186}{10}$$

Step 4: Write the answer in simplest form.

$$\frac{186}{10} = 18\frac{6}{10} = 18\frac{3}{5}$$



# IF YOUR CHILD LEARNS BETTER FROM OTHER PEOPLE, TAKE HEART ... *Most Kids Do!*

You're emotionally invested.

You're all in, baby.

This means that no matter how good of a teacher you are, it's hard to stay neutral with your own family.

One moment you're trying to explain how to write a division expression as a multiplication expression, and the next moment, things have grown so tense you need a crisis negotiator to cool you both down.

*Not to mention, you just don't have extra time to help your child practice.*

*So, if you and your child are bumping heads over fractions, it's normal*



You haven't done anything wrong.

You haven't failed your child.

With all of today's expectations on you, you can't do it all by yourself — nor should you have to.

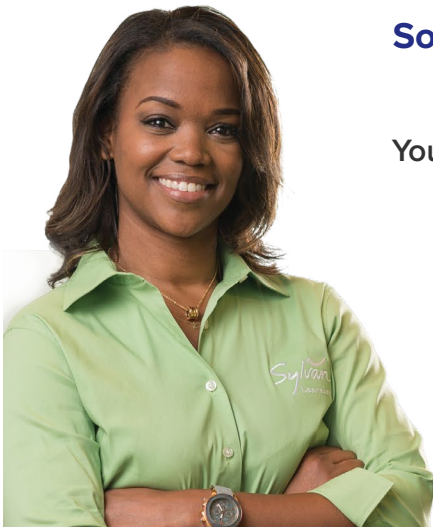
Know this:

## **Most kids learn best with an outside expert to guide them**

And it works out better for **EVERYONE**.

**YOU** provide emotional support. *(This is actually really important.)* And you let a teacher take on the instruction of tricky math skills.

You're a team.



## **So, where do you find qualified teachers who *really* care about your child's success?**

You find them at Sylvan.

Sylvan's teachers and coaches will help your child get the right amount of **practice, motivation** and **skill re-enforcement** to master these math skills and be ready for more advanced math topics to come.

Plus, your child will get the support to tackle tough homework assignments and prepare for monster tests.

No frustration. No arguing. And *w-a-a-a-y* less stress.

## “Sylvan helped take the pressure off us” & other transformations from families

*“We were frustrated and having a hard time thinking of new ways to help our son understand the material. Sylvan helped take that pressure off us, giving him a person with patience and clear focus to help him, which we had lost at that point. It also helped give us time to refocus and get back to where we needed to be to support our child again.”*

— J. Lowe

*“I like that my daughter gets additional help from a different perspective. Her grades have already come up.”*

— T. Gutermuth

*“My daughter struggles in math. By her third session, she came out smiling, and she felt hopeful for the first time in a long time. She is finally grasping concepts that were just out of her reach. I am very happy for her and very grateful to Sylvan for putting the spark back in her eyes. She used to say she feels ‘dumb,’ but I have not heard her say that for a couple of weeks now. That alone is worth it.”*

— M. Jamerson

*There are a number of ways we can help —  
from a monthly homework coach, to tutoring with guaranteed skill growth*

And our programs have flexible scheduling for busy families, like yours.

### Find out if a Sylvan program is right for your child

Reach out today for a **free, no-pressure consultation**.  
You can get it by phone or in-person at a time that works for you.



This your chance to:

- ✓ **Share what’s going on:** Fill us in on what’s working — and what isn’t. We’ll help you get to the root cause, so you can ...
- ✓ **Find out if we can even help your family:** We’ll share exactly what your options are.
- ✓ **Feel 100% comfortable and assured:** You can ask us your toughest questions, from prices to results.
- ✓ **Discover why 7 million parents have trusted Sylvan** with their children’s success.

We promise:

You'll walk away with a clear picture of whether Sylvan can help your child get fractions to click, take the battle out of schoolwork and get grades on track.

*Raising kids is hard work ... You aren't in this alone*

Reach out to your local Sylvan center today:

**888-338-2283**

Find a *Sylvan* Near You!

# GLOSSARY OF MATHEMATICAL TERMS

**Introduction:** At Sylvan, we recognize that mathematics is a language that can be learned. This glossary of mathematical terms and definitions includes several hundred of the most important mathematical terms in use today. This glossary is intended for use by all members of the Sylvan Learning family.

CLICK THE LETTERS TO JUMP TO:

**A B C D E F G H I J K L M N O P Q R S T U V W X Y Z**

**#**

**4-step method for problem solving** A problem-solving method that can be applied to any math problem. Students are taught the steps as: Understand, Plan, Solve, and Look Back.

**A**

**absolute value** The distance a number is from zero on a number line. The absolute value of  $x$  is denoted by  $|x|$ . *Example:*  $|-5| = 5$ ;  $|5| = 5$ .

**acute angle** An angle whose measure is greater than  $0^\circ$  and less than  $90^\circ$ .

**acute triangle** A triangle with three acute angles.

**addend** A number being added to obtain a sum.

**additive inverse** Also called the opposite of a number. The sum of any number and its additive inverse is zero. *Example:* the additive inverse of 5 is  $-5$  and the additive inverse of  $-5$  is 5.

**adjacent angles** A pair of angles with a common vertex and exactly one common side.

**algebra** A generalization and an extension of the concepts of arithmetic. In algebra, variables are used to represent numbers and quantities.

**algebraic equation** A mathematical sentence that includes one or more variables and contains two expressions joined by an equal sign.

**algebraic expression** A variable or a combination of one or more variables and numbers with one or more operations.  
*Examples:*  $x$ ,  $x + 9$ ,  $2x - 3$ , and  $4x^2 - 3y^2$ .

**algorithm** A set of step-by-step directions for a procedure.  
*Examples:* *Partial Sums algorithm*, *Column Addition Algorithm*, *Trade First Subtraction algorithm*, etc.



<b>altitude</b>	A segment that extends from a vertex of a figure and meets a base at a right angle. Also called the height.
<b>angle</b>	A figure formed by two rays with a common endpoint. The common endpoint is called the vertex of the angle.
<b>arc</b>	A part of a circle consisting of two endpoints and all of the points on the circle between the two endpoints.
<b>area</b>	The number of square units needed to cover a region.
<b>associative property</b>	The grouping of addends does not change the sum. $(a + b) + c = a + (b + c)$ The grouping of factors does not change the product. $(ab)c = a(bc)$
<b>axes</b>	The vertical and horizontal lines of reference that divide the coordinate plane into quadrants. The horizontal axis is the x-axis, and the vertical axis is the y-axis.

## B

<b>bar graph</b>	A graph that uses vertical or horizontal bars to represent relationships among data.
<b>binomial</b>	A polynomial that consists of two terms, or two monomials.
<b>box-and-whisker plot</b>	A graphical method for showing the median, quartiles, and extremes of data.

