





2-8 Grades 0 To Hero Math Book

This easy-to-learn, no-LaTeX math book is a fun, emoji-friendly journey through Grades 2 to 8, covering essential math topics in a clear, visual, and approachable way. Whether you're learning addition, exploring fractions, mastering multiplication, or diving into geometry, this book keeps things simple and engaging – **no confusing symbols, no complex formatting, and no LaTeX required.**

Ideal for:


-  Students who learn better with visuals and plain language
-  Teachers looking for printable, student-friendly resources
-  Parents supporting learning at home
-  Anyone who prefers **clarity over complexity**

With quizzes, examples, and relatable scenarios, this book makes math **less intimidating and more enjoyable** – one emoji at a time.

Pre-Math Chapter 1: What's $1 + 1$?

Let's keep it simple.

You have 1 .

Your friend gives you 1 more .

Now you have:

$$1 + 1 = 2$$

That's it!

✓ One thing plus another one thing makes two things.

Pre-Math Chapter 2: Basic Maths

Let's warm up with the four most important math operations:

+ Addition

Putting things together.

$$2 + 3 = 5$$

One pair of shoes + three more = five shoes

- Subtraction

Taking things away.

$$5 - 2 = 3$$

You have five cookies. You eat two. Three are left.

× Multiplication

Repeated addition.

$$3 * 4 = 12$$

Three groups of four apples = twelve apples


÷ Division

Splitting into equal parts.

$$12 / 4 = 3$$

Twelve slices of pizza shared with 4 friends = 3 slices each

That's the core of most math!

 Quick Quiz: Can You Solve These?


What's $4 + 3$?

If you have 10 apples and give away 6, how many are left?

How much is 5 times 2?

Split 8 cookies among 4 kids. How many cookies per kid?

BONUS: What's $3 + 2 * 2$? (Hint: Do multiplication first!)

 Answers at the end of the book—or just scroll down if you're impatient 😊

Pre-Math Chapter 3: Add and Subtract Within 100

Let's level up! You already know how to add and subtract small numbers. Now we go up to 100!

Adding within 100

Just line up the numbers:

$$23 + 45 = ?$$

Step 1: Add the ones $\rightarrow 3 + 5 = 8$

Step 2: Add the tens $\rightarrow 2 + 4 = 6$

$$\text{So: } 23 + 45 = 68$$

Another one:

$$58 + 19 = ?$$

Step 1: $8 + 9 = 17 \rightarrow$ write down 7, carry the 1

Step 2: $5 + 1$ (carried) $+ 1 = 7$

$$\text{So: } 58 + 19 = 77$$

Subtracting within 100

$$76 - 42 = ?$$

Step 1: $6 - 2 = 4$

Step 2: $7 - 4 = 3$

$$\text{Answer: } 76 - 42 = 34$$

When borrowing is needed:


$$62 - 38 = ?$$

Step 1: $2 - 8 \rightarrow$ can't do! Borrow 1 from the 6 \rightarrow now it's 5

$$\text{Now: } 12 - 8 = 4$$

$$\text{Then: } 5 - 3 = 2$$

$$\text{So: } 62 - 38 = 24$$

 Try it Yourself!

$$39 + 26 = ?$$

$$85 - 47 = ?$$

$$61 + 14 = ?$$

$$50 - 29 = ?$$

$$\text{BONUS: } 48 + 36 - 20 = ?$$

Grade 2 - Unit 4: Add and Subtract Within 1,000

Time to work with hundreds! Let's build your skills with bigger numbers.

✚ Adding within 1,000

Just like before—line up the digits by place value (ones, tens, hundreds).

Example 1:

$$324 + 152 = ?$$

Step 1: Ones $\rightarrow 4 + 2 = 6$

Step 2: Tens $\rightarrow 2 + 5 = 7$

Step 3: Hundreds $\rightarrow 3 + 1 = 4$

Answer: 476

Example 2 (with carrying):

$$468 + 279 = ?$$

Step 1: $8 + 9 = 17 \rightarrow$ write 7, carry 1

Step 2: $6 + 7 + 1 = 14 \rightarrow$ write 4, carry 1

Step 3: $4 + 2 + 1 = 7$

Answer: 747

— Subtracting within 1,000

Sometimes you'll need to borrow!

Example 1:

$$803 - 256 = ?$$

Step 1: $3 - 6 \rightarrow$ can't do! Borrow 1 from the tens (0 becomes 9, 3 becomes 13)

$$13 - 6 = 7$$

$$9 - 5 = 4$$

$$7 - 2 = 5$$

Answer: 547

🧠 Practice Time!

$$123 + 456 = ?$$

$$980 - 345 = ?$$

$$305 + 197 = ?$$

$$402 - 189 = ?$$

$$\text{BONUS: } 456 + 129 - 300 = ?$$

Grade 2 - Unit 5: Money and Time

Let's talk 💰 and 🕒!

💰 Understanding Money

Money comes in coins and notes.

Here are some common U.S. coins:

Penny = 1¢

Nickel = 5¢

Dime = 10¢

Quarter = 25¢

Example 1:

You have:

2 dimes + 1 nickel + 3 pennies

= 20¢ + 5¢ + 3¢ = 28¢

Example 2:

If something costs 75¢ and you give \$1.00:

$100¢ - 75¢ = 25¢$ change

🕒 Telling Time

A clock has:

Hour hand (short)

Minute hand (long)

Example 1:


If the short hand is on 3 and the long hand is on 12:

🕒 It's 3:00.

Example 2:

If the short hand is between 4 and 5, and the long hand is on 6:

🕒 It's 4:30.

 Try It Out!

What's the total of: 1 quarter + 2 nickels + 4 pennies?

You have 50¢. Can you buy a toy that costs 65¢?


If it's 2:15 now, what time will it be in 30 minutes?

What time is shown if the hour hand is on 9 and the minute hand is on 12?

BONUS: You give \$5 for something that costs \$3.75. What's your change?

Grade 2 - Unit 6: Measurement

We measure things to find out how long, how heavy, or how much.

 Length

Common units:

Inches (in)

Feet (ft) → 1 foot = 12 inches

Centimeters (cm)


Meters (m) → 1 meter = 100 cm

Example:

A pencil is 15 cm long.

A book is 30 cm long.

Which one is longer? → The book!

 Weight

Common units:

Ounces (oz)

Pounds (lb) → 1 pound = 16 ounces

Grams (g)


Kilograms (kg) → 1 kilogram = 1,000 grams

Example:

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An apple weighs about 200g.

A watermelon might weigh 5kg!

 Volume (Liquid)

Common units:

Cups

Pints

Quarts

Gallons

Milliliters (mL)


Liters (L)

Example:

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1 liter of water = 1,000 milliliters

A small juice box = about 250 mL

 Try It Out!

Is 50 cm longer or shorter than 1 meter?

What's heavier: 1 kg of feathers or 1 kg of bricks?

Which is more: 1 quart or 1 cup?

If your backpack weighs 2 kg, is that heavy or light for you?

BONUS: Convert 3 feet to inches.

Want to continue to Unit 7: Data?

Grade 2 – Unit 7: Data

Data is just information we collect.

We can count it, sort it, and show it using pictures or charts!

Tally Charts

Each tally mark = 1.

We group tallies by 5 to make counting easy.

Example:

Favorite Fruits:

 Apple |||| (4)

 Banana |||| | (5)

 Grape |||| ||| (7)

Bar Graphs

Bar graphs turn data into bars so we can see which is biggest.

Example:

Pets Owned:

Cats  (5)

Dogs  (4)

Fish  (3)





You can compare data easily:

→ More kids have cats than fish.



Picture Graphs


Each picture = a number.

Favorite Sports:

    → Soccer (4)


   → Basketball (3)

  → Tennis (2)

 Try It Out!

Which fruit had the most votes in the tally chart?

In the bar graph, how many more kids have cats than fish?

If each  = 2 kids, how many kids chose soccer?

Make your own tally chart of what you eat this week!

BONUS: Create a bar graph using this data:

Red: 6

Blue: 3

Green: 5

Grade 2 - Unit 8: Geometry

Geometry is the study of shapes and their properties.

Basic 2D Shapes

Shape	Sides	Corners
-------	-------	---------

Square	4	4
--------	---	---

Rectangle	4	4
-----------	---	---

Triangle	3	3
----------	---	---

Circle	0	0
--------	---	---

A side is a straight line.


A corner (or vertex) is where two sides meet.

More Shapes

Pentagon → 5 sides

Hexagon → 6 sides

Octagon → 8 sides


 Think of a stop sign: it's an octagon!

3D Shapes

Shape	Faces	Edges	Corners
-------	-------	-------	---------

Cube	6	12	8
------	---	----	---

Cylinder	3	2	0
Sphere	1	0	0
Rectangular Prism	6	12	8

 Try It Out!

How many sides does a hexagon have?

Which shape has no corners: triangle or circle?

Name a 3D object that looks like a can.

Which has more edges: cube or cylinder?

BONUS: Draw your own triangle, square, and rectangle – then label the sides and corners!



Grade 3 – Unit 1: Intro to Multiplication

Multiplication is just repeated addition.

If you can add, you can multiply!



What is Multiplication?

Instead of writing:

$$2 + 2 + 2 + 2 = 8$$

We write:

$$2 \times 4 = 8$$

(2, four times)

So:

$$3 \times 5 = 15 \rightarrow \text{means } 3 \text{ added } 5 \text{ times: } 3 + 3 + 3 + 3 + 3 = 15$$



Multiplication Models

Arrays

$$3 \times 2 \rightarrow 3 \text{ rows of } 2$$






Groups

$4 \times 2 \rightarrow 4$ groups of 2 stars:



 Some Multiplication Facts


Fact Meaning

$1 \times 5 = 5$ One group of five

$5 \times 1 = 5$ Five groups of one

$0 \times 7 = 0$ Zero groups = zero

$3 \times 0 = 0$ Still zero!

 Try It Out!

What is 4×2 ?

Write 3×3 as an addition problem.

Draw an array for 2×5 .


What's 0×9 ?

BONUS: You see 3 chairs at each table, and there are 6 tables. How many chairs in total?



Grade 3 – Unit 2: 1-Digit Multiplication

Now it's time to master multiplication facts for numbers 1 to 9!

 Times Tables Basics

Here are some must-know facts:

$\times 2$ Table:

$2 \times 1 = 2$

$2 \times 2 = 4$

$2 \times 3 = 6$

$2 \times 4 = 8$

$2 \times 5 = 10$

... and so on

×5 Table:

$$5 \times 1 = 5$$

$$5 \times 2 = 10$$

$$5 \times 3 = 15$$

$$5 \times 4 = 20$$

$$5 \times 5 = 25$$

×10 Table:

$$10 \times 1 = 10$$

$$10 \times 2 = 20$$

$$10 \times 3 = 30$$


$$10 \times 4 = 40$$

You'll notice:

×2 doubles numbers

×5 always ends in 0 or 5


×10 just adds a zero!

 Quick Tips

Commutative rule: $3 \times 4 = 4 \times 3$

Multiply any number by 0, you get 0

Multiply any number by 1, you get the same number

 Try It Out!

What is 6×2 ?

What's the same as 3×7 ?

Fill in the blank: $5 \times \underline{\quad} = 35$

What's 0×8 ?

BONUS: How many fingers on 9 hands?

+ - Grade 3 - Unit 3: Addition, Subtraction, and Estimation

You already know how to add and subtract – now let's get faster and smarter with it!

+ Adding Bigger Numbers

Line up the digits by place (ones, tens, hundreds).

Example:

$$426 + 385 = ?$$

$$6 + 5 = 11 \rightarrow \text{write } 1, \text{ carry } 1$$

$$2 + 8 + 1 = 11 \rightarrow \text{write } 1, \text{ carry } 1$$

$$4 + 3 + 1 = 8$$

Answer: 811

- Subtracting Bigger Numbers

Borrow if needed!

Example:

$$703 - 476 = ?$$

$$3 - 6 \rightarrow \text{can't do! Borrow from the tens} \rightarrow$$

$$13 - 6 = 7$$

$$9 - 7 = 2$$

$$6 - 4 = 2$$

Answer: 227

Estimation

Estimation means making a smart guess.


Round the numbers:

$$389 + 213 \approx 400 + 200 = 600$$

Subtraction example:

$$692 - 301 \approx 700 - 300 = 400$$

Estimation helps you check if your answers make sense.

 Try It Out!

$$426 + 389 = ?$$

$$802 - 476 = ?$$

$$\text{Estimate: } 219 + 342 \approx ?$$


$$\text{Estimate: } 721 - 299 \approx ?$$

BONUS: Your exact answer is 496. You estimated 500. Were you close?

Grade 3 - Unit 4: Intro to Division

Division means splitting into equal groups.

If you know multiplication, you're ready for division!

 What is Division?

Example:


$$8 \div 2 = 4$$

(8 split into 2 equal groups → each group has 4)

OR

$$8 \div 4 = 2$$

(8 split into 4 equal parts → each part is 2)

 Division Is the Opposite of Multiplication

Think of it like a puzzle:

$$\text{If } 3 \times 5 = 15, \text{ then } 15 \div 3 = 5$$

$$\text{and } 15 \div 5 = 3$$



Real Life Example

You have 12 cookies and 3 friends. How many cookies per friend?

$$12 \div 3 = 4$$

Each friend gets 4 cookies!



Important Rules

Any number $\div 1$ = the same number

Any number \div itself = 1

$0 \div$ any number = 0

You can't divide by 0!



Try It Out!

$$20 \div 5 = ?$$

$$15 \div 3 = ?$$

If $7 \times 6 = 42$, what's $42 \div 7$?

You have 18 marbles and 6 jars. How many per jar?

BONUS: $0 \div 9 = ?$



Grade 3 – Unit 5: Understand Fractions

A fraction is a way to show part of a whole.



What is a Fraction?

A fraction has two parts:

4

Top number (numerator) → how many parts you have

Bottom number (denominator) → how many equal parts the whole is split into

So $1/4$ means 1 out of 4 equal parts



Example:

A pizza is cut into 4 equal slices.

You eat 1 slice.

You ate:

$1/4$ of the pizza



More Examples

$1/2$ = one-half

$3/4$ = three out of four parts

$2/3$ = two out of three parts

Fractions can also be shown with pictures!

O O O O → 4 circles

[O O O _] → $3/4$ shaded



Try It Out!

What fraction is one part out of 2?

If a candy bar is split into 8 pieces and you eat 5, what's the fraction you ate?

