

# Massachusetts MCAS Grade 6 Math Made Easy

*Study Guide with Key Concepts, Review & Practice*

**Dr. A. Nazari**

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# Math Made Easy

Key Concepts • Worked Examples • Practice with Answers

Welcome to Grade 6 math.

This year you'll work with ratios, negative numbers, algebraic expressions, area and volume formulas, and real data. Every one of these ideas builds on what you already know — and this book is here to help you make sense of each one.

Each topic gives you the core idea, a worked example, and practice problems with answers in the back. Need a refresher before a test? Flip to any topic. Want to work through the whole book? Go chapter by chapter.

***You've got this. Let's get started.***



## Learn

Clear explanations  
for every topic



## Practice

Problems to build  
your skills



## Check

Full answer key  
at the back

# How to Use This Book

*Every topic follows the same flow so you always know where you are.*

## **Read the concept**

- 1 *Each topic starts with the main idea in a short, focused explanation. Understand this and the rest falls into place.*

## **Study the example**

- 2 *A worked example walks you through the steps. Try covering the solution and solving it yourself first.*

## **Solve the practice problems**

- 3 *Every topic ends with practice problems. Work them out on paper, then check your answers at the back of the book.*

## **Look for tips and shortcuts**

- 4 *Throughout the book you'll find quick tips, memory tricks, and common mistakes to watch out for.*

### **Ways to use this book:**

- *Work through it chapter by chapter*
- *Use it the night before a test*
- *Jump to any topic you need to review*
- *Keep it as a reference all year*

# Math Quick Reference

Key formulas and facts you'll use throughout Grade 6.

## Ratios & Rates

**Unit rate:** divide both terms so the denominator is 1.

$$\frac{a}{b} = \frac{a \div b}{1}$$

**Percent:**  $\text{part} = \frac{\text{percent}}{100} \times \text{whole}$

## Integers & Absolute Value

**Opposite of**  $a$  is  $-a$ .

$$|-5| = 5 \quad (\text{distance from } 0)$$

**GCF:** largest factor two numbers share.

**LCM:** smallest multiple they share.

## Area Formulas

**Rectangle:**  $A = l \times w$

**Triangle:**  $A = \frac{1}{2} b h$

**Parallelogram:**  $A = b \times h$

**Trapezoid:**  $A = \frac{1}{2}(b_1 + b_2) h$

## Expressions & Equations

**Distributive property:**

$$a(b + c) = ab + ac$$

**Solve one-step equations:**

Use inverse operations to isolate the variable.

## Volume & Surface Area

**Volume of rect. prism:**

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

**Surface area:** Find the area of each face, then add them all together.

## Coordinate Plane

**Ordered pair**  $(x, y)$ : go right/left then up/down.

**Distance:** For points sharing an axis, subtract coordinates and take absolute value.

## Order of Operations

**PEMDAS**

Parentheses  $\rightarrow$  Exponents  $\rightarrow$

Multiply/Divide (left to right)  $\rightarrow$

Add/Subtract (left to right)

## Statistics

**Mean:**  $\frac{\text{sum of values}}{\text{number of values}}$

**Median:** middle value when data is ordered.

**IQR** =  $Q3 - Q1$    **MAD:** avg distance from mean.

# Key Math Vocabulary

Words you'll see again and again in Grade 6 math.