## C

<b>Cartesian coordinate system</b>	The system of locating points on a plane formed by a horizontal line (x-axis) intersecting a vertical line (y-axis). The plane is divided into four quadrants in which ordered pairs, or points, are identified and plotted by their distance from each axis.
<b>central angle</b>	An angle that has its vertex at the center of a circle. The measure of the central angle equals the measure of the minor arc.
<b>certain event</b>	An event that must happen. It has a probability of 1.
<b>chart</b>	A display used to organize information or data.
<b>chord</b>	A line segment whose endpoints lie on a circle.
<b>circle</b>	The set of all points in a plane that are a given distance (radius) from a fixed point (center).
<b>circle graph</b>	A type of graph where a circle represents the total amount and segments denote the data. It is also known as a pie chart.

CLICK THE LETTERS TO JUMP TO:

**A B C D E F G H I J K L M N O P Q R S T U V W X Y Z**

<b>circumference</b>	The distance around a circle. $C = \pi d$
<b>coefficient</b>	A constant used as a factor in an algebraic expression. In the expression $2x + 3y$ , the coefficient of $x$ is 2, and the coefficient of $y$ is 3.
<b>coincident</b>	Two or more geometric figures that share all points. <i>Example: two coincident lines would have equations that are equivalent.</i>
<b>combination</b>	An arrangement of elements or events in which order does not matter.
<b>common factor</b>	A common factor of two natural numbers is a number that is a factor of both numbers. <i>Example: 7 is a common factor of 35 and 56, because <math>35 = 7 \times 5</math> and <math>56 = 7 \times 8</math></i>
<b>commutative property</b>	The order of addends does not change the sum. $a + b = b + a$ The order of factors does not change the product. $ab = ba$
<b>compatible numbers</b>	Pairs of numbers that can easily be added, subtracted, multiplied, or divided using mental math.
<b>complementary angles</b>	A pair of angles the sum of whose measures is $90^\circ$ .
<b>composite figure</b>	A figure made up of two or more basic two-dimensional objects.
<b>composite number</b>	An integer greater than 1 with more than two factors.
<b>concave polygon</b>	A polygon that has at least one diagonal outside the polygon.
<b>congruent</b>	Having the same shape and the same size.
<b>congruent angles</b>	Two or more angles that have the same degree measure.
<b>consecutive numbers</b>	Whole numbers that follow in order. <i>Example: 3, 4, and 5</i>
<b>consecutive sides of a polygon</b>	Adjacent sides of a polygon.
<b>convex polygon</b>	A polygon that has all of its diagonals inside the polygon.
<b>coordinate plane or system</b>	A plane formed by a horizontal line ( $x$ -axis) that intersects a vertical line ( $y$ -axis). The plane is divided into four quadrants in which ordered pairs or points can be identified and plotted.
<b>coordinates</b>	The ordered pair $(x, y)$ used to represent a point on the coordinate plane.
<b>correlation</b>	A relationship between two sets of data. A positive correlation exists when one set increases or decreases as the other set does the same. A negative correlation exists when one set increases or decreases as the other set does the opposite.
<b>corresponding angles in parallel lines cut by a transversal</b>	When parallel lines are cut by a transversal, angles in the same position relative to the parallel lines and transversal are corresponding and congruent.

CLICK THE LETTERS TO JUMP TO:

**A B C D E F G H I J K L M N O P Q R S T U V W X Y Z**

<b>corresponding angles of similar triangles</b>	In similar triangles, the angles in the same relative location of the two triangles are corresponding and congruent. If $\triangle ABC \approx \triangle XYZ$ , then $\angle A \approx \angle X$ and $m\angle A = m\angle X$ .
<b>cube</b>	A rectangular prism with all edges and faces congruent.
<b>cubed</b>	Another way to express a number or variable raised to the third power.
<b>cubic units</b>	The units used to measure the space inside a three-dimensional figure.
<b>cylinder</b>	A solid with congruent and parallel circular bases.
<b>D</b>	
<b>data</b>	Information about a situation, group, or event.
<b>data set</b>	A collection of facts or experimental results.
<b>decagon</b>	A 10-sided polygon.
<b>decimal</b>	A number written in standard notation, usually containing a decimal point. <i>Example: 5.25 and 0.36 are decimal numbers.</i>
<b>denominator</b>	The number of equal parts or groups into which the whole or group is divided. The denominator can be any number except zero. <i>Example: In the fraction <math>\frac{a}{b}</math>, <math>b</math> is the denominator.</i>
<b>diagonal</b>	A line segment that connects two non-adjacent vertices in a polygon.
<b>diameter</b>	A line segment passing through the center of a circle and connecting two points on the circle. The diameter is equal to twice the length of the radius.
<b>difference</b>	The result of subtracting two numbers. <i>Example: <math>7 - 5 = 2</math>, the difference is 2.</i>
<b>digit</b>	Any of the numerals 0 through 9.
<b>dilation</b>	A transformation that enlarges or reduces a figure.
<b>dimensional analysis</b>	The process of using unit factors to convert measurements.
<b>direct measure</b>	Measuring an object by physical means. This can be done with a device such as a ruler.
<b>direct variation</b>	The relationship between two variables such that their ratio remains constant.
<b>distance</b>	The measurement between two points in a plane.

CLICK THE LETTERS TO JUMP TO:

**A B C D E F G H I J K L M N O P Q R S T U V W X Y Z**

<b>distance formula</b>	The distance traveled ( $d$ ) in a given time ( $t$ ) at a rate ( $r$ ) is given by the formula $d = rt$ .
<b>distributive property</b>	The product of a factor and a sum is equal to the sum of the products. <i>Example: <math>a(b + c) = ab + ac</math>.</i>
<b>dividend</b>	The amount that is divided into parts. <i>Example: Given <math>a \div b = c</math> or <math>b \overline{)a}^c</math>, <math>a</math> is the dividend.</i>
<b>divisible</b>	An integer is divisible by another non-zero integer if the division leaves a remainder of zero.
<b>division</b>	The inverse operation of multiplication. Division is performed on two numbers to obtain a third number, called the quotient. <i>Example: <math>6 \div 2 = 3</math>, , the number 6 is the dividend, the number 2 is the divisor, and the number 3 is the quotient.</i>
<b>division law of exponents</b>	To divide two powers that have the same base, subtract the exponents. <i>Example: <math>\frac{x^5}{x^3} = x^2</math></i>
<b>divisor</b>	The number by which a dividend is divided. <i>Example: Given <math>a \div b = c</math> or <math>b \overline{)a}^c</math>, <math>b</math> is the divisor.</i>
<b>domain</b>	The set of all possible values for the unknown in an open sentence or a function.
<b>dotplot</b>	A graphical display in which the frequency of each result is indicated by the number of dots above that result.
<b>double bar graph</b>	A bar graph used to compare two sets of data.
<b>double line graph</b>	A graph with two lines representing different sets of data.