Draw a circle. Shade $1/2$ of it.

Which is bigger: $1/2$ or $1/3$?

BONUS: If 2 out of 5 kids like carrots, what fraction of kids like carrots?

÷ Grade 3 – Unit 6: Equivalent & Comparing Fractions

Let's look at fractions that mean the same and how to tell which is bigger or smaller.

Equivalent Fractions

Some fractions look different but are equal in value.

Examples:

$$1/2 = 2/4 = 4/8$$

(They all show half!)

If you double both the top and bottom of $1/2$:

$$1 \times 2 = 2$$

$$2 \times 2 = 4$$

$$\rightarrow 2/4 = \text{same as } 1/2$$

Comparing Fractions

When the bottoms (denominators) are the same:

$$3/8 < 5/8 \rightarrow \text{because } 3 \text{ is less than } 5$$

When the tops (numerators) are the same:

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$$1/4 > 1/6 \rightarrow \text{smaller bottom means bigger pieces!}$$

You can also use a number line or visual models to compare!

Quick Picture Trick

More slices = smaller pieces!

So:

$$1/3 > 1/5$$

(Thirds are bigger than fifths)

🧠 Try It Out!

Which is bigger: $2/3$ or $3/4$?

Are $1/2$ and $2/4$ equal?

Fill in the blank: $3/6 = \underline{\quad}/12$

Is $4/8$ the same as $1/2$?

BONUS: Draw and label $1/2$, $1/3$, and $1/4$ on a number line.



Grade 3 – Unit 7: More with Multiplication and Division

You've got the basics – now let's go deeper and get faster with facts and problems!



Memorize Key Facts

Know these well:

$$6 \times 6 = 36$$

$$7 \times 8 = 56$$

$$9 \times 3 = 27$$

$$12 \div 4 = 3$$

$$36 \div 6 = 6$$

Flashcards or skip-counting help a lot!



Word Problems

Always ask:

What do I know?

What do I need to find?

Is it multiplication or division?

Example:

A farmer has 5 baskets. Each holds 6 apples.

How many apples total?

→ $5 \times 6 = 30$ apples

Another:

There are 32 pencils. They are packed into boxes of 8.

How many boxes?

→ $32 \div 8 = 4$ boxes



Multiplication & Division Work Together

They're inverse (opposite) operations:

If $4 \times 7 = 28$,

then $28 \div 7 = 4$

and $28 \div 4 = 7$



Try It Out!

What is 7×6 ?

$48 \div 8 = ?$

You have 4 shelves with 9 books each. How many books total?

There are 24 stickers. Each child gets 6. How many children?

BONUS: Write 3 multiplication facts and their matching division facts.



Grade 3 – Unit 8: Arithmetic Patterns and Problem Solving

Math has patterns—when you spot them, solving problems gets easier!



Number Patterns

Skip Counting

2, 4, 6, 8, 10 → add 2 each time

5, 10, 15, 20 → add 5 each time

100, 90, 80, 70 → subtract 10

You're seeing addition or subtraction patterns!

Multiplication Patterns

Look at the $\times 5$ table:

5, 10, 15, 20, 25...

→ always ends in 0 or 5

$\times 9$ table:

9, 18, 27, 36...

→ The digits add up to 9 (e.g., $2 + 7 = 9$)



Problem Solving Steps

Read the problem carefully

Underline key info

Choose the right operation (add, subtract, multiply, divide)

Solve and check



Example:

Liam sees a pattern: 3, 6, 9, 12, __

What comes next?

→ Add 3 each time → 15



Try It Out!

What's the next number: 100, 90, 80, ____

What comes after: 7, 14, 21, 28, ____

Fill in the blank: $4 \times \underline{\hspace{1cm}} = 36$

A toy costs \$5. How much for 4 toys?

BONUS: Find a pattern in this list: 1, 2, 4, 8, 16, ____

Grade 3 – Unit 9: Quadrilaterals

Quadrilaterals are shapes with 4 sides and 4 corners.

Let's meet them!

Common Quadrilaterals

Shape	Sides	Special Things
Square	4	All sides equal, all right angles
Rectangle	4	Opposite sides equal, all right angles
Rhombus	4	All sides equal, angles may tilt
Parallelogram	4	Opposite sides equal and parallel
Trapezoid	4	Only 1 pair of sides is parallel
Kite	4	Two pairs of equal-length sides


Fun Facts

All squares are rectangles, but not all rectangles are squares

A rhombus is like a tilted square

A trapezoid looks like a triangle with the top cut off

Shape Sorter

 All quadrilaterals have:

4 straight sides

4 corners (vertices)

But shapes can look very different!



Try It Out!

Which has only one pair of parallel sides: trapezoid or square?

True or False: A square is a rhombus.

Draw a kite shape – label equal sides.

Which shapes have all right angles?

BONUS: Make a chart of quadrilaterals with names, drawings, and 2 facts each.



Grade 3 – Unit 10: Area

Area is the amount of space inside a shape.

We measure it in square units (like square centimeters, cm^2).



What Is a Square Unit?

Imagine a tiny square that's 1 unit on each side:



= 1 square unit

If a rectangle fits 6 of those squares inside, its area is:

Area = 6 square units



Area of a Rectangle

Use this formula:

Area = length \times width

Example:

A rectangle is 5 units long and 3 units wide.

Area = $5 \times 3 = 15$ square units



Counting Squares

If the shape is drawn on a grid, just count the squares!



2 rows of 3 $\rightarrow 2 \times 3 = 6$ square units



Try It Out!

What's the area of a 4 by 6 rectangle?

A shape covers 12 square units – could it be 3×4 ?

Draw a rectangle with area = 10 square units

True or False: Area = length + width

BONUS: A square has area 36. What's the length of one side?



Grade 3 – Unit 11: Perimeter

Perimeter is the distance around a shape.

You add up all the sides!



Perimeter Formula

For a rectangle:

Perimeter = $2 \times (\text{length} + \text{width})$

Example:

A rectangle is 6 units long and 4 units wide.

Perimeter = $2 \times (6 + 4) = 2 \times 10 = 20$ units

✚ Just Add the Sides

If the shape isn't a rectangle, just add all side lengths:

Shape sides: 3, 5, 4, 6

Perimeter = $3 + 5 + 4 + 6 = 18$ units

🔄 Perimeter vs. Area

Area = inside space

Perimeter = edge length

Think:

Area = covering a field

Perimeter = building a fence around it

🧠 Try It Out!

What is the perimeter of a square with side length 5?

A rectangle is 7 long and 3 wide. What's the perimeter?


Add the sides: $6 + 6 + 2 + 2 = ?$

A triangle has sides 4, 4, and 4. What's the perimeter?

BONUS: If a shape has 4 equal sides and a perimeter of 40, what is each side?

Grade 3 – Unit 12: Time

Time tells us when things happen and how long they take.

 Reading an Analog Clock

Short hand = hour

Long hand = minute

Examples:

If the short hand is on 2 and long hand is on 12 → 2:00

If the short hand is between 3 and 4, and long hand is on 6 → 3:30



Minutes and Hours

1 hour = 60 minutes

30 minutes = half an hour

15 minutes = a quarter hour

How long between:

2:00 and 2:30? → 30 minutes

3:15 and 4:00? → 45 minutes



Elapsed Time

Elapsed time means: How much time has passed?

Example:

Start: 1:15

End: 2:00

Elapsed: 45 minutes



Try It Out!

What time is it when the short hand is on 5 and the long hand is on 12?

How many minutes are in 2 hours?

If a movie starts at 4:30 and ends at 6:00, how long is it?

Is 6:15 before or after 6:00?

BONUS: You start a game at 3:45 and play for 50 minutes. What time do you finish?



Grade 3 – Unit 13: Measurement

We measure to find out how long, how heavy, or how much something holds.



Length

Common units:

Inches (in)

Feet (ft) → 1 foot = 12 inches

Yards (yd) → 1 yard = 3 feet

Centimeters (cm)

Meters (m) → 1 meter = 100 cm

Example:

A door is about 2 meters tall.

A crayon is about 10 cm long.



Weight (Mass)

Common units:

Ounces (oz)

Pounds (lb) → 1 lb = 16 oz

Grams (g)

Kilograms (kg) → 1 kg = 1,000 g

Example:

A watermelon might weigh 3 kg.

A paperclip weighs about 1 g.



Capacity (Volume)

Common units:

Cups, pints, quarts, gallons (U.S.)

Milliliters (mL), liters (L)

Example:

1 liter = 1,000 milliliters

A milk jug holds about 1 gallon or 4 liters

🧠 Try It Out!

What's longer: 1 foot or 10 inches?

How many grams in 1 kilogram?

Would you measure a pool in cups or liters?

Which is heavier: 500g or 1 kg?

BONUS: If a rope is 3 feet long, how many inches is that?



Grade 3 – Unit 14: Represent and Interpret Data

Data helps us understand information with numbers, pictures, and graphs.



Types of Data Displays



Tally Chart

Pets Owned:

🐶 Dogs |||| = 4

🐱 Cats |||| | = 5


🐰 Rabbits || = 2


📊 Bar Graph





Books Read This Month:




Genre	Books
-----	-----



Fiction		■■■■■	(6)
Comics		■■■	(4)
Science		■■	(3)


 Picture Graph

Each  = 2 books

    → 8 books

   → 6 books

  → 4 books


 Interpreting Data


Ask:

What is being counted?

Which has the most/least?

How many more/fewer?

 Try It Out!

If  = 2 cats, how many cats are shown with 3 symbols?

Which pet is most popular in the tally chart?

How many more books were read in Fiction than in Science?

Which type of data chart is your favorite and why?

BONUS: Make your own chart showing favorite snacks in your class!

Grade 4 – Unit 1: Place Value

Place value helps us understand what each digit means in a number. Each place is 10 times bigger than the one to its right.

 Place Value Chart

Place Value

Thousands 1,000s

Hundreds 100s

Tens 10s

Ones 1s

Example:

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Number: 4,382

4 → Thousands = 4,000

3 → Hundreds = 300

8 → Tens = 80

2 → Ones = 2



Expanded Form

Break the number into parts:

$$4,382 = 4,000 + 300 + 80 + 2$$



Comparing Numbers

Use >, <, or = to compare:

$$5,209 > 4,998$$

$$3,301 < 3,310$$

$$6,000 = 6,000$$

Look at the leftmost digits first!



Rounding Numbers

Round to the nearest 10 or 100:

If the digit is 5 or more, round up

If it's 4 or less, round down

Example:

CSS

Round 368 to nearest 10 → 370

Round 368 to nearest 100 → 400



Try It Out!

What's the value of the 7 in 7,154?

Write 5,682 in expanded form.

Round 2,947 to the nearest 100.

Which is greater: 4,209 or 4,920?

BONUS: What's the smallest 4-digit number you can make using 3, 0, 8, and 1?

Want to continue with Unit 2 - Addition, Subtraction, and Estimation next?

Grade 4 - Unit 2: Addition, Subtraction, and Estimation

Let's work with bigger numbers and sharpen your skills with estimating answers too.

Multi-Digit Addition

Line up digits carefully - use place value!

Example:

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$$\begin{array}{r} 3,482 \\ + 1,657 \\ \hline \end{array}$$

$$\begin{array}{r} 5,139 \end{array}$$

Start from the right (ones place) and carry when needed.

Multi-Digit Subtraction

Borrow when needed!

Example:

markdown

$$\begin{array}{r} 7,004 \\ - 2,879 \\ \hline \end{array}$$

$$\begin{array}{r} 4,125 \end{array}$$

Take your time with borrowing - especially across zeros!

Estimation

Estimate to check if your answer is reasonable.


Round first:

$$4,289 + 3,712 \approx 4,000 + 4,000 = 8,000$$

So the exact answer should be close to 8,000

Subtraction example:

$$5,174 - 2,165 \approx 5,000 - 2,000 = 3,000$$

 Try It Out!

$$4,286 + 3,105 = ?$$

$$9,000 - 6,752 = ?$$

Round 6,837 to the nearest 100.

$$\text{Estimate: } 3,246 + 2,679 \approx ?$$

BONUS: If your estimate is 7,000 but the actual answer is 6,992 – were you close?

Continue with Unit 3 – Multiply by 1-digit numbers?

Grade 4 – Unit 3: Multiply by 1-Digit Numbers

Let's learn how to multiply large numbers by 1-digit numbers using place value and regrouping.

 Place Value Method

Multiply each digit one at a time, starting from the right.

Example:

$$\begin{array}{r} 436 \\ \times 3 \\ \hline \end{array}$$

Step 1: $3 \times 6 = 18 \rightarrow$ write 8, carry 1

Step 2: $3 \times 3 = 9 + 1 = 10 \rightarrow$ write 0, carry 1

Step 3: $3 \times 4 = 12 + 1 = 13$

Answer: 1,308



Estimate First

Before you multiply, estimate the answer to check your work:

python

Estimate $436 \times 3 \rightarrow$ round 436 to 400

$400 \times 3 = 1,200$ (so the exact answer should be near 1,200)



Word Problem Example

A factory makes 245 boxes of cookies each day. How many cookies in 4 days?

$245 \times 4 = 980$ cookies



Try It Out!

$327 \times 2 = ?$

$186 \times 5 = ?$

Estimate first: $489 \times 6 \approx ?$

A school has 213 books per shelf. There are 3 shelves. How many books total?

BONUS: Multiply 409×7 using the standard algorithm.



Grade 4 – Unit 4: Multiply by 2-Digit Numbers

Now we're multiplying big numbers by 2-digit numbers.

It's just like multiplying twice – then adding!



Step-by-Step Example

Let's multiply:

markdown

34
 $\times 12$

Step 1: Multiply by the ones digit (2):

$$34 \times 2 = 68$$

Step 2: Multiply by the tens digit (1):

(Remember: it's actually 10, so shift one place left!)

$$34 \times 10 = 340$$

Step 3: Add them together:

$$\begin{array}{r} 68 \\ +340 \\ \hline \end{array}$$

$$408$$

💡 Estimate First

Estimate 34×12 :

Round $34 \rightarrow 30$

Round $12 \rightarrow 10$

$$\rightarrow 30 \times 10 = 300$$

Your final answer should be close!

📦 Word Problem Example

A pack of 23 crayons costs \$12.

How much for 23 packs?

$$23 \times 12 = 276 \text{ dollars}$$

🧠 Try It Out!

$$21 \times 13 = ?$$

$$46 \times 32 = ?$$

$$\text{Estimate: } 48 \times 19 \approx ?$$

A bus holds 34 students. There are 15 buses. How many students in total?