## Ratios & Rates

**Ratio** — A comparison of two quantities.

**Equivalent ratios** — Ratios that represent the same relationship.

**Rate** — A ratio comparing two different units.

**Unit rate** — A rate with a denominator of 1.

**Percent** — A ratio that compares a number to 100.

## The Number System

**Integer** — A whole number or its opposite (...-2, -1, 0, 1, 2 ...).

**Rational number** — Any number that can be written as a fraction.

**Absolute value** — The distance of a number from zero on a number line.

**Opposite** — Two numbers the same distance from zero on opposite sides.

**Reciprocal** — Flip the numerator and denominator: the reciprocal of  $\frac{2}{3}$  is  $\frac{3}{2}$ .

**GCF** — Greatest Common Factor — the largest factor shared by two numbers.

**LCM** — Least Common Multiple — the smallest multiple shared by two numbers.

## Expressions & Equations

**Variable** — A letter that represents an unknown number.

**Coefficient** — The number multiplied by a variable (6 in  $6x$ ).

**Constant** — A fixed number with no variable (+3 in  $2x + 3$ ).

**Expression** — Numbers, variables, and operations combined (no = sign).

**Equation** — A statement that two expressions are equal.

**Inequality** — A statement that uses  $<$ ,  $>$ ,  $\leq$ , or  $\geq$ .

**Exponent** — Tells how many times to multiply a base by itself.

**Distributive property** —  $a(b + c) = ab + ac$ .

## Geometry

**Area** — The space inside a flat shape, in square units.

**Base** — The bottom side of a shape (or any side used for the formula).

**Height** — The perpendicular distance from the base to the top.

**Volume** — The space inside a 3-D shape, in cubic units.

**Surface area** — The total area of all faces of a 3-D shape.

**Net** — A flat pattern that folds into a 3-D shape.

**Face** — A flat surface of a solid figure.

**Edge** — The line segment where two faces meet.

**Vertex** — A point where edges meet.

### Coordinate Plane

**Ordered pair** — A pair  $(x, y)$  that names a location on the plane.

**Origin** — The point  $(0, 0)$  where the axes cross.

**Quadrant** — One of the four sections of the coordinate plane.

**$x$ -axis** — The horizontal number line.

**$y$ -axis** — The vertical number line.

### Statistics & Data

**Mean** — The average — sum of values divided by the count.

**Median** — The middle value when data is in order.

**Range** — The difference between the greatest and least values.

**Dot plot** — A number line with dots showing data frequency.

**Histogram** — A bar graph that shows data grouped in intervals.

**Box plot** — A diagram showing the five-number summary of data.

**IQR** — Interquartile Range — the spread of the middle 50% of data.

**MAD** — Mean Absolute Deviation — average distance from the mean.



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## ★ Table of Contents ★

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

|     |                                   |    |
|-----|-----------------------------------|----|
| ★ 1 | Ratios, Rates, and Percents ..... | 2  |
| ★ 2 | Expressions and Equations .....   | 9  |
| ★   | Answer Key .....                  | 14 |



*Let's learn and have fun!*



CHAPTER

1

# Ratios, Rates, and Percents

## ★ What's Inside ★

|                            |   |
|----------------------------|---|
| 1.1 What Is a Ratio? ..... | 3 |
|----------------------------|---|



## ★ 1.1 What Is a Ratio? ★

### What Is a Ratio?

#### 🎯 Learning Goals

- Understand that a ratio compares two quantities
- Write ratios in three different forms
- Identify and describe ratios in everyday situations

#### 🌐 Ratios Are Everywhere

Imagine you're making a fruit smoothie. The recipe says to use 2 cups of strawberries for every 3 cups of banana. That "2 for every 3" is a **ratio** — and you use ratios all the time, whether you realize it or not!

#### 🎓 What Is a Ratio?

A **ratio** is a comparison of two quantities. It tells you how much of one thing there is compared to another.

For example, if a bag has 5 red marbles and 3 blue marbles, you can compare them with a ratio:

- The ratio of red to blue is 5 to 3.
- The ratio of blue to red is 3 to 5.

**Order matters! The ratio 5 to 3 is NOT the same as 3 to 5.**



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“Think of a ratio like a recipe — the order of the ingredients matters! “2 cups flour to 1 cup sugar” is very different from “1 cup flour to 2 cups sugar.””

### Three Ways to Write a Ratio

You can write the same ratio in three different forms:

| Words  | Colon | Fraction      |
|--------|-------|---------------|
| 5 to 3 | 5 : 3 | $\frac{5}{3}$ |

All three mean the same thing: for every 5 of the first quantity, there are 3 of the second.



**TIP**

When you write a ratio as a fraction, it does NOT mean “5 divided by 3.” It’s still a comparison. The context tells you it’s a ratio, not a division problem.

### Writing Ratios from a Picture

A parking lot has 4 trucks and 7 cars.

Write the ratio of trucks to cars in three ways.

**Solution:**

1. Identify the two quantities: trucks = 4, cars = 7.
2. Write the ratio in order — trucks first, cars second.

| Words  | Colon | Fraction      |
|--------|-------|---------------|
| 4 to 7 | 4 : 7 | $\frac{4}{7}$ |



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What about the ratio of cars to trucks?

✓ **Answer:** 7 to 4, 7 : 4,  $\frac{7}{4}$

### **Part-to-Part vs. Part-to-Whole**

A classroom has 12 boys and 18 girls.

**Part-to-Part:**

- Boys to girls: 12 : 18
- Girls to boys: 18 : 12

**Part-to-Whole:**

- Total students:  $12 + 18 = 30$
- Boys to total: 12 : 30
- Girls to total: 18 : 30

**Part-to-part** ratios compare one part of a group to another part.

**Part-to-whole** ratios compare one part to the entire group.

Always read the problem carefully to know which type is being asked for!

*The same situation can give you many different ratios depending on what you're comparing.*

### **Identifying Ratios in Real Life**

A pizza shop sells 3 cheese pizzas for every 2 pepperoni pizzas. On Saturday they sold 15 cheese pizzas. How many pepperoni pizzas did they sell?

**Solution:**



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1. The ratio of cheese to pepperoni is 3 : 2.
2. They sold 15 cheese pizzas. That's  $15 \div 3 = 5$  groups of 3.
3. So there must be 5 groups of 2 pepperoni pizzas:  $5 \times 2 = 10$ .