## E

<b>edge</b>	The line along which two faces of a solid figure meet.
<b>edge of a graph</b>	A line segment that connects two vertices in a graph.
<b>element</b>	An item in a set.
<b>endpoints</b>	The initial point and end point of a line segment.
<b>equal</b>	The term used to describe a relationship between two numbers or expressions that have exactly the same value.
<b>equation</b>	A mathematical sentence that uses an equal sign to show that two quantities are equal.
<b>equilateral triangle</b>	A triangle with three sides of equal length and three angles of equal measure. Each angle in an equilateral triangle has a measure of $60^\circ$ .

CLICK THE LETTERS TO JUMP TO:

**A B C D E F G H I J K L M N O P Q R S T U V W X Y Z**

<b>equivalent</b>	Equal in value, but in a different form. <i>Example: <math>\frac{3}{4}</math>, 0.75, and 75% are equivalent.</i>
<b>equivalent fractions</b>	Fractions that name the same number. <i>Example: <math>\frac{3}{4}</math> and <math>\frac{6}{8}</math> are equivalent fractions.</i>
<b>equivalent ratios</b>	Ratios that make the same comparison. <i>Example: 5 to 10 and 1 to 2 are equivalent ratios.</i>
<b>estimate</b>	An approximation, or rough calculation, of a quantity or measurement.
<b>even integer</b>	An integer that can be written as the sum of two equal integers. An even number can be expressed in the form $2x$ , where $x$ is any integer. Even integers end in 0, 2, 4, 6, and 8.
<b>even number</b>	A whole number that is divisible by 2. <i>Example: 0, 2, 4, 6, ...</i>
<b>expanded form</b>	The expanded form of an algebraic expression is the equivalent expression without parentheses. <i>Example: the expanded form of <math>(a + b)^2</math> is <math>a^2 + 2ab + b^2</math></i>
<b>expanded notation</b>	A way of writing a number to show the value of each digit. <i>Example: <math>34,718 = 30,000 + 4,000 + 700 + 10 + 8</math>.</i>
<b>expenses</b>	The total amount of money spent, including all costs.
<b>experimental probability</b>	Probability of an event based on the statistical results of an actual experiment that has already been performed. Also called empirical probability.
<b>exponent</b>	A symbol written above and to the right of a base that tells how many times the base is used as a factor. <i>Example: <math>5^3</math>, the exponent is 3.</i>
<b>exponential function</b>	A function commonly used to study growth and decay. It has the form $f(x) = a^x$ , when $a > 0$ .
<b>expression</b>	A mathematical arrangement of numbers and variables connected by operations such as addition, subtraction, multiplication, and division. An expression does not contain an equal sign.
<b>exterior angle of a polygon</b>	An angle on the outside of a polygon formed by one side of the polygon and the extension of a second side of the polygon.

## F

<b>face</b>	A flat side of a solid figure.
<b>factor</b>	A number that divides exactly into another number with no remainder. When two or more factors are multiplied, they form a product. <i>Example: <math>3 \times 6 = 18</math>, 3 and 6 are factors, and 18 is the product.</i>

CLICK THE LETTERS TO JUMP TO:

**A B C D E F G H I J K L M N O P Q R S T U V W X Y Z**

<b>factor</b>	To write a number or expression as a product of its factors.
<b>factor tree</b>	A graphical tool used to help determine the prime factors of a number.
<b>factored form</b>	A way to write numbers using factors. <i>Example: <math>2 \times 3 \times 5</math> is the factored form of 30.</i>
<b>factorial</b>	The product of all of the positive integers less than or equal to a number. The symbol for factorial is !. <i>Example: <math>5! = 5 \times 4 \times 3 \times 2 \times 1 = 120</math></i>
<b>formal mathematical language</b>	A written language that relies on precise mathematical terms and definitions to communicate ideas.
<b>fraction</b>	A number in the form $\frac{a}{b}$ , where $a$ and $b$ are whole numbers and $b$ is not 0. Fractions are used to name parts of a whole object or part of a whole collection of objects, or to compare two quantities.
<b>fractional equation</b>	An equation that includes fractional coefficients. <i>Example: <math>\frac{a}{4} + \frac{a}{3} = 5</math></i>
<b>function</b>	A mathematical relationship between two sets in which each element of the domain is matched with exactly one element of the range.
<b>function table</b>	Pairs of $x$ and $y$ values arranged in a table to represent a function, relationship, sequence, or pattern.
<b>fundamental counting principle</b>	If one event has $p$ possible outcomes and an independent event has $q$ possible outcomes, then the first event followed by the second event has $p \times q$ possible outcomes.

## G

<b>geoboard</b>	A board with pegs aligned in grid fashion that permits rubber bands to be wrapped around pegs to form geometric figures.
<b>geometric sequence</b>	A sequence of numbers that is generated by multiplying each new term by the same number. <i>Example: In the sequence <math>\{1, 4, 16, 64, 256, \dots\}</math> each term has been multiplied by 4 to generate the next term in the sequence.</i>
<b>geometry</b>	The study of the properties, measurement, and relationships of points, lines, angles, planes, and solids.
<b>glyph</b>	A pictorial form of data collection used to organize and analyze data.
<b>graph</b>	A data display that uses ordered pairs, bars, lines, circles, or pictures to show a data pattern or as a model to predict future values.
<b>graphing calculator</b>	A calculator that will store and draw the graphs of several functions at once.
<b>greater than</b>	The symbol used to denote that one quantity is greater than another. <i>Example: <math>8 &gt; 5</math></i>

CLICK THE LETTERS TO JUMP TO:

**A B C D E F G H I J K L M N O P Q R S T U V W X Y Z**

**greatest common factor (GCF)**

The largest number that is a factor of two or more numbers.  
*Example: the GCF of 36 and 24 is 12, since  $36 = 12 \times 3$  and  $24 = 12 \times 2$ .*

**guess and check**

A problem-solving strategy that involves testing possible answers and using the results of those tests to determine the answer.

**H****height of a prism or cylinder**

The perpendicular distance between the bases.

**height of a pyramid or cone**

The length of the perpendicular segment from the vertex to the base.

**height of a trapezoid**

The perpendicular distance between the bases.

**height of a triangle**

The perpendicular segment from a vertex to the base. Also called the altitude.

**histogram**

A type of graph that uses adjacent vertical bars to show frequencies of data.

**horizontal axis**

The axis running left to right, often denoted as the x-axis in a coordinate plane.

**hundredth**

Each of one hundred equal parts.