BONUS: Multiply 67×24 using both steps (ones and tens).

Want to continue with Unit 5 - Division?

÷ Grade 4 – Unit 5: Division

Division means splitting into equal parts.

Now we'll divide larger numbers, sometimes with remainders!

| | | |---|---| | 1 | 2 | | 3 | 4 | Long Division Steps

Let's divide:

$$728 \div 4$$

Step 1: Divide

4 goes into 7 → 1 time (write 1)

$$1 \times 4 = 4$$

$$7 - 4 = 3$$

Step 2: Bring down the 2 → now 32

4 goes into 32 → 8 times

$$8 \times 4 = 32 \rightarrow \text{subtract} \rightarrow 0$$

Step 3: Bring down the 8

4 goes into 8 → 2 times

$$2 \times 4 = 8 \rightarrow \text{subtract} \rightarrow 0$$

✅ Final Answer: 182

+ What's a Remainder?

If it doesn't divide evenly, you'll have a remainder.

Example:

$$25 \div 4 = 6 \text{ R}1$$

(because $4 \times 6 = 24$, and 1 is left)

💡 Estimate First

Estimate:


$$820 \div 4$$

$$\rightarrow 800 \div 4 = 200$$

📦 Word Problem

You have 96 pencils and want to pack them into boxes of 8.
How many boxes?

$$96 \div 8 = 12 \text{ boxes}$$

 Try It Out!

$$684 \div 3 = ?$$

$$135 \div 4 = ? \text{ (Include remainder)}$$

$$\text{Estimate: } 912 \div 3 \approx ?$$

You have 150 stickers. Each student gets 6. How many students?

BONUS: Divide $1,024 \div 8$ using long division.



Grade 4 – Unit 6: Factors, Multiples, and Patterns

Let's explore how numbers are built and how they repeat in patterns.

◆ Factors

A factor is a number you multiply to get another number.

Example:

Factors of 12:

$$1 \times 12$$

$$2 \times 6$$

$$3 \times 4$$


→ Factors: 1, 2, 3, 4, 6, 12

◆ Multiples

A multiple is the result of multiplying a number.


Example:

Multiples of 5:
5, 10, 15, 20, 25...
Multiples go on forever!

 Number Patterns
Look for rules!

Example:

Pattern: 3, 6, 9, 12, 15...
Rule: Add 3 each time
Another:

100, 90, 80, 70...
Rule: Subtract 10 each time
 Try It Out!
List all factors of 18

List the first 5 multiples of 7


What's the next number: 2, 4, 8, 16, ____?

Is 24 a multiple of 6?

BONUS: Write a pattern that starts at 5 and multiplies by 2 each time

Grade 4 – Unit 7: Equivalent Fractions and Comparing Fractions

Let's work with fractions that are equal and learn how to tell which is larger or smaller.

 Equivalent Fractions
Two fractions are equivalent if they show the same amount.

Example:

$\frac{1}{2} = \frac{2}{4} = \frac{4}{8}$
(They all represent one-half!)

To make equivalent fractions, multiply or divide both top and bottom:

$$\frac{2}{3} = \frac{(2 \times 2)}{(3 \times 2)} = \frac{4}{6}$$



Comparing Fractions

If the bottoms (denominators) are the same:

$$\frac{3}{8} < \frac{5}{8} \rightarrow \text{compare the numerators}$$

If the tops (numerators) are the same:

CSS

$$\frac{2}{5} > \frac{2}{7} \rightarrow \text{smaller bottom means bigger pieces}$$

Use models or number lines if you're not sure.



Use Common Denominators

To compare different denominators, find a common one.

Example:

Compare $\frac{3}{4}$ and $\frac{5}{8}$

→ Make denominators the same:

$$\frac{3}{4} = \frac{6}{8}$$

$$\text{So: } \frac{6}{8} > \frac{5}{8} \rightarrow \frac{3}{4} > \frac{5}{8}$$



Try It Out!

Are $\frac{2}{3}$ and $\frac{4}{6}$ equivalent?

Which is greater: $\frac{3}{5}$ or $\frac{3}{8}$?


Write two fractions equal to $\frac{5}{6}$

Which is smaller: $\frac{7}{10}$ or $\frac{3}{4}$?

BONUS: Draw a number line and place $\frac{1}{2}$, $\frac{2}{4}$, and $\frac{4}{8}$ on it — what do you notice?


Grade 4 – Unit 8: Add and Subtract Fractions

Fractions can be added or subtracted – just make sure the denominators match!

 Adding Fractions (Same Denominator)
Just add the tops (numerators):

$$\frac{2}{5} + \frac{1}{5} = \frac{3}{5}$$

The bottom (denominator) stays the same.

 Subtracting Fractions (Same Denominator)
Just subtract the tops:

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

 Different Denominators?


You need to make them the same first (common denominator).

Example:

$$\frac{1}{4} + \frac{1}{2}$$

→ Make $\frac{1}{2}$ into $\frac{2}{4}$


$$\text{Now: } \frac{1}{4} + \frac{2}{4} = \frac{3}{4}$$

 Word Problem Example

You ate $\frac{1}{6}$ of a cake. Your friend ate $\frac{2}{6}$.

How much did you eat together?

$$\frac{1}{6} + \frac{2}{6} = \frac{3}{6} \rightarrow \text{or simplify to } \frac{1}{2}$$

 Try It Out!

$$\frac{3}{10} + \frac{4}{10} = ?$$

$$\frac{7}{9} - \frac{2}{9} = ?$$


Add: $\frac{2}{3} + \frac{1}{6}$ (Hint: change $\frac{2}{3}$ to $\frac{4}{6}$)

Subtract: $\frac{5}{6} - \frac{1}{3}$ (Hint: change $\frac{1}{3}$ to $\frac{2}{6}$)

BONUS: You drink $\frac{3}{8}$ of a bottle in the morning and $\frac{2}{8}$ in the afternoon. How much total?

✖ Grade 4 - Unit 9: Multiply Fractions

Multiplying fractions is easy – just multiply straight across!

 Multiply Fraction \times Whole Number
Think of it as repeated addition:


Example:

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

✖ Multiply Fraction \times Fraction


Just multiply top \times top and bottom \times bottom:

$$\frac{1}{2} \times \frac{2}{3} = \frac{(1 \times 2)}{(2 \times 3)} = \frac{2}{6} = \frac{1}{3}$$

 Word Problem Example

You eat $\frac{2}{3}$ of a pizza, and each piece is $\frac{1}{4}$ of the whole.
How much did you eat?

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

 Try It Out!

$$3 \times \frac{1}{5} = ?$$

$$\frac{2}{3} \times \frac{1}{2} = ?$$

$$4 \times \frac{1}{6} = ?$$


$$\frac{1}{3} \times \frac{3}{4} = ?$$

BONUS: Multiply $\frac{2}{5} \times \frac{5}{6}$ and simplify

Continue with Unit 10 - Understand Decimals?

100 Grade 4 - Unit 10: Understand Decimals

Decimals are numbers that show parts of a whole - like fractions, but with a dot (decimal point).


 What is a Decimal?

A decimal has tenths, hundredths, and more.

Example:

0.5 → means 5 tenths = $5/10$

0.25 → means 25 hundredths = $25/100$

 Place Value After the Decimal


Place Example: 3.47

Ones 3

. Decimal point

Tenths 4

Hundredths 7

 Fractions and Decimals


Fraction	Decimal
----------	---------

$1/2$	0.5
-------	-----

$1/4$	0.25
-------	------

$3/4$	0.75
-------	------

$1/10$	0.1
--------	-----

 Try It Out!

What is 0.3 as a fraction?

What does the 6 mean in 0.6?

Which is greater: 0.8 or 0.65?

Write $1/4$ as a decimal.

BONUS: Fill in the blanks - 0.1, 0.2, ____, ____, 0.5

Grade 4 – Unit 11: Plane Figures

Plane figures are flat shapes that we see in 2D (two dimensions).

Types of Plane Figures

Shape Description

Triangle 3 sides, 3 angles

Quadrilateral 4 sides (includes squares, rectangles)

Pentagon 5 sides

Hexagon 6 sides

Octagon 8 sides

Circle No sides or corners (round)

Special Quadrilaterals

Shape Properties

Square 4 equal sides, all right angles

Rectangle Opposite sides equal, all right angles

Rhombus 4 equal sides, but angles may not be right

Trapezoid Only one pair of parallel sides

Parallelogram Opposite sides parallel and equal

Sides and Angles

A side is a straight line in a shape

An angle is where two sides meet

A right angle is a square corner (90°)

Try It Out!

How many sides does a hexagon have?

Name two quadrilaterals with right angles.

Does a circle have sides or angles?

What do all triangles have in common?

BONUS: Draw a shape with 5 equal sides – what's it called?



Grade 4 – Unit 12: Measuring Angles

Angles are made when two lines meet at a point.
We measure them in degrees ($^{\circ}$) using a protractor.

▲ Types of Angles

Angle Type	Degrees	Description
Right Angle	Exactly 90°	Like the corner of a square
Acute Angle	Less than 90°	Small, sharp angle
Obtuse Angle	More than 90°	Big, wide angle
Straight Angle	Exactly 180°	A straight line



Measuring with a Protractor

Line up one side of the angle with 0°

Read the number where the other side points

That's the angle in degrees!



Estimating Angles

Right angle =  (perfect corner)

Acute = smaller than a corner

Obtuse = wider than a corner



Try It Out!

Is 45° acute, right, or obtuse?

What kind of angle is 120° ?

Estimate: is the angle in a triangle usually acute or right?

Draw and label a 90° angle

BONUS: Name an object in real life with a right angle!



Grade 4 – Unit 13: Area and Perimeter

Let's revisit area and perimeter – two important ways to measure flat shapes.



What is Area?

Area = the space inside a shape

Measured in square units (like cm^2 or m^2)

Formula for a rectangle:

Area = length \times width

Example:

A rectangle is 5 units long and 4 units wide:

Area = $5 \times 4 = 20$ square units



What is Perimeter?

Perimeter = the distance around a shape

Measured in regular units (like cm, inches)

Formula for a rectangle:

Perimeter = $2 \times (\text{length} + \text{width})$

Example:

Length = 6, Width = 3

Perimeter = $2 \times (6 + 3) = 2 \times 9 = 18$ units




Remember

Area = inside

Perimeter = outside

Don't mix them up!

 Try It Out!

What's the area of a square with side 7 units?

What's the perimeter of a rectangle that's 10 by 4?

Area or perimeter: which would you use to tile a floor?

A rectangle has area 36 and width 6. What's the length?

BONUS: Draw a shape with area = 12 and perimeter = 14. Is it a square?

Continue with Unit 14 - Units of Measurement?



Grade 4 - Unit 14: Units of Measurement

We use units to measure length, mass (weight), and capacity (volume).



Length

Metric Units	U.S. Customary Units
millimeter (mm)	inch (in)
centimeter (cm)	foot (ft) = 12 inches
meter (m)	yard (yd) = 3 feet
kilometer (km)	mile = 1,760 yards



Mass (Weight)

Metric Units	U.S. Customary Units
gram (g)	ounce (oz)
kilogram (kg)	pound (lb) = 16 oz



Capacity (Volume)

Metric Units	U.S. Customary Units
milliliter (mL)	cup, pint, quart
liter (L)	gallon = 4 quarts



Converting Units


Know basic conversions:

1 meter = 100 centimeters

1 kilogram = 1,000 grams

1 gallon = 4 quarts

1 foot = 12 inches

 Try It Out!


How many centimeters in 3 meters?

Which is heavier: 1,000g or 2kg?

How many feet in 3 yards?


Which holds more: a liter or a cup?

BONUS: You run 5 kilometers. About how many meters is that?

 Grade 4 complete! Want to start Grade 5 - Unit 1: Decimal Place Value next?

Grade 5 - Unit 1: Decimal Place Value

Decimals are numbers with digits after the decimal point.
Each digit has a value based on its place.

 Place Value Chart (with Decimals)

Place Example: 72.345

Tens 7


Ones 2

. (decimal)

Tenths 3

Hundredths 4

Thousandths 5

 What Each Place Means

0.1 → one tenth = $1/10$

0.01 → one hundredth = $1/100$

0.001 → one thousandth = $1/1,000$


Compare Decimals

Line up digits and compare left to right:

go


$0.6 > 0.59 \rightarrow$ tenths place wins

$0.503 < 0.53 \rightarrow$ hundredths make the difference!

 Expanded Form Example

Number: 4.327

$= 4 + 0.3 + 0.02 + 0.007$

 Try It Out!

What's the value of the 5 in 3.548?

Which is greater: 0.8 or 0.79?


Write 7.406 in expanded form

What does the 2 mean in 9.32?

BONUS: Arrange these in order from smallest to largest: 0.4, 0.04, 0.444

Grade 5 – Unit 2: Add Decimals

Adding decimals is just like adding whole numbers – just line up the decimal points!

 Step-by-Step Example

Add:

$$\begin{array}{r} 3.75 \\ + 2.4 \end{array}$$

Step 1: Line up the decimals


markdown

$$\begin{array}{r} 3.75 \\ + 2.40 \\ \hline \end{array}$$

6.15

Step 2: Add like normal


(If needed, add a 0 to make the decimal places equal)

 Estimate First

Estimate:


$$3.75 + 2.4 \approx 4 + 2 = 6$$

Helps check if your answer makes sense!

 Word Problem Example

You drink 1.5 liters in the morning and 0.75 liters in the afternoon.
How much did you drink in total?

$$1.5 + 0.75 = 2.25 \text{ liters}$$

 Try It Out!

$$4.2 + 3.05 = ?$$

$$6.38 + 1.4 = ?$$

$$\text{Estimate: } 5.9 + 2.3 \approx ?$$

Emma ran 2.45 miles on Monday and 3.1 miles on Tuesday. How far total?

BONUS: Add $12.005 + 8.95$ – line up those decimals carefully!

Grade 5 – Unit 3: Subtract Decimals

Subtracting decimals is like subtracting whole numbers – just line up the decimal points!

Step-by-Step Example

Subtract:

$$\begin{array}{r} 5.6 \\ - 2.45 \end{array}$$

Step 1: Line up the decimal points

Step 2: Add a 0 to make the digits even:

$$\begin{array}{r} 5.60 \\ - 2.45 \\ \hline 3.15 \end{array}$$

Borrowing with Decimals


Sometimes you'll need to borrow — just like whole numbers.