✓ **Answer:** They sold 10 pepperoni pizzas.

 **Watch the Order!**

If a problem says "the ratio of cats to dogs is 3 : 5," that means:

- Cats = 3, Dogs = 5    ✓
- Dogs = 3, Cats = 5    **WRONG!**

Always match the first number to the first thing named, and the second number to the second thing named.



 **What Is a Ratio? — Practice** **Write the Ratio**

A bag contains 6 apples and 10 oranges. Write each ratio in all three forms (words, colon, fraction).

1. The ratio of apples to oranges.
2. The ratio of oranges to apples.
3. The ratio of apples to total fruit.

**Read and Write Ratios**

4. A recipe uses 3 eggs and 5 cups of flour. What is the ratio of eggs to flour?
5. In a class, there are 14 students who walk to school and 8 who ride the bus. Write the ratio of bus riders to walkers as a fraction.
6. A team won 9 games and lost 6 games. Write the ratio of wins to total games played.

**Apply It**

7. A store sells phones and tablets in a ratio of 5 : 2. If the store sold 20 phones, how many tablets did it sell?
8. At a concert, the ratio of adults to children is 7 : 3. If there are 21 adults, how many children are there?



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the most useful ideas in all of math!*

PREVIEW



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CHAPTER

2

# *Expressions and Equations*

## ★ *What's Inside* ★

|                                                           |           |
|-----------------------------------------------------------|-----------|
| <b>2.1</b> <i>Exponents and Order of Operations</i> ..... | <b>10</b> |
|-----------------------------------------------------------|-----------|

## ★ 2.1 Exponents and Order of Operations ★

### 🎯 Learning Goals

- Write repeated multiplication using exponents
- Evaluate expressions with whole-number exponents
- Apply the order of operations (PEMDAS)

### 🎓 Exponents

An **exponent** tells you how many times to multiply the base by itself.

$$3^4 = 3 \times 3 \times 3 \times 3 = 81$$

- 3 is the **base** — the number being multiplied.
- 4 is the **exponent** — how many times.
- We say “3 to the fourth power.”

Any number to the power of 1 is itself:  $7^1 = 7$ . Any number to the power of 0 is 1:  $5^0 = 1$ .

### ✏️ Order of Operations (PEMDAS)

Evaluate:  $5 + 2 \times 3^2$

**Solution:**

1. **Exponents first:**  $3^2 = 9$ .
2. **Multiply:**  $2 \times 9 = 18$ .
3. **Add:**  $5 + 18 = 23$ .



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✓ **Answer:** 23



“PEMDAS: *P*arentheses, *E*xponents, *M*ultiply/*D*ivide (left to right), *A*dd/*S*ubtract (left to right).”



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 **Exponents and Order of Operations Practice** **Write Using Exponents**

1.  $7 \times 7 \times 7$

2.  $2 \times 2 \times 2 \times 2 \times 2$

**Evaluate**

3.  $4^3$

4.  $10^2 - 6 \times 5$

**Apply PEMDAS**

5.  $(8 + 2)^2 \div 5$

6. Maria says  $3 + 4 \times 2 = 14$ . Jake says the answer is 11. Who is correct?Find more at  
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# *Answer Key*



## Answer Key

Try each problem on your own first, then check your work here.

### Chapter 1

#### > Section 1.1

1 6 to 10,  $6 : 10$ ,  $\frac{6}{10}$

2 10 to 6,  $10 : 6$ ,  $\frac{10}{6}$

3 6 to 16,  $6 : 16$ ,  $\frac{6}{16}$

4  $3 : 5$

5  $\frac{8}{14}$

6  $9 : 15$

7 8 tablets

8 9 children

#### Explanations

1 Apples first, then oranges.

2 Oranges first, then apples.

3  $Total = 6 + 10 = 16$ . This is a part-to-whole ratio.

6  $Total\ games = 9 + 6 = 15$ .

7  $20 \div 5 = 4$  groups.  $4 \times 2 = 8$  tablets.



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8  $21 \div 7 = 3$  groups.  $3 \times 3 = 9$  children.

## Chapter 2

### > Section 2.1

1  $7^3$

2  $2^5$

3 64

4 70

5 20

6 Jake

### Explanations

1 The base 7 is multiplied 3 times.

2 The base 2 is multiplied 5 times.

3  $4 \times 4 = 16$ , then  $16 \times 4 = 64$ .

4 Exponent:  $10^2 = 100$ . Multiply:  $6 \times 5 = 30$ . Subtract:  $100 - 30 = 70$ .

5 Parentheses:  $8 + 2 = 10$ . Exponent:  $10^2 = 100$ . Divide:  $100 \div 5 = 20$ .

6 Multiply first:  $4 \times 2 = 8$ . Then add:  $3 + 8 = 11$ . Maria added before multiplying.



**Well done checking your answers!**

*Keep practicing to strengthen your skills.*



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THANK YOU

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