**hypotenuse**

The side opposite the right angle in a right triangle. The hypotenuse is the longest side of a right triangle.

**I****identity**

A mathematical equation that is true for all real numbers.  
*Example:  $x + x = 2x$*

**identity property of addition**

The sum of any number and 0 is that number. For all real numbers  $a$ ,  $a + 0 = 0 + a = a$ . Zero is called the additive identity.

**identity property of multiplication**

The product of any real number and 1 is that number. The real number 1 is the multiplicative identity.  $1 \times a = a \times 1 = a$

**image**

The result of a transformation.

**impossible event**

An event that cannot happen, it has a probability of 0.

**independent events**

Two or more events in which the outcome of any one event does not affect the outcome of any of the other events.

**independent variable**

A mathematical term or variable whose value is given or defined first, and determines the value of the dependent variable. In a function, the domain lists the possible values of the independent variable.

**indirect measure**

Measuring an object on the basis of another object whose measure is known.

CLICK THE LETTERS TO JUMP TO:

**A B C D E F G H I J K L M N O P Q R S T U V W X Y Z**

<b>inequality</b>	A mathematical sentence that uses symbols such as for greater than (>) and less than (<) to compare values.
<b>inscribed angle</b>	An angle formed by two chords of a circle with a common endpoint. The measure of the inscribed angle is half the measure of the intercepted arc.
<b>inscribed polygon</b>	A polygon whose sides are all chords of a circle.
<b>integers</b>	The set of whole numbers and their opposites. Zero is an integer, and is neither positive nor negative. $\{\dots -3, -2, -1, 0, 1, 2, 3, \dots\}$
<b>intercepted arc</b>	An arc that is formed by an inscribed angle. The arc falls in the interior of the angle, with endpoints on the rays of the inscribed angle.
<b>interest</b>	A sum of money paid when borrowing or saving money. Simple interest is calculated by multiplying the principle (P) by the rate (r) and the amount of time (t). $I = Prt$
<b>interior angles</b>	Angles on the inside of a polygon formed by two consecutive sides of the polygon.
<b>intersection</b>	The point where two lines cross.
<b>interval</b>	The constant space between grid lines on the axes of a graph.
<b>inverse operations</b>	Operations that are opposites. Addition is the inverse operation of subtraction, and multiplication is the inverse operation of division.
<b>inverse property of addition</b>	The sum of any real number and its opposite is zero. The real number $-a$ is the additive inverse of $a$ . $a + (-a) = (-a) + a = 0$
<b>inverse property of multiplication</b>	The product of any nonzero real number and its reciprocal is 1. The real number $\frac{1}{a}$ is the multiplicative inverse of the nonzero real number $a$ . $a\left(\frac{1}{a}\right) = \left(\frac{1}{a}\right)a = 1$
<b>inverse variation</b>	The relationship between two variables such that the ratio of one variable to the reciprocal of the other is a constant.
<b>isosceles right triangle</b>	A right triangle whose two legs have equal lengths. The angles of an isosceles right triangle measure $45^\circ$ , $45^\circ$ , and $90^\circ$ .
<b>isosceles trapezoid</b>	A trapezoid with non-parallel sides congruent.
<b>isosceles triangle</b>	A triangle with at least two congruent sides and angles.

## K

<b>kite</b>	A four-sided polygon with exactly two distinct pairs of congruent consecutive sides.
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CLICK THE LETTERS TO JUMP TO:

**A B C D E F G H I J K L M N O P Q R S T U V W X Y Z**



# L

<b>lateral area</b>	The sum of the areas of the surfaces, excluding the bases, of a three-dimensional figure.
<b>lateral edge</b>	A line formed by the intersection of two lateral faces of a prism.
<b>lateral faces</b>	The faces of a prism that are not bases.
<b>least common multiple (LCM)</b>	The smallest number that is a multiple of two or more numbers. <i>Example: LCM of 15 and 20 is 60.</i>
<b>legend</b>	A key that explains the symbols used in a graph.
<b>legs</b>	In a right triangle, the two sides that intersect to form the right angle.
<b>length</b>	A dimension of a rectangle, usually the longer side.
<b>less than</b>	The symbol used to denote that one quantity is less than another. <i>Example: <math>5 &lt; 8</math></i>
<b>like terms</b>	Terms with the same variables and the same powers of those variables. <i>Example: <math>2x^3</math> and <math>-5x^3</math> are like terms.</i>
<b>likely</b>	A result that will probably, but not definitely, occur.
<b>line</b>	A set of points that form a straight path extending infinitely in both directions.
<b>line graph</b>	A graph with a horizontal and vertical axis that represents data as a continuous line or curve.
<b>line segment</b>	The set of points between two given points on a line.
<b>linear algebra</b>	The branch of mathematics that considers vectors, systems of linear equations, and linear transformations.
<b>linear equation</b>	An equation that represents a straight line.
<b>linear function</b>	A function whose general equation is $f(x) = mx + b$ , where $m$ and $b$ are constants.
<b>linear measurement</b>	Measurement in a straight line.
<b>linear pair of angles</b>	A pair of adjacent angles whose distinct sides lie on a straight line. The sum of the measures of a linear pair of angles is $180^\circ$ .
<b>liter</b>	The basic unit for measuring capacity within the metric system. One liter equals 1,000 milliliters.

CLICK THE LETTERS TO JUMP TO:

**A B C D E F G H I J K L M N O P Q R S T U V W X Y Z**

# M

<b>magic square</b>	A square containing integers arranged in an equal number of rows and columns so that each row, column, and diagonal has the same sum.
<b>major arc</b>	An arc whose measure is more than the measure of a semicircle.
<b>manipulatives</b>	Materials that allow students to explore mathematical concepts in a concrete mode.
<b>mass</b>	The amount of matter that an object contains.
<b>mathematical model</b>	A representation in the mathematical world of some phenomenon in the real world.
<b>maximum</b>	The largest value in a data set.
<b>maximum point</b>	The highest point on a graph.
<b>mean</b>	The average of a set of numbers. The mean can be found by taking the sum of the numbers in a set of data divided by the number of pieces of data.
<b>measures of central tendency</b>	Values that summarize a set of numerical data. The most common measures of central tendency are mean, median, mode, and range.
<b>median</b>	The middle number in a set of numbers that are arranged from least to greatest. The median of a set with an even number of elements is the arithmetic mean of the two middle elements.
<b>mental computation</b>	A calculation done without pencil, paper, calculator, or computer.
<b>meter</b>	A unit of length in the metric system. One meter equals 100 centimeters.
<b>metric system</b>	A system of measurement that is based on units of 10. The basic units of the metric system are the meter, liter, and gram.
<b>midpoint</b>	The point on a line segment that is equidistant from the endpoints.
<b>minimum</b>	The smallest value in a data set.
<b>minimum point</b>	The lowest point on a graph.
<b>minor arc</b>	An arc whose measure is less than $180^\circ$ .
<b>minuend</b>	The first number in an expression of subtraction. <i>Example: In the expression <math>5 - 3 = 2</math>, the minuend is 5.</i>
<b>mixed number</b>	A number consisting of a whole number and a fraction <i>Example: <math>3\frac{1}{2}</math></i>