Example:

$$\begin{array}{r} 3.02 \\ - 1.67 \end{array}$$


You'll borrow from the ones or tenths place to subtract properly:

Answer: 1.35

 Estimate First

Estimate:

$$5.6 - 2.45 \approx 6 - 2 = 4$$

 Try It Out!

$$7.4 - 3.25 = ?$$

$$9.08 - 2.6 = ?$$

$$\text{Estimate: } 8.75 - 3.2 \approx ?$$

A rope is 10.5 meters long. You cut off 4.35 meters. How much is left?

BONUS: Subtract $12.005 - 8.95$ — line up those decimals!

Grade 5 – Unit 4: Add and Subtract Fractions

To add or subtract fractions, the denominators must be the same.

Add Fractions with Same Denominator

Just add the numerators:

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

Subtract Fractions with Same Denominator

$$\frac{5}{6} - \frac{2}{6} = \frac{3}{6} \rightarrow \text{simplify} \rightarrow \frac{1}{2}$$

Unlike Denominators?

Find a common denominator first.

Example:

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

$$\rightarrow \frac{3}{12} + \frac{4}{12} = \frac{7}{12}$$

Multiply top and bottom to get equivalent fractions.

Mixed Numbers

Add the whole numbers and fractions separately:

$$2 \frac{1}{4} + 3 \frac{1}{2}$$

$$\rightarrow \text{Convert: } 2 \frac{1}{4} = \frac{9}{4}, 3 \frac{1}{2} = \frac{7}{2}$$

$$\rightarrow \text{Common denominator: } \frac{9}{4} + \frac{14}{4} = \frac{23}{4} = 5 \frac{3}{4}$$

(Or use LCM, add parts, simplify.)

Try It Out!

$$\frac{5}{6} - \frac{1}{6} = ?$$

$$\frac{2}{3} + \frac{1}{4} = ?$$

$$3 \frac{1}{2} + 2 \frac{1}{3} = ?$$

Estimate: Is $\frac{1}{2} + \frac{3}{4}$ more or less than 1?

BONUS: $4 \frac{5}{6} - 2 \frac{2}{3} = ?$

✖÷ Grade 5 – Unit 5: Multi-Digit Multiplication and Division

You already know the basics – now let's multiply and divide larger numbers!

✖ Multi-Digit Multiplication
Use the standard algorithm:

Example:

326
× 24
Step 1: Multiply by 4

1304
Step 2: Multiply by 20 (write one zero!)

6520
Step 3: Add them:

$1304 + 6520 = 7824$

÷ Long Division
Let's divide:

$3,768 \div 6$
Step-by-step:

6 into 37 \rightarrow 6 times ($6 \times 6 = 36$)

Bring down 6 \rightarrow 6 into 6 = 1

Bring down 8 \rightarrow 6 into 8 = 1, remainder 2

Answer: 628



Estimate First

Estimate $780 \div 6 \rightarrow$ about $800 \div 8 = 100$

Helps you know if your answer is reasonable!



Try It Out!

$154 \times 39 = ?$

$4,912 \div 8 = ?$

Estimate: $672 \div 7 \approx ?$

A box holds 25 toys. How many in 36 boxes?

BONUS: Multiply 431×27 using the full algorithm.



Grade 5 – Unit 6: Multiply Fractions

Multiplying fractions is straight across – top \times top, bottom \times bottom.



Fraction \times Fraction

Example:

$\frac{2}{3} \times \frac{3}{4} = (2 \times 3) / (3 \times 4) = 6/12 \rightarrow$ simplify $\rightarrow \frac{1}{2}$




Whole Number \times Fraction

Example:

$4 \times \frac{2}{5} = (4 \times 2) / 5 = 8/5 = 1 \frac{3}{5}$


You can turn whole numbers into fractions:

$4 = 4/1 \rightarrow$ then multiply: $4/1 \times 2/5$

 Simplify When Possible


Multiply first, then simplify the result.

$$3/6 \times 2/3 = 6/18 = 1/3$$

 Word Problem Example

A recipe uses $3/4$ cup of sugar. You're making 2 batches.

$$2 \times 3/4 = 6/4 = 1 \frac{1}{2} \text{ cups}$$

 Try It Out!

$$1/2 \times 1/3 = ?$$

$$5 \times 2/7 = ?$$

$$3/4 \times 4/9 = ?$$

A ribbon is $2/3$ meter long. What's the total for 3 ribbons?

BONUS: Multiply $7/8 \times 4/5$ and simplify your answer.



Grade 5 - Unit 7: Divide Fractions

To divide fractions, we use the rule:

Keep, Change, Flip (also called "multiply by the reciprocal").



Keep, Change, Flip

Example:

$$1/2 \div 1/4$$

\rightarrow Keep $1/2$, change \div to \times , flip $1/4$ to $4/1$

$$\rightarrow 1/2 \times 4/1 = 4/2 = 2$$

Whole Number \div Fraction

Turn the whole number into a fraction:

$$3 \div 1/2 \rightarrow 3/1 \div 1/2$$

$$\rightarrow 3/1 \times 2/1 = 6/1 = 6$$

Means: how many halves are in 3? Answer: 6 halves.



Word Problem Example

You have 3 cups of flour. Each recipe needs $3/4$ cup.

How many recipes can you make?

$$3 \div 3/4 = 3/1 \times 4/3 = 12/3 = 4 \text{ recipes}$$



Try It Out!

$$1/3 \div 1/6 = ?$$

$$2 \div 1/4 = ?$$

$$5/8 \div 1/2 = ?$$

A rope is 6 meters long. Each piece is $3/4$ meter. How many pieces?

BONUS: Divide $4/5 \div 2/3$ and simplify.



Grade 5 – Unit 8: Multiply Decimals

You multiply decimals like whole numbers – then count the decimal places in the answer.



Basic Steps

Example:

$$0.6 \times 0.3$$

$$\rightarrow 6 \times 3 = 18$$

\rightarrow Count 2 decimal places (1 from each number)

→ Final answer: 0.18

 Decimal × Whole Number

Example:


$$3.2 \times 4$$

$$\rightarrow 32 \times 4 = 128$$

→ One decimal place → 12.8

 Tip: Ignore the decimals at first


Then put the decimal back in the answer by counting total decimal places.

 Word Problem Example

A donut costs \$1.25. You buy 6.

$$1.25 \times 6 = 7.50$$

→ Total: \$7.50

 Try It Out!

$$0.4 \times 0.7 = ?$$

$$5 \times 1.6 = ?$$

$$0.25 \times 0.3 = ?$$


Estimate: Is 3.1×2.5 closer to 6, 7, or 8?

BONUS: Multiply 2.43×1.2 – how many decimal places?

Ready to continue with Unit 9 – Divide Decimals?

Grade 5 – Unit 9: Divide Decimals

You can divide decimals just like whole numbers – but watch where the decimal point goes!


 Decimal ÷ Whole Number

Example:

$$6.4 \div 4 = ?$$

$64 \div 4 = 16 \rightarrow$ place the decimal:

$$\rightarrow 6.4 \div 4 = 1.6$$

 Decimal \div Decimal


Move the decimal in the divisor (the number you're dividing by) to make it a whole number – then do the same to the dividend.

Example:


$$1.2 \div 0.4$$

\rightarrow Move decimal in both: $12 \div 4 = 3$

Answer: 3

 Tip


Line up the digits carefully in long division. The decimal point in the quotient goes straight up from the dividend.

 Word Problem Example

You have 7.5 liters of juice. Each bottle holds 0.5 liters.

How many bottles can you fill?

$$7.5 \div 0.5 = 15 \text{ bottles}$$

 Try It Out!

$$8.4 \div 2 = ?$$

$$2.7 \div 0.3 = ?$$

$$5.25 \div 0.25 = ?$$

A rope is 9.6 meters long. Each piece is 1.2 meters. How many pieces?

BONUS: Divide $4.83 \div 0.3$ – show your steps.

Grade 5 – Unit 10: Powers of Ten

Powers of ten are numbers like 10, 100, 1,000 – made by multiplying 10 repeatedly.

What Is a Power of Ten?


Power Value Meaning

$$10^1 = 10 \quad 10 \times 1$$

$$10^2 = 100 \quad 10 \times 10$$

$$10^3 = 1,000 \quad 10 \times 10 \times 10$$

The exponent tells you how many zeros.


 Multiply by Powers of Ten
Move the decimal right.

Example:

$$3.2 \times 10 = 32$$

$$3.2 \times 100 = 320$$


$$3.2 \times 1,000 = 3,200$$

 Divide by Powers of Ten
Move the decimal left.


Example:

$$3.2 \div 10 = 0.32$$

$$3.2 \div 100 = 0.032$$

 Trick

No calculator needed – just count the zeros to move the decimal!

 Try It Out!

$$4.5 \times 10 = ?$$

$$67 \div 1,000 = ?$$

What's 0.83×100 ?

Move the decimal: $12.3 \rightarrow \times 1,000 \rightarrow ?$

$$\text{BONUS: } 5.9 \div 10^2 = ?$$



Grade 5 – Unit 11: Volume

Volume is the amount of space a 3D object takes up – like how much a box can hold.



Volume of a Rectangular Prism

Use this formula:

Volume = length \times width \times height

Measured in cubic units (like cm^3 , m^3 , in^3)



Example

A box is:

5 cm long

3 cm wide

2 cm high

Volume = $5 \times 3 \times 2 = 30 \text{ cm}^3$



Real-Life Meaning

If 1 cube = 1 cm^3 , then the box can hold 30 cubes.



Try It Out!

Volume of a box: $6 \times 4 \times 2 = ?$

A prism is 3 cm tall, 5 cm wide, and 5 cm long. What's the volume?

True or False: Volume is measured in square units.

What is the volume of a cube that is 3 cm on each side?

BONUS: A tank is 10 m long, 2 m wide, 1 m high. How many cubic meters of water can it hold?



Grade 5 – Unit 12: Coordinate Plane

A coordinate plane helps you find and graph points using numbers called coordinates.



The Axes

X-axis → horizontal (left to right)

Y-axis → vertical (up and down)

They meet at the origin (0, 0).



Coordinates

A point is written like this:

(x, y)

x = how far you move across (→)

y = how far you move up (↑)

Example:

(3, 2) → go 3 units right, then 2 units up



Quadrant I

You'll mostly work in Quadrant I, where x and y are both positive.



Try It Out!

Plot (4, 1) – where does it land?

What are the coordinates of a point that is 2 right and 5 up?

True or False: (0, 3) is on the y-axis

Which comes first in a coordinate pair: x or y?

BONUS: Plot these points and connect them – what shape do you make?

(1, 1), (1, 4), (4, 4), (4, 1)

Grade 5 – Unit 13: Algebraic Thinking

Algebra is all about finding unknown values and spotting patterns and rules.

What's a Variable?

A variable is a letter that stands for a number.

Common letters: x , y , n

Example:

$$x + 4 = 10$$

→ What is x ?

$$\rightarrow x = 6$$

Expressions vs. Equations

Expression: no equal sign → $3x + 5$

Equation: has an equal sign → $2x = 8$

Patterns and Rules

You can write a rule for number patterns.

Example:

Pattern: 2, 4, 6, 8, ...

Rule: Start at 2, add 2 each time

Expression: $x = 2n$

Order of Operations

Use PEMDAS:

CSS

P – Parentheses

E – Exponents

MD – Multiply & Divide (left to right)

AS – Add & Subtract (left to right)

Example:

$$3 + (2 \times 4) = 3 + 8 = 11$$

🧠 Try It Out!

Solve: $x + 7 = 12$

What's the value of x in: $5x = 20$?

Is $3n + 1$ an expression or equation?

Rule: Start at 1, add 3 each time. List 5 numbers.

BONUS: Use PEMDAS — $6 + 2 \times (3 + 1) = ?$



Grade 5 – Unit 14: Converting Units of Measure

Sometimes you need to convert (change) a measurement into a different unit.



Length

$$1 \text{ foot (ft)} = 12 \text{ inches (in)}$$

$$1 \text{ yard (yd)} = 3 \text{ feet or } 36 \text{ inches}$$

$$1 \text{ mile} = 1,760 \text{ yards}$$

Example:

$$5 \text{ feet} = 5 \times 12 = 60 \text{ inches}$$



Weight (Mass)

$$1 \text{ pound (lb)} = 16 \text{ ounces (oz)}$$

$$1 \text{ ton} = 2,000 \text{ pounds}$$



Capacity

$$| 1 \text{ gallon} | = 4 \text{ quarts} | | 1 \text{ quart} | = 2 \text{ pints} | | 1 \text{ pint} | = 2 \text{ cups} |$$

Example:

$$2 \text{ gallons} = 8 \text{ quarts}$$



Metric System (based on 10s)

$$| 1 \text{ kilometer (km)} | = 1,000 \text{ meters (m)} | | 1 \text{ meter (m)} | = 100 \text{ centimeters (cm)} | | 1 \text{ centimeter} | = 10 \text{ millimeters (mm)} |$$

Just move the decimal left or right.



Try It Out!

How many inches in 6 feet?

Convert 3 pounds to ounces

How many cups in 2 quarts?

Convert 1.5 meters to centimeters

BONUS: A race is 5 km long. How many meters is that?



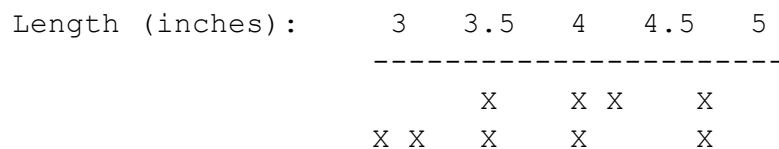
Grade 5 - Unit 15: Line Plots

A line plot shows data along a number line using X marks to show how often a value appears.



Example Line Plot

Measuring the length (in inches) of pencils:



This tells us:

Two pencils are 3 inches

Three pencils are 4 inches

Two pencils are 4.5 inches

One pencil is 5 inches




Line Plots Can Show Fractions Too!

You can have points like $\frac{1}{2}$, $\frac{1}{4}$, etc.

Example:

X X X X X X
1/4 1/2 3/4
→ 3 values at 1/4, 2 at 1/2, 1 at 3/4

 Try It Out!

What's the most common value in the plot above?

How many total items are shown?

If each X represents 1 student, how many students have pencils longer than 4 inches?

What fraction appears the least in the second plot?