CLICK THE LETTERS TO JUMP TO:

**A B C D E F G H I J K L M N O P Q R S T U V W X Y Z**

<b>mode</b>	In statistics, the value that occurs most frequently in a given set of numbers.
<b>monomial</b>	A single term that is made up of a number, a variable, or the product of numbers and variables. <i>Example: 4, 2x, and <math>-5x^2y^3</math> are monomials.</i>
<b>multiple</b>	A multiple of a number is the product of that number and any nonzero whole number.
<b>multiplication</b>	An operation on two numbers, called factors, to obtain a third number called the product. Example: In the equation $5 \times 2 = 10$ , the numbers 5 and 2 are factors, and 10 is the product.
<b>multiplication laws of exponents</b>	To multiply two powers that have the same base, add the exponents. <i>Example: <math>x^3 \cdot x^5 = x^8</math></i>
<b>multiplicative inverse</b>	The opposite of a number in a multiplication operation. The product of any number and its multiplicative inverse is one. The multiplicative inverse is also called the reciprocal. <i>Example: the multiplicative inverse of <math>\frac{2}{3}</math> is <math>\frac{3}{2}</math></i>

## N

<b>natural numbers</b>	The set of positive integers, not including zero. Natural numbers are also known as counting numbers. $\{1, 2, 3, 4, 5, \dots\}$
<b>negative integer</b>	An integer that is less than zero. $\{\dots -5, -4, -3, -2, -1\}$
<b>net of a polyhedron</b>	A two-dimensional diagram of a polyhedron.
<b>nonagon</b>	A nine-sided polygon.
<b>nonstandard unit</b>	Unit of measurement expressed in terms of objects, such as paper clips, sticks of gum, shoes, etc.
<b>notation</b>	Symbols and characters used to express values, operations, and relationships in mathematical expressions.
<b>number line</b>	A line on which points are marked off at regular intervals and labeled with ordered numbers.
<b>numerator</b>	When a whole is divided into a number of equal parts, the number of equal parts being considered is the numerator. <i>Example: In the fraction <math>\frac{a}{b}</math>, a is the numerator.</i>
<b>numerical expression</b>	A mathematical phrase that contains numbers and operation symbols, but no variables.

CLICK THE LETTERS TO JUMP TO:

**A B C D E F G H I J K L M N O P Q R S T U V W X Y Z**

## O

<b>obtuse angle</b>	An angle whose measure is between $90^\circ$ and $180^\circ$ .
<b>obtuse triangle</b>	A triangle with one angle greater than $90^\circ$ .
<b>odd number</b>	A whole number that is not divisible by 2.
<b>odds</b>	The ratio of the number of favorable outcomes to the number of unfavorable outcomes.
<b>one-to-one correspondence</b>	When each element of a set is assigned to one element of a second set, and each element of the second set is assigned to one element of the first set, the mapping is called a one-to-one correspondence.
<b>open sentence</b>	A statement that contains at least one unknown. It becomes true or false when a quantity is substituted for the unknown. <i>Example: <math>2x + 3 = 12</math> or <math>5 + \underline{\quad} = 9</math></i>
<b>operation</b>	A process performed on numbers and expressions. The basic operations are addition, subtraction, multiplication, and division.
<b>opposite integers</b>	Two integers that are the same distance from zero on a number line, in opposite directions.
<b>order of operations</b>	A rule indicating the order in which operations should be performed when there are several operations in an expression. Perform operations inside grouping symbols first, and then simplify exponents. Next perform multiplication and division from left to right, and finally perform addition and subtraction from left to right. The acronym PEMDOS refers to the specified order.
<b>ordered pair</b>	An ordered pair of numbers $(x, y)$ used to name a point on a coordinate plane.
<b>origin</b>	The point $(0, 0)$ on the coordinate plane at the intersection of the x-axis and the y-axis.
<b>outcome</b>	The result of an experiment.

## P

<b>parabola</b>	A curve in which every point is the same distance from a fixed point (focus) and a fixed line (directrix). The equation of a parabola can be expressed as $y = a(x - h)^2 + k$ , where $(h, k)$ is the vertex of the parabola. The graph is concave up if $a > 0$ and concave down if $a < 0$ .
<b>parallel lines</b>	Lines in the same plane and never intersect.
<b>parallelogram</b>	A four-sided polygon with opposite sides parallel and congruent.

CLICK THE LETTERS TO JUMP TO:

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<b>patterns</b>	Regularities in situations such as those in nature, events, shapes, designs, and sets of numbers. Example: spirals on a pineapple, geometric designs in quilts, the number sequence 2, 4, 6, 8, ...
<b>percent</b>	A ratio where the comparison is made out of 100. <i>Example:</i> $17\% = \frac{17}{100}$
<b>percent decrease</b>	The percent represented by the ratio of the amount of decrease to the original amount.
<b>percent increase</b>	The percent represented by the ratio of the amount of increase to the original amount.
<b>perfect square</b>	A whole number that can be renamed as the square of an integer. <i>Example:</i> <i>16 is a perfect square because <math>16 = 4^2</math></i>
<b>perfect square trinomial</b>	A trinomial in the form $a^2 + 2ab + b^2$ , which can be factored as $(a + b)^2$
<b>perimeter</b>	The distance around a polygon. This distance can be found by adding the lengths of the sides.
<b>perpendicular bisector of a line segment</b>	A line, ray, or line segment that is perpendicular to a given line segment, and divides the line segment into two equal parts.
<b>perpendicular lines</b>	Lines that intersect to form right angles.
<b>pi</b>	The ratio of the circumference of a circle to its diameter. The symbol for pi is $\pi$ . It can be approximated as 3.14 or $\frac{22}{7}$
<b>pictograph</b>	A type of graph in which pictures are used to represent values.
<b>pie chart</b>	A type of graph where a circle represents the total amount and segments denote the data. It is also known as a circle graph.
<b>pint</b>	A dry or liquid measure of capacity. Two cups equal 1 pint and two pints equal one quart.
<b>place value</b>	The value of a digit depending on its position in a numeral. In the numeral 4695, the 6 is in the hundreds place, which gives it a value of 600.
<b>plane</b>	A two-dimensional geometric object that extends without boundary.
<b>plane figure</b>	A figure that lies in only one plane. Circles and polygons are plane figures.
<b>plotting points</b>	Locating points, lines, or curves by means of placing coordinates on a grid.
<b>point</b>	A geometric object with position but without length, width, or depth.
<b>polygon</b>	A many-sided closed figure in which each side is a line segment.
<b>polyhedron</b>	A three-dimensional closed figure whose faces are polygons.

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<b>polynomial</b>	In algebra, a sum of one or more monomials. <i>Example: <math>-2x</math>, <math>3x^2 + 5x - 7</math> or <math>a^2b - ab^2</math>.</i>
<b>positive integer</b>	An integer that is greater than zero. $\{1, 2, 3, \dots\}$
<b>power</b>	Another name for exponent.
<b>prediction</b>	A guess about the outcome or result of an event or action based on the available information.
<b>prime factorization</b>	The expression of a composite number as the product of its prime factors. Example: $2^3 \cdot 3 \cdot 5^2$ is the prime factorization of 600.
<b>prime number</b>	A whole number greater than one that has exactly two factors. <i>Example: The first five prime numbers are 2, 3, 5, 7, and 11.</i>
<b>principal</b>	A sum of money that increases by a certain rate of interest.
<b>principal square root</b>	The positive square root of a number. The notation $\sqrt{36}$ indicates the principal square root, 6.
<b>prism</b>	A solid formed by three or more lateral faces that intersect with bases.
<b>probability</b>	The likelihood or chance of an event occurring. Probability is expressed as a number from 0 to 1. A probability of 0 means that the event cannot occur, while a probability of 1 means that the event is certain to occur.
<b>probability formula for geometric regions</b>	The probability that a random point is located in a particular part, or subregion, of a larger region is given by the formula $P(E) = \frac{\text{measure of region in the event}}{\text{measure of entire region}}$
<b>problem solving</b>	Finding ways to reach a goal when no routine path is apparent.
<b>product</b>	The result of multiplying two or more numbers.
<b>property of proportions</b>	In the proportion $\frac{a}{b} = \frac{c}{d}$ , the product of the means $a \cdot d$ is equal to the product of the extremes $b \cdot c$ . This can be expressed as $a \cdot d = b \cdot c$ .
<b>proportion</b>	An equation stating that two ratios are equivalent.
<b>protractor</b>	A tool used to measure angles in degrees.
<b>pyramid</b>	A solid formed by the intersection of a polygonal base with triangular faces that meet at a vertex.
<b>Pythagorean theorem</b>	The sum of the squares of the lengths of the legs in a right triangle is equal to the square of the length of the hypotenuse. Example: In a right triangle with legs of length $a$ and $b$ and $c$ as the length of the hypotenuse $a^2 + b^2 = c^2$

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## Q

<b>quadrant</b>	One of the four sections or quarters of a coordinate plane.
<b>quadratic equation</b>	An equation of degree 2 that has at most two solutions. Quadratic equations are often written in the standard form $ax^2 + bx + c = 0$ .
<b>quadratic formula</b>	A formula used to find the solutions of a quadratic equation written in standard form $ax^2 + bx + c = 0$ . The formula is $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ .
<b>quadratic term</b>	A term of degree 2. Example: $x^2$ is a quadratic term.
<b>quadrilateral</b>	A four-sided polygon.
<b>quotient</b>	The result of dividing a number by another number.

## R

<b>radius</b>	A line segment connecting a point on a circle with the center of the circle. The radius is half the length of the diameter.
<b>range of a data set</b>	The difference between the largest number and the smallest number in a set of data.
<b>range of a function</b>	The elements of the second set to which elements of the first set have been assigned.
<b>rate</b>	A comparison of two quantities that have different units of measure. <i>Example: miles per hour, cans per dollar, miles per gallon, and dollars per pound.</i>
<b>ratio</b>	A comparison of two numbers, often expressed by a fraction. <i>Example: if there are four boys in class for every five girls, the ratio of boys to girls is <math>\frac{4}{5}</math> or 4:5 which is read as 4 to 5.</i>
<b>rational numbers</b>	The set of numbers that can be expressed in the form $\frac{a}{b}$ , where $a$ and $b$ are integers and $b$ is not equal to zero. <i>Example: <math>\frac{6}{5}</math>, <math>-\frac{3}{7}</math>, <math>\frac{4}{1}</math></i>
<b>rationalizing the denominator</b>	The process of eliminating a radical from a denominator.
<b>ray</b>	A portion of a line that extends from a given point in one direction only.
<b>real numbers</b>	The set of all rational and irrational numbers.

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<b>reciprocal</b>	The reciprocal of a non-zero real number is equal to one divided by that number. The product of a number and its reciprocal is one. <i>Example: The reciprocal of 5 is <math>\frac{1}{5}</math></i>
<b>rectangle</b>	A parallelogram with four congruent angles.
<b>rectangular prism</b>	A three-dimensional figure whose sides are all rectangles.
<b>reflection</b>	A transformation that flips a figure across a fixed line, resulting in a mirror image.
<b>reflection symmetry</b>	A two-dimensional figure has reflection symmetry if a line exists about which the figure can be reflected so that the image of the reflection matches the original figure exactly. This line is called the line or axis of symmetry.
<b>regroup</b>	Rearrange a group or groups. <i>Example: 2 tens and 15 ones can be regrouped to 3 tens and 5 ones</i>
<b>regular polygon</b>	A convex polygon with all sides congruent and all angles congruent.
<b>regular pyramid</b>	A pyramid where the base is a regular polygon, and the height meets that base at its center.
<b>relation</b>	A mathematical relationship between two sets of numbers. A relation may be represented as a set of ordered pair.
<b>relatively prime</b>	Two integers are relatively prime if their greatest common factor is 1. <i>Example: 8 and 15 are relatively prime, but 8 and 12 are not, because their greatest common factor is 4</i>
<b>relevant information</b>	Pertinent or useful information for solving a problem.
<b>remainder</b>	A whole number that is left over after one whole number is divided by another, non-zero whole number.
<b>repeated addition</b>	A way of showing multiplication as a sum of factors. <i>Example: <math>6 \cdot 5 = 6 + 6 + 6 + 6 + 6</math></i>
<b>repeated multiplication</b>	Another way to write numbers in exponential form. <i>Example: <math>3^4</math> can be written as <math>3 \cdot 3 \cdot 3 \cdot 3</math></i>
<b>repeating decimal</b>	A decimal with a block of one or more digits that repeats without end. <i>Example: <math>\frac{3}{11}</math> can be expressed as the repeating decimal <math>0.\overline{27}</math>.</i>
<b>repeating pattern</b>	A sequence whose elements repeat in a consistent way.
<b>rhombus</b>	A parallelogram with four congruent sides.
<b>right angle</b>	An angle whose measure is exactly $90^\circ$ .
<b>right cone</b>	A cone where one end point of the height is at the center of the base and is perpendicular to the base.