BONUS: Create a line plot for the data: 1/2, 1/2, 3/4, 1/4, 1/2, 3/4

Grade 5 – Unit 16: Properties of Shapes

Let's explore what makes 2D shapes special – like their sides, angles, and symmetry.

Classifying Shapes

Shapes are grouped based on:

Number of sides

Types of angles

Equal sides

Parallel sides

◆ Triangles

Type Description

Equilateral 3 equal sides, 3 equal angles

Isosceles 2 equal sides, 2 equal angles

Scalene No equal sides or angles

Right Triangle Has one 90° (right) angle

Acute Triangle All angles $< 90^\circ$

Obtuse Triangle One angle $> 90^\circ$

♦ Quadrilaterals

Shape Key Features

Square 4 equal sides, 4 right angles

Rectangle Opposite sides equal, 4 right angles

Rhombus 4 equal sides, opposite angles equal

Parallelogram Opposite sides parallel and equal

Trapezoid Only 1 pair of parallel sides

Kite 2 pairs of equal-length sides (next to each other)



Other Properties

Parallel lines: never cross

Perpendicular lines: meet at 90°

Symmetry: shape looks the same if folded or flipped

Angle types: acute ($< 90^\circ$), right (90°), obtuse ($> 90^\circ$)



Try It Out!

Name a shape with 4 equal sides and no right angles.

True or False: All rectangles are squares.

What's the difference between a rhombus and a square?

Which triangle has all angles less than 90° ?

BONUS: Draw a quadrilateral with only one pair of parallel sides – what is it?



Grade 6 – Unit 1: Ratios

A ratio is a way to compare two quantities.

It tells how much of one thing there is compared to another.



What Is a Ratio?

Ratios can be written in three ways:

3 to 2

3:2

$\frac{3}{2}$

All mean the same thing.

Example:

If a recipe uses 3 cups of flour and 2 cups of sugar,

→ The ratio of flour to sugar is 3:2



Equivalent Ratios

Ratios are like fractions – you can scale them up or down.

Example:

$3:2 = 6:4 = 9:6$

(Just multiply both parts by the same number)



Ratio Tables

Flour (cups)	Sugar (cups)
3	2
6	4
9	6

Ratio tables help you organize and extend ratios.



Try It Out!

What's the ratio of 4 apples to 6 bananas?

Is 2:3 equivalent to 6:9?

Complete the ratio table:

$5:2 = \underline{\quad}:4 = \underline{\quad}:6$

If there are 10 boys and 15 girls, what's the ratio of boys to total students?

BONUS: You have red and blue beads in a 2:5 ratio. If you have 14 red beads, how many blue?

+- Grade 6 – Unit 2: Arithmetic with Rational Numbers

Rational numbers are numbers that can be written as a fraction – this includes whole numbers, fractions, and decimals, even negatives.

Rational Number Examples

3 (whole number)

-2 (negative integer)

$\frac{1}{2}$ (fraction)

-0.75 (decimal)

$\frac{4}{1} = 4$ (any whole number is a rational number)

+-÷× Operations

You can add, subtract, multiply, and divide rational numbers – even when they're negative or in fraction/decimal form.

1. Adding/Subtracting Fractions

Make denominators the same:

$$\frac{1}{3} + \frac{1}{6} = \frac{2}{6} + \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$$

2. Multiplying Fractions

Multiply straight across:

$$2/3 \times 4/5 = 8/15$$

3. Dividing Fractions

Use Keep-Change-Flip:

$$3/4 \div 2/5 = 3/4 \times 5/2 = 15/8$$

4. Adding/Subtracting Decimals

Line up the decimal points:


$$3.25 - 1.4 = 1.85$$

5. Multiplying/Dividing Decimals

Ignore the decimal, multiply, then count decimal places:

$$0.2 \times 0.4 = 0.08$$

$$3.6 \div 0.6 = 6$$

 Try It Out!

What is $-4 + 7$?

$$2/3 - 1/6 = ?$$

$$3/5 \times 2/3 = ?$$

$$-0.5 + 0.25 = ?$$

$$\text{BONUS: } 4/7 \div 2/3 = ?$$

Grade 6 – Unit 3: Rates and Percentages

Rates compare two different units.

Percentages compare to 100.

What Is a Rate?

A rate tells how much of one thing happens for every one of another.

Example:

60 miles per hour \rightarrow 60 miles / 1 hour

\$12 for 3 pounds \rightarrow \$4 per pound

Unit Rates

A unit rate has 1 as the denominator.

Example:

\$18 for 6 shirts \rightarrow $\$18 \div 6 = \3 per shirt

What Is a Percent?

Percent means "per 100."

$25\% = 25$ out of 100 $= 25/100 = 0.25$

Converting

Fraction \rightarrow Percent: $1/2 = 50\%$

Decimal \rightarrow Percent: $0.2 = 20\%$

Percent \rightarrow Decimal: $75\% = 0.75$

Word Problem Example

A jacket is 30% off a \$100 price:

shell

30% of \$100 $= 0.30 \times 100 = \$30$ off \rightarrow Pay \$70

Try It Out!

What is the unit rate: \$24 for 8 books?

Convert $3/4$ to a percent

What is 20% of 60?

A car travels 150 miles in 3 hours. What is its rate?

BONUS: A store gives 15% off a \$200 item – how much is the discount?



Grade 6 – Unit 4: Exponents and Order of Operations

Let's power up your math with exponents and solve problems in the correct order!



What Is an Exponent?

An exponent tells you how many times to multiply a number by itself.

Example:

$$3^2 = 3 \times 3 = 9$$

$$2^4 = 2 \times 2 \times 2 \times 2 = 16$$

The base is the number (like 2 or 3)

The exponent is the little number above it



Order of Operations (PEMDAS)

Solve expressions in this order:

CSS

P – Parentheses

E – Exponents

MD – Multiply & Divide (left to right)

AS - Add & Subtract (left to right)

Example:

$$5 + (2 \times 3)^2$$

$$\rightarrow 2 \times 3 = 6$$

$$\rightarrow 6^2 = 36$$

$$\rightarrow 5 + 36 = 41$$

! Common Mistake

Don't do addition before multiplication!

Always follow the PEMDAS steps.

🧠 Try It Out!

$$4^3 = ?$$

What comes first: parentheses or exponents?

$$\text{Solve: } 2 + 3 \times 4 = ?$$

$$\text{Solve: } (5 + 1)^2 - 3 = ?$$

$$\text{BONUS: Simplify: } 8 + 2 \times (6 - 3)^2$$

▬ Grade 6 - Unit 5: Negative Numbers

Negative numbers are numbers less than zero.

They're used in real life for temperature, debt, elevation, and more.

▼ Where Are They on the Number Line?

python-repl

... -3 -2 -1 0 1 2 3 ...

The farther left, the smaller the number

$$-4 < -1, \text{ and } -2 < 0$$



Adding & Subtracting Negatives

Add a negative:

$$3 + (-2) = 1$$

$$-4 + (-5) = -9$$

Subtract a negative:

$$5 - (-3) = 8 \rightarrow \text{double negative} = \text{add}$$

$$-2 - 4 = -6$$



Multiplying & Dividing Negatives

Rule Result

Positive \times Positive Positive

Positive \times Negative Negative

Negative \times Negative Positive

Same rules for division.

Example:

$$-3 \times 4 = -12$$

$$-3 \times -4 = 12$$



Try It Out!

What is $-5 + 7$?

What's greater: -3 or -8 ?

Solve: $6 - (-2) = ?$

Multiply: $-4 \times -6 = ?$

BONUS: A submarine dives 50 meters below sea level (0 m). Then it dives 20 more. What's its position?



Grade 6 – Unit 6: Variables & Expressions

A variable is a letter that represents a number.

An expression is a math phrase without an equal sign.

Variables

Common variables: x , y , n

Example:

java

$$x + 3$$

(If $x = 5$, then $x + 3 = 8$)

Expressions

Expressions can include:

Variables

Numbers

Operations ($+$, $-$, \times , \div)

Examples:

$$2x + 7$$

$$4(n - 1)$$

Evaluate an Expression

Replace the variable with a number and solve.

Example:

java

If $x = 3$, then:

$$2x + 1 = 2(3) + 1 = 6 + 1 = 7$$

Word Phrases to Expressions

"3 more than x " $\rightarrow x + 3$

"Twice a number" $\rightarrow 2x$

"5 less than a number" $\rightarrow x - 5$

Try It Out!

Evaluate: $5x$ if $x = 4$

Write an expression for: "7 less than n "

If $y = 2$, what is $y^2 + 1$?

Translate: "3 times the sum of x and 4"

BONUS: If $t = 10$, evaluate: $4(t - 2) + 6$



Grade 6 – Unit 7: Equations & Inequalities

An equation has an equal sign ($=$).

An inequality compares values using $<$, $>$, \leq , \geq .



Solving Equations

Find the value of the variable that makes the equation true.

Example:

$$x + 5 = 12$$

$$\rightarrow x = 12 - 5 = 7$$

Use inverse operations to solve:

Undo addition with subtraction

Undo multiplication with division



Multi-Step Equations

Example:

$$2x + 3 = 11$$

$$\rightarrow \text{Subtract 3: } 2x = 8$$

$$\rightarrow \text{Divide by 2: } x = 4$$

▲ Inequalities

Inequalities show a range of values.

Symbol	Meaning	Example
$<$	Less than	$x < 5$
$>$	Greater than	$x > 3$
\leq	Less than or equal	$x \leq 10$
\geq	Greater than or equal	$x \geq 0$



Graphing Inequalities

Use a number line:

Open circle \circ for $<$ or $>$

Closed circle \bullet for \leq or \geq

Shade the direction that matches the symbol



Try It Out!

Solve: $x - 3 = 9$

Solve: $4x = 20$

Is 7 a solution?

Solve: $2x + 1 = 11$

BONUS: Graph $x \geq 2$ on a number line



Grade 6 - Unit 8: Plane Figures

Plane figures are 2D shapes – flat shapes like triangles, rectangles, and circles.

Key Vocabulary

Side: a straight edge of a shape

Angle: where two sides meet

Vertex: a corner

Polygon: closed shape with straight sides

Types of Plane Figures

Shape	Sides	Special Features
Triangle	3	Angles add up to 180°
Quadrilateral	4	Angles add up to 360°
Pentagon	5	Regular = 5 equal sides and angles
Hexagon	6	Common in tiling and nature (e.g., honeycombs)
Circle	0	No sides or angles

Area Formulas

Shape Formula

Rectangle Area = length \times width

Triangle Area = $\frac{1}{2} \times$ base \times height

Parallelogram Area = base \times height

Trapezoid Area = $\frac{1}{2} \times (\text{base}_1 + \text{base}_2) \times$ height

Circle Area = $\pi \times r^2$ ($\pi \approx 3.14$)

Angle Types

Acute: $< 90^\circ$

Right: $= 90^\circ$

Obtuse: $> 90^\circ$

Straight: $= 180^\circ$

Try It Out!

What shape has 4 equal sides and 4 right angles?

Find the area of a triangle with base 10 and height 4

Classify an angle that measures 110°

How many degrees in a triangle?

BONUS: A trapezoid has bases 6 and 10, height 4 – what's its area?



Grade 6 – Unit 9: Coordinate Plane

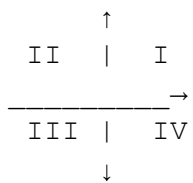
A coordinate plane is a grid made of a horizontal x-axis and a vertical y-axis.



Four Quadrants

The axes split the plane into four quadrants:

less



Quadrant I: (+, +)

Quadrant II: (-, +)

Quadrant III: (-, -)

Quadrant IV: (+, -)



Coordinates

Coordinates are written as (x, y)


Move x units left/right

Move y units up/down

Example:

$(3, -2) \rightarrow$ right 3, down 2


$(-4, 5) \rightarrow$ left 4, up 5

 Graphing on a Grid

Start at the origin $(0, 0)$

Move along the x-axis

Then move along the y-axis

 Try It Out!

Which quadrant is $(-3, -2)$ in?

Plot the point $(0, 4)$ – where is it?

What are the coordinates of a point 2 left and 3 up?

True or False: $(5, 0)$ is on the y-axis

BONUS: Plot $(-2, -3)$, $(-2, 1)$, $(1, 1)$, $(1, -3)$. What shape do they form?



Grade 6 – Unit 10: 3D Figures

3D figures have length, width, and height – they take up space and have volume.



Common 3D Shapes

Shape	Faces	Edges	Vertices	Example
-------	-------	-------	----------	---------

Cube	6	12	8	Dice	
Rectangular Prism	6	12	8	Shoebox	
Cylinder	3	2	0	Can	
Sphere	1	0	0	Ball	
Cone	2	1	1	Ice cream cone	
Pyramid (square)	5	8	5	Egyptian pyramid	



Surface Area

Surface area is the total area of all faces.

Example:

A cube has 6 faces. If one face = 4 cm^2 ,

→ Surface area = $6 \times 4 = 24 \text{ cm}^2$



Volume Formulas

Shape Formula

Rect. Prism $V = \text{length} \times \text{width} \times \text{height}$

Cube $V = \text{side}^3$

Cylinder $V = \pi \times r^2 \times \text{height}$



Try It Out!

How many faces does a rectangular prism have?

What is the volume of a box that's $5 \times 3 \times 2$?

Name a 3D shape with no edges

True or False: A cone has a circular base

BONUS: A cube has sides 4 cm long. What is its volume?



Grade 6 – Unit 11: Data and Statistics

Statistics helps us collect, organize, and understand data.
Let's learn how to describe what numbers tell us!



Types of Data

Numerical: numbers (like heights, test scores)

Categorical: labels (like colors, favorite foods)



Measures of Center

Name What it Means

Mean Average (add all, divide by count)

Median Middle number (in order)

Mode Most frequent number

Range Difference between high and low

Example:

Data: 2, 4, 4, 6, 8

Mean = $(2+4+4+6+8)/5 = 24/5 = 4.8$

Median = 4

Mode = 4

Range = $8 - 2 = 6$



Graphing Data

Line plot: X marks on a number line

Histogram: bars show frequency in intervals

Box plot: shows median and quartiles



Word Problem Example

A group of students scores: 85, 90, 85, 70, 100

→ Mean? → $(85 + 90 + 85 + 70 + 100) \div 5 = 86$



Try It Out!

Find the mean of: 3, 5, 8, 9

What is the median of: 7, 2, 4, 6, 9?

What's the mode of: 10, 12, 10, 14?