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<b>right cylinder</b>	A cylinder in which the height from the center of one base meets the center of the other base.
<b>right rectangular prism</b>	A prism with rectangular bases that are perpendicular to its lateral faces.
<b>right triangle</b>	A triangle with one $90^\circ$ angle.
<b>rigid motion</b>	A transformation of the plane or space that preserves distance and angles.
<b>rise</b>	The vertical distance, or change in $y$ , between two points on a coordinate grid.
<b>roots</b>	The solutions of a quadratic equation.
<b>rotation</b>	A transformation that turns a figure around a fixed point.
<b>rotation symmetry</b>	A two-dimensional figure has rotation symmetry if a point exists about which the figure can be rotated less than a full $360^\circ$ turn so that the image of the rotation matches the original figure exactly. This point is called the center of rotation.
<b>round</b>	To arrive at an approximation of a number by following a prescribed algorithm.
<b>rule</b>	A set of operations that corresponds to a pattern or relationship. A rule can be represented as a mathematical expression or equation, or as a written description.
<b>run</b>	The horizontal distance, or change in $x$ , between two points on a coordinate grid.

## S

<b>sample space</b>	The set of all possible outcomes for an experiment.
<b>scale</b>	An arrangement of numbers that increase by equal intervals. In a graph, there may be a scale for the horizontal axis, for the vertical axis, for both axes, or for neither axis.
<b>scale drawing</b>	A reduced or enlarged drawing whose shape is the same as the actual object, and whose size is determined by a scale factor.
<b>scale factor</b>	The ratio used to compare measurements on a scale drawing to the same measurement on the actual object.
<b>scalene triangle</b>	A triangle that does not have any congruent sides.
<b>scatter plot</b>	A graph of the points representing a collection of data.
<b>scientific calculator</b>	A calculator that represents very large or very small numbers in scientific notation with the powering, factorial, square root, negative and reciprocal keys.

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<b>scientific notation</b>	A way of writing very large or very small numbers as a product of a number with an absolute value greater than or equal to 1 and less than 10, and a power of 10. <i>Example: <math>0.00035 = 3.5 \times 10^{-4}</math> or <math>52,600,000 = 5.26 \times 10^7</math></i>
<b>semicircle</b>	An arc of a circle that shares the endpoints of the diameter and is equivalent to half of the circumference.
<b>sequence</b>	Numbers arranged according to a particular pattern.
<b>set</b>	A collection of numbers, objects, or events.
<b>side of a polygon</b>	One of the line segments that enclose a polygon.
<b>Sieve of Eratosthenes</b>	A method of finding all the prime numbers in a certain range. To find all the primes less than 100, start with 2, cross out all numbers greater than 2 that are multiples of 2. Go to the next remaining number, which is 3. Cross out all numbers greater than 3 that are multiples of 3. Go to the next remaining number, which is 5. Cross out all remaining numbers greater than 5 that are multiples of 5, and so on. At each stage, the next number is always a prime. At the end of this process, when there are no more numbers less than 100 to be crossed out, every remaining number is a prime.
<b>similar figures</b>	Figures that have the same shape but not necessarily the same size. Corresponding angles are congruent and the lengths of corresponding side are proportional.
<b>simple event</b>	An event whose probability can be obtained from consideration of a single occurrence. <i>Example: tossing of a coin</i>
<b>simplified algebraic fraction</b>	A fraction in which the numerator and denominator have no common factors other than 1.
<b>simplify an algebraic expression</b>	To combine like terms to write an expression in simplest form.
<b>simplified form of a fraction</b>	A fraction in which the numerator and denominator are relatively prime. <i>Example: <math>\frac{6}{15} = \frac{2}{5}</math></i>
<b>simulation</b>	Modeling a real event without actually observing the event.
<b>skew lines</b>	Lines that are not in the same plane and are therefore neither parallel nor intersecting.
<b>skip counting</b>	A method of counting that begins with a base integer and then passes over a single integer or set of integers. The pattern for skip counting is often multiples of the base number. <i>Example: skip counting by 2s gives the sequence 2, 4, 6, 8, 10... and skip counting by 5s gives the sequence 5, 10, 15, 20, 25,...</i>
<b>slant height</b>	An altitude of a face of a cone or pyramid.
<b>slope</b>	The steepness of a line graphed on the coordinate plane. It is written as a ratio that compares the change in y values (rise) to the change in x values (run). Lines that rise up from left to right have positive slopes. Lines that fall down from left to right have negative slopes.

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<b>slope formula</b>	The formula for finding the slope of a line that passes through points $(x_1, y_1)$ and $(x_2, y_2)$ is $m = \frac{y_2 - y_1}{x_2 - x_1}$ .
<b>slope-intercept form</b>	A linear equation in the form $y = mx + b$ , where $m$ is the slope and $b$ is the y-intercept.
<b>solid figure</b>	A closed three-dimensional figure. <i>Example: cube, sphere, cylinder, pyramid</i>
<b>solution</b>	A value or mathematical representation that satisfies the conditions of a problem.
<b>solution to an equation</b>	Any value of a variable that changes an open sentence into a true statement. <i>Example: 4 is a solution to the equation <math>x + 6 = 10</math> because <math>4 + 6 = 10</math> is a true sentence.</i>
<b>solving</b>	The process of determining the answer to a problem.
<b>solving an equation</b>	Finding the value of the variable for which an equation is true.
<b>square</b>	A parallelogram with four congruent sides and four congruent angles.
<b>square root</b>	One of the two equal factors of a number. Geometrically, the square root is the length of the side of a square that has an area equal to the number for which the square root is being found. <i>Example: <math>\sqrt{25} = 5</math>, because a square with an area of 25 square units has sides measuring 5 units each in length.</i>
<b>square units</b>	The units used to measure area in two dimensions.
<b>squared</b>	Another way to say raised to the second power.
<b>standard form</b>	The way numbers are usually written. <i>Example: <math>7^2 = 49</math>, standard form is 49, and <math>7^2</math> is written in exponential form</i>
<b>standard form of a line</b>	In standard form, a linear function is written as $Ax + By = C$ , where $A$ , $B$ , and $C$ are constants.
<b>statistics</b>	The study of collecting, organizing, and interpreting data.
<b>stem-and-leaf plot</b>	A display of numerical data in a table using digits on the left side as stems and digits on the right side as leaves.
<b>step plot</b>	A type of graph that represents change in whole increments, represented by a series of discontinuous steps.
<b>straight angle</b>	An angle whose measure is exactly $180^\circ$ .
<b>straightedge</b>	An instrument used to draw straight lines.
<b>subscript</b>	A letter or number used to index a variable. Subscripts are usually set in small type below and to the right of the variable.