Find the range of: 25, 30, 20, 35

BONUS: Make a line plot for these numbers: 2, 2, 3, 4, 4, 4, 5



Grade 6 complete! Would you like to start Grade 7 - Unit 1: Proportional Relationships next?



Grade 7 - Unit 1: Proportional Relationships

A proportional relationship is when two quantities increase or decrease at the same rate.



What Does Proportional Mean?

If the ratio between two values is constant, they are proportional.

Example:

x: 2 → 4 → 6

y: 10 → 20 → 30

→ Each $y = 5 \times x$ → constant ratio = 5



Constant of Proportionality (k)

Use the formula:

$$y = kx$$

Where k is the constant of proportionality.

Example:

java

If $y = 12$ when $x = 4$ → $k = y \div x = 12 \div 4 = 3$


So: $y = 3x$



Tables & Graphs

A proportional table has equal ratios

A proportional graph is a straight line through the origin (0, 0)

 Try It Out!

If $x = 3$ and $y = 12$, what is the constant of proportionality?

Write the equation for: $x = 5$, $y = 40$

Is this table proportional?

x	y
1	4
2	8
3	12

True or False: A proportional graph must go through (0, 0)

BONUS: A car travels 180 miles in 3 hours. How far in 5 hours?

Ready to continue with Unit 2 - Rates and Percentages?



Grade 7 - Unit 2: Rates and Percentages

This unit builds on what you learned in Grade 6 - now with multi-step problems and percent increase/decrease.



Unit Rates

A unit rate compares something to 1 unit.

Example:

\$18 for 3 books $\rightarrow 18 \div 3 = \6 per book

100 Percent Problems

Percent = "out of 100"

Type Formula

Finding a percent $\text{part} \div \text{whole} \times 100$

Finding the part $\text{percent} \times \text{whole}$

Finding the whole $\text{part} \div \text{percent}$

Example:

What is 30% of 80? $\rightarrow 0.30 \times 80 = 24$

▲ Percent Increase/Decrease

Use:

cpp

$\% \text{ change} = (\text{new} - \text{original}) \div \text{original} \times 100$

Example:

Price goes from \$50 to \$65

$\rightarrow (65 - 50) \div 50 \times 100 = 30\%$ increase

🧠 Try It Out!

Find the unit rate: \$45 for 9 shirts

What is 25% of 60?

A price drops from \$100 to \$75 – what's the percent decrease?

A jacket costs \$80 and is 20% off – what's the sale price?

BONUS: A test score went from 72 to 90. What's the percent increase?

Grade 7 - Unit 3: Integers - Addition and Subtraction

Integers include positive numbers, negative numbers, and zero.

Adding Integers

Same signs: Add and keep the sign

$$-4 + (-3) = -7$$

$$5 + 2 = 7$$

Different signs: Subtract and take the sign of the bigger number

$$7 + (-10) = -3$$

$$-6 + 4 = -2$$

Subtracting Integers

Change subtracti

nginx

$$a - b = a + (-b)$$

Example:

$$5 - (-2) = 5 + 2 = 7$$

$$-3 - 4 = -7$$

Number Line Tip

Use a number line to visualize:

Right = positive

Left = negative

Try It Out!

$$-5 + 3 = ?$$

$$8 + (-2) = ?$$


$$-4 - 6 = ?$$

$$0 - (-9) = ?$$

BONUS: A diver is 10 meters below sea level. He descends 6 more meters. Where is he now?

Grade 7 - Unit 4: Rational Numbers - Addition & Subtraction


Rational numbers are numbers that can be written as fractions or decimals, including negatives.

 Adding & Subtracting Decimals
Line up the decimal points.

Example:


$$-3.5 + 2.1 = -1.4$$

$$5.75 - 6.2 = -0.45$$

 Fractions (With Same Denominators)
Just add or subtract the numerators:

$$\frac{3}{5} + (-\frac{1}{5}) = \frac{2}{5}$$

$$-\frac{4}{7} - \frac{2}{7} = -\frac{6}{7}$$

 Fractions (With Different Denominators)
Find a common denominator first:

$$\frac{1}{2} + (-\frac{1}{4}) \rightarrow \frac{2}{4} + (-\frac{1}{4}) = \frac{1}{4}$$

✨ Word Problem Example

A bank account has $-\$25$. You deposit $\$40$:

$$-25 + 40 = 15 \rightarrow \text{New balance} = \$15$$

🧠 Try It Out!

$$-3.2 + 5.7 = ?$$

$$4/9 - 7/9 = ?$$

$$-2.5 - 1.3 = ?$$

$$1/2 + (-3/8) = ?$$

BONUS: A submarine is 50 meters below sea level. It rises 37.6 meters. What's its new depth?

✖÷ Grade 7 - Unit 5: Negative Numbers - Multiplication & Division

You already know how to multiply and divide – now apply it to negative numbers!

🔄 Multiplication Rules

Sign 1	Sign 2	Result
$+$	\times	$+$
$+$	\div	$+$
$+$	\times	$-$
$+$	\div	$-$
$-$	\times	$-$
$-$	\div	$+$

$$- \times - = +$$

Example:

$$-3 \times 4 = -12$$

$$-6 \times -2 = 12$$



Division Rules

Same rules as multiplication!

Example:

$$12 \div (-3) = -4$$

$$(-20) \div (-5) = 4$$



Tip to Remember

Same signs = positive

Different signs = negative



Try It Out!

$$-8 \times 6 = ?$$

$$36 \div (-9) = ?$$

$$-7 \times -3 = ?$$

$$(-18) \div 3 = ?$$

BONUS: A submarine descends at 4 meters per minute for 6 minutes.
What is its change in depth?



Grade 7 – Unit 6: Expressions, Equations, & Inequalities

Let's build and solve with variables, equal signs, and comparison symbols.



Expressions

An expression is a math phrase with no equal sign.

Example:

$3x + 5$

$2(a - 4)$

You evaluate expressions by plugging in values.



Equations

An equation has an equal sign and can be solved.

Example:

$$2x + 1 = 7$$

→ Subtract 1: $2x = 6$

→ Divide by 2: $x = 3$

Use inverse operations to isolate the variable.



Inequalities

Inequalities compare values using:

Symbol	Meaning
$<$	Less than
$>$	Greater than
\leq	Less than or equal
\geq	Greater than or equal

Example:

$x + 4 < 10$

$$x + 4 < 10 \rightarrow x < 6$$

You can graph the solution on a number line.



Important:

When multiplying or dividing by a negative in an inequality, flip the symbol.

Example:

$$-2x > 8 \rightarrow x < -4$$

🧠 Try It Out!

Simplify: $2(x + 3)$

$$\text{Solve: } 4x - 5 = 11$$

Solve and graph: $x + 2 \leq 7$

$$\text{Solve: } -3x \geq 9$$

BONUS: A number is increased by 4 and is less than 10 – write and solve the inequality.



Grade 7 – Unit 7: Statistics and Probability

This unit helps you analyze data and understand the likelihood of events happening.



Statistics

Statistics is about collecting, organizing, and interpreting data.

Measures of Center:

Mean → average

Median → middle number

Mode → most frequent

Range → difference between highest and lowest

Example:

Data: 3, 4, 4, 5, 6

Mean = $(3+4+4+5+6)/5 = 4.4$

Median = 4

Mode = 4

Range = $6 - 3 = 3$



Box Plots (Box-and-Whisker)

A box plot shows:

Minimum

Q1 (lower quartile)

Median

Q3 (upper quartile)

Maximum

Use it to visualize spread and compare data sets.



Probability

Probability is the chance that something happens.

Formula:

$P(\text{event}) = \text{favorable outcomes} \div \text{total outcomes}$

Example:

Roll a number less than 5 on a 6-sided die:

$P = 4/6 = 2/3$



Experimental vs. Theoretical Probability

Theoretical: based on math

Experimental: based on actual trials



Try It Out!

Find the mean: 2, 5, 7, 8

What's the probability of flipping heads on a coin?

What's the mode: 4, 6, 6, 6, 7, 8?

A bag has 2 red, 3 green, and 5 blue marbles. What's $P(\text{green})$?

BONUS: Draw and label a box plot for: 1, 3, 4, 7, 9



Grade 7 – Unit 8: Scale Copies

A scale copy is a figure that's the same shape as the original – just larger or smaller.



What Stays the Same?

Angles stay the same

Side lengths change, but all by the same scale factor



Scale Factor

The number you multiply each side by to get the new figure.

Example:

Original side = 4

Scale factor = 3

→ New side = $4 \times 3 = 12$



Important

Scale factor > 1 → figure gets bigger

Scale factor $< 1 \rightarrow$ figure gets smaller



How to Check if It's a Scale Copy

Same angle measures

All side lengths multiplied by the same number

If both are true \rightarrow it's a scale copy.



Try It Out!

A triangle has sides 3, 4, 5. What are the side lengths if the scale factor is 2?

What's the scale factor if a side goes from 5 to 15?

Are these scale copies?

Figure A: sides 2, 4, 6

Figure B: sides 4, 8, 12

A rectangle is scaled by 0.5. Is it bigger or smaller?

BONUS: A shape has an area of 20. A scale factor of 3 is applied. What happens to the area?

Grade 7 – Unit 9: Geometry

This unit focuses on understanding angles, area, surface area, and volume of geometric shapes.

Angle Relationships

Relationship	Rule
Vertical angles	Opposite angles → equal
Adjacent angles	Next to each other
Supplementary angles	Add up to 180°
Complementary angles	Add up to 90°
Triangle angles	Always add up to 180°

Area of 2D Shapes

Shape Formula

Triangle $A = \frac{1}{2} \times \text{base} \times \text{height}$

Trapezoid $A = \frac{1}{2} \times (\text{base}_1 + \text{base}_2) \times \text{height}$

Circle $A = \pi \times r^2$

Surface Area

Add the area of all faces.

Rectangular Prism: $SA = 2lw + 2lh + 2wh$

Cylinder: $SA = 2\pi r^2 + 2\pi rh$

Volume

Shape Formula

Rectangular Prism $V = l \times w \times h$

Cylinder $V = \pi \times r^2 \times h$

Try It Out!

What's the area of a triangle with base 10 and height 6?

Find the missing angle: one angle is 60° , the other is 90° , what's the third?

Volume of a box: $5 \times 3 \times 2 = ?$

Surface area of a cube with side 4?

BONUS: A cylinder has radius 3 cm and height 5 cm. Find its volume (use $\pi \approx 3.14$).




Grade 8 – Unit 1: Numbers and Operations

This unit covers real numbers, irrational numbers, scientific notation, and roots.



Types of Numbers

Type	Example	Description
Rational	$1/2$, 0.75, -4	Can be written as a fraction
Irrational	$\sqrt{2}$, π	Cannot be written as a fraction, never ends or repeats
Real	All rational and irrational numbers	

 Square Roots & Cube Roots

$\sqrt{16} = 4$ because $4^2 = 16$

$\sqrt[3]{27} = 3$ because $3^3 = 27$

Not all square roots are rational:

$\sqrt{2} \approx 1.41$ (irrational)



Scientific Notation

Used to write very big or small numbers.

Example:

$5,000 = 5 \times 10^3$


$0.006 = 6 \times 10^{-3}$



Estimating Roots

Find two perfect squares the number falls between:

$\sqrt{50}$ is between $\sqrt{49}$ (7) and $\sqrt{64}$ (8) \rightarrow So $\sqrt{50} \approx 7.1$

 Try It Out!

Is 0.25 rational or irrational?

Estimate $\sqrt{20}$

Write 3,200,000 in scientific notation

Is π rational or irrational?

BONUS: Between which two integers does $\sqrt{90}$ fall?



Grade 8 – Unit 2: Solving Equations with One Unknown

This unit focuses on solving linear equations that include variables, fractions, and parentheses.



Goal: Isolate the Variable

Use inverse operations to undo addition, subtraction, multiplication, or division.

Example:

$$2x + 5 = 11$$

→ Subtract 5: $2x = 6$

→ Divide by 2: $x = 3$



Equations with Fractions

Multiply both sides by the least common denominator to eliminate fractions.

Example:

$$x/3 + 2 = 5$$

→ Subtract 2: $x/3 = 3$

→ Multiply by 3: $x = 9$



Equations with Parentheses

Use the distributive property first.

Example:

$$3(x - 4) = 12$$

→ $3x - 12 = 12$

→ Add 12: $3x = 24$

→ Divide: $x = 8$



Equations with Variables on Both Sides

Move all variables to one side, numbers to the other.

Example:

$$2x + 3 = x + 7$$

→ Subtract x : $x + 3 = 7$

→ Subtract 3: $x = 4$



Try It Out!

Solve: $5x - 2 = 18$

Solve: $x/4 + 1 = 5$

Distribute and solve: $2(x + 3) = 14$

Solve: $4x - 5 = 2x + 3$

BONUS: Solve: $(x - 1)/2 = (x + 3)/4$



Grade 8 – Unit 3: Linear Equations and Functions

A linear equation makes a straight line when graphed.
A function is a rule where each input has one output.



Slope-Intercept Form

The most common linear equation form:

$$y = mx + b$$

m = slope (rise over run)

b = y-intercept (where the line crosses the y-axis)

Example:

$$y = 2x + 3 \rightarrow \text{slope} = 2, \text{ y-intercept} = 3$$



Finding Slope

Use two points:

$$\text{Slope} = (\text{change in } y) \div (\text{change in } x)$$

$$m = (y_2 - y_1) / (x_2 - x_1)$$

Example:

From (1, 2) to (3, 6):

$$m = (6 - 2)/(3 - 1) = 4/2 = 2$$



What Is a Function?

A function pairs each input with only one output.

Example:

java

$$f(x) = x + 5$$

If $x = 2$, then $f(x) = 7$



Try It Out!

What is the slope in $y = -3x + 1$?

Find the y-intercept: $y = 4x - 2$

Is this a function? $\{(1, 2), (2, 3), (1, 4)\}$

Find the slope between $(2, 5)$ and $(4, 11)$

BONUS: Write a function rule for a line that passes through $(0, 3)$ with slope -2



Grade 8 – Unit 4: Systems of Equations

A system of equations is two or more equations with the same variables.

You solve them to find where the lines intersect – the solution.



Goal: Find the point (x, y) that works in both equations.



3 Methods to Solve a System

1. Graphing

Graph both lines

The intersection point = solution

Example:

$$y = 2x + 1$$

$$y = -x + 4$$

→ They cross at (1, 3)

2. Substitution

Solve one equation for a variable

Plug into the other

Example:

$$y = 2x$$

$$x + y = 9$$

$$\rightarrow x + 2x = 9 \rightarrow 3x = 9 \rightarrow x = 3$$

$$\rightarrow y = 2(3) = 6 \rightarrow \text{solution: } (3, 6)$$

3. Elimination

Add or subtract equations to cancel a variable


Example:

$$x + y = 7$$

$$x - y = 1$$

$$\rightarrow \text{Add: } 2x = 8 \rightarrow x = 4$$

$$\rightarrow \text{Plug in: } 4 + y = 7 \rightarrow y = 3 \rightarrow \text{solution: } (4, 3)$$

 Try It Out!

Solve by substitution: $y = x + 1$, $2x + y = 7$

Solve by elimination:

$$x + y = 10$$

$$x - y = 2$$

What's the soluti

True or False: Two lines that never meet have no solution

BONUS: A system has no solution – what do the graphs look like?



Grade 8 - Unit 5: Geometry

This unit focuses on angles, congruent shapes, and applying the Pythagorean Theorem.



Angle Relationships

Relationship	Description
Vertical Angles	Opposite angles → equal
Supplementary Angles	Add to 180°
Complementary Angles	Add to 90°
Triangle Angles	Always add to 180°



Congruence

Two figures are congruent if they have:

Same shape and size

Can be moved (rotated, flipped, slid) to match



Pythagorean Theorem

Used in right triangles to find a missing side:

$a^2 + b^2 = c^2$

(c = hypotenuse)

Example:

java

If $a = 3$ and $b = 4$

$$\rightarrow 3^2 + 4^2 = c^2 \rightarrow 9 + 16 = 25 \rightarrow c = 5$$

🧠 Try It Out!

Find the missing side: $a = 6$, $b = 8$

Two angles are 40° and 90° – what's the third angle?

True or False: Congruent figures must face the same way

Are vertical angles always equal?

BONUS: A right triangle has one leg 5 and hypotenuse 13. What's the other leg?



Grade 8 – Unit 6: Geometric Transformations

Transformations move or change a figure while keeping its shape and size.



Types of Transformations

Type Description

Translation Slides the shape (no turn or flip)

Reflection Flips the shape over a line

Rotation Turns the shape around a point

Dilation Resizes the shape (makes it bigger or smaller)



Rigid Transformations

Translation, reflection, and rotation are rigid

They keep the figure congruent (same shape and size)




Dilation and Scale Factor

Dilation changes size but keeps shape

Scale factor $> 1 \rightarrow$ enlargement

Scale factor $< 1 \rightarrow$ reduction


 Describing Transformations

Translation: "5 units right, 2 units up"

Reflection: "across the x-axis"

Rotation: "90° clockwise around the origin"

Dilation: "scale factor 2, center at (0, 0)"

 Try It Out!

What transformation flips a shape?

If a triangle is rotated 180° around the origin, is it congruent?

A shape is dilated by a factor of 0.5 – is it larger or smaller?

Describe the translation from (2, 3) to (5, 7)

BONUS: A figure is reflected over the y-axis and then translated 3 units down. Describe the full transformation.



Grade 8 – Unit 7: Data and Modeling

This unit helps you analyze data, understand trends, and create models to represent real-world relationships.



Scatter Plots

A scatter plot shows data points on a graph.

It helps you see patterns, trends, or correlations.

Types of trends:

Positive → points go up (as x increases, y increases)

Negative → points go down

No correlation → points are scattered randomly



Line of Best Fit

A straight line that best represents the data.

You can estimate it and write its equation in:

$$y = mx + b$$

This is a linear model.



Interpreting Models

From the equation of a line:

Slope (m) tells the rate of change

Y-intercept (b) is the starting value when $x = 0$



Two-Way Tables

Used to organize data for two categories.

Example:

	Likes Math	Doesn't Like Math	Total
Boys	12	8	20
Girls	15	5	20
Total	27	13	40

You can find joint, marginal, and conditional frequencies from this.



Try It Out!

Is this correlation positive, negative, or none: hours studied vs. test score?

What does the slope mean in $y = 2x + 5$?

Use the table to find: how many students don't like math?

Estimate a line of best fit for points near $y = -x + 4$

BONUS: A scatter plot shows height vs. shoe size — explain what a line of best fit might help you predict.

Quiz Answers

Pre-Maths

Pre-Maths Chapter 2: Basic Maths

- $4 + 3 = 7$
- $10 - 6 = 4$
- $5 \times 2 = 10$
- $8 \div 4 = 2$
- $3 + 2 \times 2 = 7$ (multiplication first: $2 \times 2 = 4$, then $3 + 4$)

Pre-Maths Chapter 3

- $39 + 26 = 65$
- $85 - 47 = 38$
- $61 + 14 = 75$
- $50 - 29 = 21$
- $48 + 36 - 20 = 64$

Grade 2

Grade 2 - Chapter 4

- $123 + 456 = 579$

- $980 - 345 = 635$
- $305 + 197 = 502$
- $402 - 189 = 213$
- $456 + 129 - 300 = 285$


Grade 2 – Chapter 5

- 1 quarter + 2 nickels + 4 pennies = **39¢**
- Can you buy a toy that costs 65¢ with 50¢? → **No**
- $2:15 + 30 \text{ minutes} = 2:45$
- 9 o'clock
- $\$5 - \$3.75 = \$1.25$ change

Grade 2 – Chapter 6

- $50 \text{ cm} < 1 \text{ meter} \rightarrow$ **Shorter**
- 1 kg of feathers vs. 1 kg of bricks → **Same weight**
- 1 quart $>$ 1 cup → **Quart**
- 2 kg backpack → **Medium-heavy**
- 3 feet = **36 inches**

Grade 2 – Chapter 7

- Most votes = **Grape**
- More cats than fish = **2 more**
-  = 2 → 4 soccer balls = **8 kids**

- Bar graph: Red = 6, Blue = 3, Green = 5

Grade 2 – Chapter 8

- Hexagon = **6 sides**
- Circle has **no corners**
- Can shape = **Cylinder**
- More edges: **Cube**
- BONUS: (your own drawing)

Grade 3

Grade 3 – Unit 1: Intro to Multiplication

- $4 \times 2 = 8$
- 3×3 as addition $\rightarrow 3 + 3 + 3 = 9$
- Array for $2 \times 5 \rightarrow 2$ rows of 5 blocks
- $0 \times 9 = 0$
- BONUS: 3 chairs \times 6 tables = **18 chairs**

Grade 3 – Unit 2: 1-Digit Multiplication

- $6 \times 2 = 12$
- Same as $3 \times 7 = 7 \times 3 = 21$
- $5 \times 7 = 35$
- $0 \times 8 = 0$
- BONUS: 9 hands \times 5 fingers = **45 fingers**

Grade 3 – Unit 3: Addition, Subtraction, Estimation

- $426 + 389 = 815$
- $802 - 476 = 326$
- Estimate: $219 + 342 \approx 560$
- Estimate: $721 - 299 \approx 420$
- BONUS: 496 is very close to 500 → **Yes**

Grade 3 – Unit 4: Intro to Division

- $20 \div 5 = 4$
- $15 \div 3 = 5$
- $42 \div 7 = 6$
- $18 \div 6 = 3$
- BONUS: $0 \div 9 = 0$

Grade 3 – Unit 5: Understand Fractions

- One out of 2 = $\frac{1}{2}$
- Ate 5 of 8 pieces = $\frac{5}{8}$
- $\frac{1}{2}$ of a circle shaded (your drawing)
- $\frac{1}{2} > \frac{1}{3}$
- BONUS: $\frac{2}{5}$

Grade 3 – Unit 6: Equivalent & Comparing Fractions

- $\frac{2}{3}$ vs $\frac{3}{4} \rightarrow \frac{3}{4}$ is bigger

- $1/2 = 2/4 \rightarrow \text{Yes}$
- $3/6 = 6/12$
- $4/8 = 1/2 \rightarrow \text{Yes}$
- BONUS: All at $1/2$

Grade 3 – Unit 7: More with Multiplication and Division

- $7 \times 6 = 42$
- $48 \div 8 = 6$
- $4 \times 9 = 36$
- $24 \div 6 = 4$
- BONUS:
 - $3 \times 4 = 12$
 - $4 \times 3 = 12$
 - $6 \times 2 = 12$
 - $12 \div 3 = 4$
 - $12 \div 4 = 3$
 - $12 \div 2 = 6$

Grade 3 – Unit 8: Patterns

- 100, 90, 80, \rightarrow 70
- 7, 14, 21, 28 \rightarrow 35
- $4 \times 9 = 36$
- $5 \times 4 = 20$

- BONUS: **Doubles** pattern $\rightarrow 1, 2, 4, 8, 16, 32$

Grade 3 – Unit 9: Quadrilaterals

- Trapezoid has only 1 pair \rightarrow **Correct**
- A square **is** a rhombus \rightarrow **True**
- Your drawing of a kite (2 pairs of equal sides)
- Right angles: square, rectangle
- BONUS: Your custom chart

Grade 3 – Unit 10: Area

- $4 \times 6 = 24$
- $3 \times 4 = 12 \rightarrow$ Yes
- Drawing: any 2×5 or 5×2 shape
- Area \neq length + width \rightarrow **False**
- BONUS: $\sqrt{36} = 6$

Grade 3 – Unit 11: Perimeter

- Square with side 5 $\rightarrow 5 \times 4 = 20$
- Rectangle $7 + 3 \rightarrow 2(7+3) = 20$
- $6 + 6 + 2 + 2 = 16$
- Triangle $4 + 4 + 4 = 12$
- BONUS: $40 \div 4 = 10$

Grade 3 – Unit 12: Time

- 5 o'clock
- 2 hours = **120 minutes**
- 6:00 - 4:30 = **1 hour 30 min**
- 6:15 is **after** 6:00
- BONUS: 3:45 + 50 min = **4:35**

Grade 3 - Unit 13: Measurement

- 1 foot = 12 inches → longer than 10"
- 1 kg = **1,000 g**
- A pool → measured in **liters**
- 1 kg > 500g → **1 kg**
- BONUS: 3 ft = **36 inches**

Grade 3 - Unit 14: Data

- 3 symbols (🐱) = $2 \times 3 =$ **6 cats**
- Most pets → **Cats**
- Fiction (6) - Science (3) = **3 more**
- Your favorite chart (opinion)
- BONUS: Custom tally/chart

Grade 4

Unit 1: Place Value

- Value of 7 in 7,154 → **7,000**

- 5,682 expanded form $\rightarrow 5,000 + 600 + 80 + 2$
- 2,947 rounded to nearest 100 $\rightarrow 2,900$
- Greater: $4,920 > 4,209 \rightarrow 4,920$
- BONUS: Smallest 4-digit using 3, 0, 8, 1 $\rightarrow 1,038$

Unit 2: Addition, Subtraction, Estimation

- $4,286 + 3,105 = 7,391$
- $9,000 - 6,752 = 2,248$
- 6,837 rounded to nearest 100 $\rightarrow 6,800$
- Estimate: $3,246 + 2,679 \approx 6,000$
- BONUS: Yes — **6,992** is close to **7,000**

Unit 3: Multiply by 1-Digit Numbers

- $327 \times 2 = 654$
- $186 \times 5 = 930$
- Estimate: $489 \times 6 \approx 3,000$
- 213 books \times 3 shelves = **639**
- BONUS: $409 \times 7 = 2,863$

Unit 4: Multiply by 2-Digit Numbers

- $21 \times 13 = 273$
- $46 \times 32 = 1,472$
- Estimate: $48 \times 19 \approx 960$

- $34 \text{ students} \times 15 \text{ buses} = 510$
- BONUS: $67 \times 24 = 1,608$

Unit 5: Division

- $684 \div 3 = 228$
- $135 \div 4 = 33 \text{ R}3$
- Estimate: $912 \div 3 \approx 300$
- $150 \div 6 = 25$
- BONUS: $1,024 \div 8 = 128$

Unit 6: Factors, Multiples, Patterns

- Factors of 18: 1, 2, 3, 6, 9, 18
- First 5 multiples of 7: 7, 14, 21, 28, 35
- Next number: 2, 4, 8, 16 → 32
- 24 is a multiple of 6 → Yes
- BONUS: 5, 10, 20, 40...