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<b>substitute</b>	To replace a variable in an equation or expression with a number or expression having equal value.
<b>subtraction</b>	The inverse operation of addition. An operation on two numbers to obtain a third number, called the difference. In the equation $15 - 7 = 8$ , the number 8 is the difference.
<b>subtrahend</b>	In subtraction, the second number in the expression. <i>Example: <math>15 - 7 = 8</math>, the subtrahend is 7.</i>
<b>sum</b>	The result of adding two or more numbers.
<b>sum of the interior angles of a polygon</b>	The total number of degrees in all angles inside of a polygon. The sum of the interior angles of a convex polygon is equal to $180^\circ (n - 2)$ where n is the number of sides of the polygon.
<b>supplementary angles</b>	A pair of angles the sum of whose measures is $180^\circ$ .
<b>surface area</b>	The area of the surface or surfaces of a figure.
<b>symmetric</b>	A shape is symmetric, or symmetrical, if a line can be drawn through the shape such that a reflection across the line creates an identical figure, or if a point can be drawn inside the shape such that a rotation with respect to the point creates an identical figure.
<b>symmetry</b>	The characteristic of a figure that can be divided into congruent sections such that the sections are mirror images of each other.
<b>system of equations</b>	A number of equations with an equal number of variables. The brace indicates a system of equations to be solved simultaneously. <i>Example:</i> $\begin{cases} y = 3x + 2 \\ y = 5x - 8 \end{cases}$

## T

<b>table</b>	A display of information or data by which the facts can be easily read or understood.
<b>tally chart</b>	A chart that uses tally marks to represent data.
<b>tangent to a circle</b>	A line that intersects a circle at exactly one point.
<b>tenth</b>	One of 10 equal parts.
<b>term of a sequence</b>	Any of the numbers in a sequence.
<b>terminating decimal</b>	A decimal that ends. Example: $\frac{1}{4} = 0.25$ which is a terminating decimal.

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<b>terms</b>	The parts of a variable expression that are separated by addition or subtraction signs. These can be numbers, variables, or the product of numbers and variables. Example: In the expression $2x + 5$ , the terms are $2x$ and $5$ .
<b>tessellation</b>	An interlocking pattern of polygons covering a plane with no gaps or overlaps.
<b>theoretical probability</b>	Probability that is expressed as the ratio of the number of times an event can happen to the total number of possible outcomes. This is a probability based on what is likely to occur if an experiment takes place.
<b>transformation</b>	A movement that does not change the shape of a figure.
<b>translation</b>	A transformation of a figure to a new position without turning or flipping the figure.
<b>transversal</b>	A line that intersects two or more coplanar lines.
<b>trapezoid</b>	A four-sided polygon with exactly one pair of parallel sides. The parallel sides are called bases. The two pairs of angles that share a base as a common side are called base angles.
<b>tree diagram</b>	A diagram that shows all of the possible combinations of elements or outcomes of an event.
<b>triangle</b>	A three-sided polygon. The sum of the interior angles of a triangle is $180^\circ$ .
<b>trichotomy property</b>	For all real numbers $a$ and $b$ , exactly one of the following is true: $a < b$ , $a = b$ , or $a > b$ .
<b>trigonometric function</b>	A function (e.g., sine, cosine, tangent, cotangent, secant, cosecant) whose independent variable is an angle measure, usually in degrees or radians.
<b>trigonometric ratio</b>	The ratio of the measures of two sides of a right triangle. There are six basic trigonometric ratios: sine (sin), cosine (cos), tangent (tan), secant (sec), cosecant (csc), and cotangent (cot).
<b>trinomial</b>	A polynomial that consists of three terms, or monomials, when written in standard form.

## U

<b>undefined slope</b>	The slope of a vertical line. The slope is undefined because the difference in the $x$ -values is zero.
<b>unit factor</b>	A special type of ratio that is equivalent to 1. When a number is multiplied by a unit factor, the measurement unit changes, but the value of the measure does not.
<b>unit price</b>	The cost of one item, also called the unit cost.
<b>unlikely</b>	The description of a result that may occur, but probably will not.

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## V

<b>variable</b>	An unknown quantity. A variable may be represented by a letter.
<b>variable expression</b>	A mathematical phrase that contains at least one variable.
<b>velocity</b>	The speed or rate of time at which something moves. The formula for velocity is $v = \frac{d}{t}$ , where $v$ represents velocity, $d$ represents distance, and $t$ represents time.
<b>Venn diagram</b>	A visual device used to represent the relationships among sets.
<b>vertex</b>	The point shared by two rays or line segments forming an angle. It can also refer to the point at which two lines intersect. The plural of vertex is vertices.
<b>vertex of a parabola</b>	The maximum or minimum point of a parabola.
<b>vertex of a polygon</b>	The point at which two sides of a polygon meet.
<b>vertex of an angle</b>	The point where two rays meet to form an angle.
<b>vertical angles</b>	Pairs of opposite angles formed by intersecting lines. Vertical angles are congruent.
<b>vertical axis</b>	The axis running top to bottom, often denoted as the y-axis in a coordinate plane.
<b>vertical line test</b>	A rule used to determine if a graph represents a function. The rule states that if a vertical line cannot be drawn anywhere through the graph so that the line intersects more than one point on the graph, then the graph represents a function.
<b>volume</b>	The number of cubic units inside a three-dimensional figure.
<b>volume formula for a prism or cylinder</b>	The formula $V = Bh$ , where $B$ is the area of the base and $h$ is the height of the prism or cylinder.
<b>volume formula for a pyramid or cone</b>	The formula $V = \frac{1}{3}Bh$ , where $B$ is the area of the base and $h$ is the height of the pyramid or cone.

## W

<b>whole numbers</b>	The set of natural numbers and zero. $\{0, 1, 2, 3, 4, \dots\}$
<b>width</b>	A dimension of a rectangle, usually the shorter side.

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## X

**x-axis**

The horizontal axis in the coordinate plane.

**x-intercept**

The x-coordinate at which a graph crosses (or intercepts) the x-axis.

## Y

**y-axis**

The vertical axis in the coordinate plane.

**y-intercept**

The y-coordinate at which a graph crosses (or intercepts) the y-axis. A line can be identified by its slope and y-intercept in slope-intercept form,  $y = mx + b$ .

## Z

**zero exponent**

Any term with zero as the exponent is equal to one.

**zero property of multiplication**

If  $a$  and  $b$  are real numbers and  $ab = 0$ , then  $a = 0$  or  $b = 0$ .

**zero slope**

The slope of a horizontal line. In other words, the line does not slant up or down.

**zero-product property**

If  $ab = 0$ , then  $a = 0$  or  $b = 0$ , and if  $a = 0$  or  $b = 0$ , then  $ab = 0$ .



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