Unit 7: Equivalent & Comparing Fractions

- $2/3 = 4/6 \rightarrow \text{Yes}$
- $3/5 > 3/8 \rightarrow \text{Yes}$
- Two equal to $5/6$: $10/12$, $15/18$
- $7/10$ vs $3/4 \rightarrow 3/4$ is greater
- BONUS: All three fall at $1/2$

Unit 8: Add & Subtract Fractions

- $3/10 + 4/10 = 7/10$
- $7/9 - 2/9 = 5/9$
- $2/3 + 1/6 \rightarrow 4/6 + 1/6 = 5/6$
- $5/6 - 1/3 \rightarrow 5/6 - 2/6 = 3/6 = 1/2$
- BONUS: $3/8 + 2/8 = 5/8$

Unit 9: Multiply Fractions

- $3 \times 1/5 = 3/5$
- $2/3 \times 1/2 = 2/6 = 1/3$
- $4 \times 1/6 = 4/6 = 2/3$
- $1/3 \times 3/4 = 3/12 = 1/4$
- BONUS: $2/5 \times 5/6 = 10/30 = 1/3$

Unit 10: Understand Decimals

- $0.3 = 3/10$
- $0.6 \rightarrow 6$ means **6 tenths**
- $0.8 > 0.65 \rightarrow \text{True}$
- $1/4 = 0.25$
- BONUS: **0.3, 0.4**

Unit 11: Plane Figures

- Hexagon has **6 sides**

- Rectangles and squares have right angles
- Circle → no sides or angles
- All triangles have **3 sides and 3 angles**
- BONUS: **Pentagon**

Unit 12: Measuring Angles

- 45° → **Acute**
- 120° → **Obtuse**
- Most triangle angles → **Acute**
- Draw 90° angle
- BONUS: A book corner, paper, window frame → **Right angle**

Unit 13: Area & Perimeter

- Square $7 \times 7 = 49$
- Rectangle $10 + 4 = 14 \rightarrow 2 \times 14 = 28$
- Tile a floor → use **area**
- Area 36, width 6 → length = **6**
- BONUS: Example → rectangle 3×4

Unit 14: Units of Measurement

- 3 meters = **300 cm**
- 2 kg > 1,000 g → **Yes**
- 3 yards = **9 feet**

- Liter > cup → **Yes**
 - BONUS: 5 km = **5,000 meters**
-

Grade 5

Unit 1: Decimal Place Value

- Value of 5 in 3.548 → **0.05**
- $0.8 > 0.79$ → **Yes**
- 7.406 expanded form: **$7 + 0.4 + 0.006$**
- 2 in 9.32 → **2 hundredths**
- BONUS: 0.04, 0.4, 0.444 → **In order: $0.04 < 0.4 < 0.444$**

Unit 2: Add Decimals

- $4.2 + 3.05 =$ **7.25**
- $6.38 + 1.4 =$ **7.78**
- Estimate: $5.9 + 2.3 \approx$ **8**
- $2.45 + 3.1 =$ **5.55**
- BONUS: $12.005 + 8.950 =$ **20.955**

Unit 3: Subtract Decimals

- $7.4 - 3.25 =$ **4.15**
- $9.08 - 2.6 =$ **6.48**
- Estimate: $8.75 - 3.2 \approx$ **5.5**

- $10.5 - 4.35 = 6.15$
- BONUS: $12.005 - 8.95 = 3.055$

Unit 4: Add & Subtract Fractions

- $5/6 - 1/6 = 4/6 = 2/3$
- $2/3 + 1/4 = 8/12 + 3/12 = 11/12$
- $3 \frac{1}{2} + 2 \frac{1}{3} = 5 \frac{5}{6}$
- $1/2 + 3/4 = 1.25 \rightarrow \text{more than } 1$
- BONUS: $4 \frac{5}{6} - 2 \frac{2}{3} = 2 \frac{1}{6}$

Unit 5: Multi-Digit Multiplication & Division

- $154 \times 39 = 6,006$
- $4,912 \div 8 = 614$
- Estimate: $672 \div 7 \approx 96$
- $25 \text{ toys} \times 36 \text{ boxes} = 900$
- BONUS: $431 \times 27 = 11,637$

Unit 6: Multiply Fractions

- $1/2 \times 1/3 = 1/6$
- $5 \times 2/7 = 10/7 = 1 \frac{3}{7}$
- $3/4 \times 4/9 = 12/36 = 1/3$
- $2/3 \times 3 = 2$
- BONUS: $7/8 \times 4/5 = 28/40 = 7/10$

Unit 7: Divide Fractions

- $1/3 \div 1/6 = 2$
- $2 \div 1/4 = 8$
- $5/8 \div 1/2 = 1 \frac{1}{4}$
- $6 \div 3/4 = 8$
- BONUS: $4/5 \div 2/3 = 4/5 \times 3/2 = 12/10 = 6/5 = 1 \frac{1}{5}$

Unit 8: Multiply Decimals

- $0.4 \times 0.7 = 0.28$
- $5 \times 1.6 = 8.0$
- $0.25 \times 0.3 = 0.075$
- Estimate: $3.1 \times 2.5 \approx 7.5$
- BONUS: $2.43 \times 1.2 = 2.916$

Unit 9: Divide Decimals

- $8.4 \div 2 = 4.2$
- $2.7 \div 0.3 = 9$
- $5.25 \div 0.25 = 21$
- $9.6 \div 1.2 = 8$
- BONUS: $4.83 \div 0.3 = 16.1$

Unit 10: Powers of Ten

- $4.5 \times 10 = 45$

- $67 \div 1,000 = 0.067$
- $0.83 \times 100 = 83$
- $12.3 \times 1,000 = 12,300$
- BONUS: $5.9 \div 10^2 = 0.059$

Unit 11: Volume

- $6 \times 4 \times 2 = 48 \text{ cm}^3$
- $3 \times 5 \times 5 = 75 \text{ cm}^3$
- Volume is in square units \rightarrow **False**
- Cube $3^3 = 27 \text{ cm}^3$
- BONUS: $10 \times 2 \times 1 = 20 \text{ m}^3$

Unit 12: Coordinate Plane

- $(4, 1) \rightarrow$ 4 right, 1 up
- 2 right, 5 up $\rightarrow (2, 5)$
- $(0, 3)$ is on y-axis \rightarrow **True**
- x comes first \rightarrow **True**
- BONUS: Connect points forms \rightarrow **Square**

Unit 13: Algebraic Thinking

- $x + 7 = 12 \rightarrow x = 5$
- $5x = 20 \rightarrow x = 4$
- $3n + 1 \rightarrow$ **Expression**

- Rule: 1, 4, 7, 10, 13
- BONUS: $6 + 2 \times (3 + 1) = 6 + 8 = 14$

Unit 14: Converting Units

- $6 \text{ ft} \times 12 = 72 \text{ in}$
- $3 \text{ lb} = 48 \text{ oz}$
- $2 \text{ qt} = 8 \text{ cups}$
- $1.5 \text{ m} = 150 \text{ cm}$
- BONUS: $5 \text{ km} = 5,000 \text{ m}$

Unit 15: Line Plots

- Most common = $\frac{1}{2}$
- Total items = 6
- 4 inches = 3 pencils
- Least in second = $\frac{3}{4}$
- BONUS: Your plot with $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$

Unit 16: Properties of Shapes

- 4 equal sides, no right angles → **Rhombus**
- All rectangles are squares → **False**
- Rhombus vs Square → angles
- Triangle with all $< 90^\circ$ → **Acute triangle**
- BONUS: **Trapezoid**

Grade 6

Unit 1: Ratios

- 4 apples to 6 bananas: **4:6** or **2:3**
- 2:3 equivalent to 6:9? **Yes**
- $5:2 = __:4 = __:6 \rightarrow$ **10:4, 15:6**
- 10 boys, 15 girls \rightarrow boys to total: **10:25**
- BONUS: 14 red beads (2:5 ratio) \rightarrow **35 blue beads**

Unit 2: Arithmetic with Rational Numbers

- $-4 + 7 = 3$
- $2/3 - 1/6 = 1/2$
- $3/5 \times 2/3 = 2/5$
- $-0.5 + 0.25 = -0.25$
- BONUS: $4/7 \div 2/3 = 6/7$

Unit 3: Rates and Percentages

- \$24 for 8 books \rightarrow **\$3 per book**
- $3/4 = 75\%$
- 20% of 60 = **12**
- 150 miles in 3 hours \rightarrow **50 mph**
- BONUS: 15% of \$200 = **\$30**

Unit 4: Exponents and Order of Operations

- $4^3 = 64$
- Parentheses or exponents first? → **Parentheses**
- $2 + 3 \times 4 = 14$
- $(5 + 1)^2 - 3 = 33$
- BONUS: $8 + 2 \times (6 - 3)^2 = 26$

Unit 5: Negative Numbers

- $-5 + 7 = 2$
- Greater: -3 or $-8 \rightarrow -3$
- $6 - (-2) = 8$
- $-4 \times -6 = 24$
- BONUS: Submarine: -70 m

Unit 6: Variables & Expressions

- $5x$ if $x = 4 \rightarrow 20$
- "7 less than n " → $n - 7$
- $y^2 + 1$ if $y = 2 \rightarrow 5$
- 3 times $(x + 4) \rightarrow 3(x + 4)$
- BONUS: $4(t - 2) + 6$ if $t=10 \rightarrow 38$

Unit 7: Equations & Inequalities

- $x - 3 = 9 \rightarrow x = 12$
- $4x = 20 \rightarrow x = 5$

- Is 7 a solution of $x - 3 = 4$? → **Yes**
- $2x + 1 = 11$ → **$x = 5$**
- BONUS: Graph $x \geq 2$ → **solid dot at 2, shade right**

Unit 8: Plane Figures

- 4 equal sides & right angles → **Square**
- Triangle area: $b=10$, $h=4$ → **20**
- 110° = **Obtuse angle**
- Triangle angles = **180°**
- BONUS: Trapezoid with bases 6, 10; $h = 4$ → **Area = 32**

Unit 9: Coordinate Plane

- $(-3, -2)$ → **Quadrant III**
- $(0, 4)$ → **Y-axis**
- 2 left, 3 up → **$(-2, 3)$**
- $(5, 0)$ on y-axis? → **False**
- BONUS: Points form a **Rectangle**

Unit 10: 3D Figures

- Rectangular prism → **6 faces**
- Volume $5 \times 3 \times 2$ → **30**
- Shape with no edges → **Sphere**
- Cone has circular base? → **True**

- BONUS: Cube with side 4 \rightarrow Volume = **64 cm³**

Unit 11: Data and Statistics

- Mean of 3, 5, 8, 9 \rightarrow **6.25**
- Median of 2, 4, 6, 7, 9 \rightarrow **6**
- Mode of 10, 12, 10, 14 \rightarrow **10**
- Range of 20-35 \rightarrow **15**
- BONUS: Line plot for 2, 2, 3, 4, 4, 4, 5 \rightarrow done!

Grade 7

Unit 1: Proportional Relationships

- $x = 3, y = 12 \rightarrow k = 4$
- $x = 5, y = 40 \rightarrow y = 8x$
- Table proportional? Yes (ratios 4, 8, 12 over 1, 2, 3 are all **4:1**)
- Graph through (0, 0)? **True**
- BONUS: 180 miles in 3h \rightarrow 60 mph \times 5h = **300 miles**

Unit 2: Rates and Percentages

- \$45/9 shirts \rightarrow **\$5 per shirt**
- 25% of 60 \rightarrow **15**
- \$100 \rightarrow \$75 \rightarrow **25% decrease**
- \$80 with 20% off \rightarrow **\$64**
- BONUS: From 72 \rightarrow 90 \rightarrow **25% increase**

Unit 3: Integers - Add/Sub

- $-5 + 3 = -2$
- $8 + (-2) = 6$
- $-4 - 6 = -10$
- $0 - (-9) = 9$
- BONUS: $-10 - 6 = -16$

Unit 4: Rational Numbers - Add/Sub

- $-3.2 + 5.7 = 2.5$
- $4/9 - 7/9 = -1/3$
- $-2.5 - 1.3 = -3.8$
- $1/2 + (-3/8) = 1/8$
- BONUS: $-50 + 37.6 = -12.4$

Unit 5: Negatives - \times and \div

- $-8 \times 6 = -48$
- $36 \div (-9) = -4$
- $-7 \times -3 = 21$
- $-18 \div 3 = -6$
- BONUS: $-4 \times 6 = -24$ meters

Unit 6: Expressions, Equations, Inequalities

- Simplify $2(x + 3) \rightarrow 2x + 6$

- $4x - 5 = 11 \rightarrow \mathbf{x = 4}$
- $x + 2 \leq 7 \rightarrow \mathbf{x \leq 5}$
- $-3x \geq 9 \rightarrow \mathbf{x \leq -3}$
- BONUS: $x + 4 < 10 \rightarrow \mathbf{x < 6}$

Unit 7: Statistics and Probability

- Mean of 2, 5, 7, 8 $\rightarrow \mathbf{5.5}$
- Probability of heads $\rightarrow \mathbf{1/2}$
- Mode: 6
- P(green) from 2 red, 3 green, 5 blue $\rightarrow \mathbf{3/10}$
- BONUS: Box plot: min=1, Q1=2, med=3.5, Q3=4, max=5

Unit 8: Scale Copies

- Scale factor = 2 $\rightarrow \mathbf{6, 8, 10}$
- 5 to 15 $\rightarrow \mathbf{Scale\ factor = 3}$
- Figures A and B $\rightarrow \mathbf{Yes, same\ ratio}$
- 0.5 = **smaller**
- BONUS: Area \times scale² $\rightarrow 20 \times 9 = \mathbf{180}$

Unit 9: Geometry

- Triangle area: $10 \times 6 \times \frac{1}{2} = \mathbf{30}$
- $40^\circ + 90^\circ \rightarrow \text{third} = \mathbf{50^\circ}$
- Volume: $5 \times 3 \times 2 = \mathbf{30}$

- Cube SA: $6 \times (4^2) = 96$
 - BONUS: Volume = $\pi \times 3^2 \times 5 = 141.3 \text{ cm}^3$
-

Grade 8

Unit 1: Numbers & Operations

- $0.25 \rightarrow \text{Rational}$
- $\sqrt{20} \approx 4.5$
- 3.2×10^6
- $\pi \rightarrow \text{Irrational}$
- BONUS: $\sqrt{90}$ between 9 and 10

Unit 2: Solving Equations

- $5x - 2 = 18 \rightarrow x = 4$
- $x/4 + 1 = 5 \rightarrow x = 16$
- $2(x + 3) = 14 \rightarrow x = 4$
- $4x - 5 = 2x + 3 \rightarrow x = 4$
- BONUS: $(x - 1)/2 = (x + 3)/4 \rightarrow x = 5$

Unit 3: Linear Equations & Functions

- Slope of $y = -3x + 1 \rightarrow -3$
- Y-intercept of $y = 4x - 2 \rightarrow -2$
- Is $\{(1, 2), (2, 3), (1, 4)\}$ a function? **No**

- Slope between $(2, 5)$ and $(4, 11) \rightarrow 3$
- BONUS: Through $(0, 3)$, slope $-2 \rightarrow y = -2x + 3$

Unit 4: Systems of Equations

- Substitution: $y = x + 1$, $2x + y = 7 \rightarrow x = 2, y = 3$
- Elimination: $x + y = 10$, $x - y = 2 \rightarrow x = 6, y = 4$
- No solution \rightarrow **Parallel lines**

Unit 5: Geometry

- $a = 6$, $b = 8 \rightarrow c = 10$
- $40^\circ + 90^\circ \rightarrow \text{third} = 50^\circ$
- Congruent = **False** (can be rotated or flipped)
- Vertical angles = **Always equal**
- BONUS: $a = 5$, $c = 13 \rightarrow b = 12$

Unit 6: Transformations

- Flip = **Reflection**
- 180° rotation = **Yes, congruent**
- Dilation by $0.5 =$ **Smaller**
- $(2, 3) \rightarrow (5, 7) \rightarrow$ **Right 3, up 4**
- BONUS: Reflection over y-axis $\rightarrow (-x, y)$, then down 3 $\rightarrow (-x, y-3)$

Unit 7: Data & Modeling

- Hours vs. test score \rightarrow **Positive**

- $y = 2x + 5 \rightarrow \text{slope} = 2$
- Don't like math: $8 + 5 = 13$
- Line of best fit: $y \approx -x + 4$
- BONUS: Predict shoe size from height trend \rightarrow **Positive correlation**