# Grade 4 Mathematics

## رياضيات الصف الرابع

A Bilingual Learning Guide for Absolute Beginners

دليل تعلّم ثنائي اللغة للمبتدئين تمامًا

**From Zero to Ready-to-Teach**

**من الصفر إلى الاستعداد للتدريس**

7 Units • 21 Modules • Real-Life Applications


إعداد: احمد محمود سعيد احمد علي

**Prepared by: Ahmed Mahmoud Saeed Ahmed Ali**

# Table of Contents

# Introduction / مقدمة

Welcome to your Grade 4 Mathematics Bilingual Learning Guide! This guide is designed for absolute beginners who want to understand math from the very beginning and become ready to teach it. Every concept is explained step by step, with Arabic translations and real-life applications to help you connect math to the world around you. Grade 4 is a very important year because you extend your skills with larger numbers, learn multi-digit multiplication and long division, work deeply with fractions and decimals, and explore geometry and measurement in greater depth. These are the foundations for all middle school and high school mathematics!

مرحبًا بكم في دليل تعلّم رياضيات الصف الرابع! هذا الدليل مصمم للمبتدئين تمامًا الذين يريدون فهم الرياضيات من البداية والاستعداد لتدريسها. الصف الرابع مهم جدًا لأنك تتعلم الضرب بأرقام كبيرة والقسمة الطويلة والكسور والأعداد العشرية والهندسة والقياس!

## Who Founded Mathematics? / من أسس الرياضيات؟

Mathematics was not founded by one single person. It developed over thousands of years across many civilizations. The Babylonians (about 4000 years ago in modern-day Iraq) created one of the first number systems and used math for astronomy and trade. The Ancient Egyptians used geometry to build the pyramids and measure land after the Nile flooded. They needed math to calculate areas and volumes with amazing accuracy.

The Greeks made huge contributions. Pythagoras (about 2500 years ago) discovered famous rules about triangles that we still use today. Euclid wrote a book called 'The Elements' that organized all math knowledge and is still referenced after 2300 years. Archimedes calculated the value of pi and invented many mathematical tools. In Grade 4, you will learn about angles and symmetry, which Archimedes and Euclid studied deeply!

Indian mathematicians invented the most important number in math: zero! They also created the decimal system (0-9) that the whole world uses today. Arab and Islamic mathematicians preserved and advanced this knowledge. Muhammad ibn Musa al-Khwarizmi (about 1200 years ago) is called the Father of Algebra. The word 'algorithm' comes from his name! His work allows computers to function today. Another Arab mathematician, Omar Khayyam, solved cubic equations. In Grade 4, when you learn multi-digit multiplication, remember that al-Khwarizmi wrote the first systematic treatment of multiplication and division algorithms! The very method you will learn for multiplying large numbers traces back to his work.

الرياضيات لم يؤسسها شخص واحد. البابليون أنشأوا أول نظام عد. المصريون القدماء استخدموا الهندسة لبناء الأهرامات.

اليونان مثل فيثاغورس وإقليدس قدموا إسهامات عظيمة. الرياضيون الهند اخترعوا الصفر والنظام العشري. والعالم العربي الخوارزمي هو أبو الجبر — وكلمة algorithm مشتقة من اسمه!

**لماذا نتعلم الرياضيات؟ / Why Do We Learn Math?**

Math is everywhere in our daily lives! When you buy groceries, you use addition and subtraction. When you cook, you measure ingredients using fractions. When you tell time, you use numbers. Doctors use math to give the right medicine doses. Engineers use math to build bridges and buildings. Shopkeepers use math to calculate prices and change. Without math, we could not build houses, tell time, share food fairly, or use phones and computers. Learning math opens doors to every career and helps you make better decisions every day. Every great civilization that advanced in science and technology first advanced in math! In Grade 4, you will learn skills that are used in construction, cooking, science, finance, art, and technology.

### How to Use This Guide / كيف تستخدم هذا الدليل

1. Read each section in order — each concept builds on the previous one.
2. Green boxes contain Arabic translations of key terms and concepts.
3. Teal boxes explain WHY we learn each topic and how math connects to real life.
4. Purple boxes contain real-life applications showing how the math concept is used in the real world.
5. Blue boxes contain everyday examples from American, British, and Gulf life.
6. Orange boxes contain important warnings and key points to remember.
7. Take your time with each module. There is no rush!

# Unit 1: Place Value and Whole-Number Operations

الوحدة الأولى: قيمة المكان وعمليات الأعداد الصحيحة

## Module 1: Place Value of Whole Numbers

الموديول الأول: قيمة المكان للأعداد الصحيحة

In Grade 4, you extend your understanding of place value to much larger numbers! You already know ones, tens, and hundreds. Now you will learn about thousands, ten thousands, hundred thousands, and even millions. Every digit in a number has a specific value depending on its position, which is called its place value. For example, in the number 5,382, the 5 is in the thousands place and represents 5,000. The 3 is in the hundreds place and represents 300. Understanding place value is the foundation for all operations with larger numbers, including addition, subtraction, multiplication, and division. Without a solid understanding of place value, it is impossible to do multi-digit arithmetic correctly.

**الترجمة العربية**

في الصف الرابع، توسع فهمك لقيمة المكان لتشمل أرقامًا أكبر! ستتعلم عن الآلاف وعشرات الآلاف ومئات الآلاف والملايين. كل رقم في العدد له قيمة محددة حسب موقعه

## Key Vocabulary

**Place Value** قيمة المكان — the value of a digit based on its position

**Period** فترة — a group of three places (ones, thousands, millions)

**Standard Form** الصيغة القياسية — writing a number using digits (e.g., 45,230)

**Word Form** صيغة الكلمات — writing a number using words (e.g., forty-five thousand, two hundred thirty)

**Expanded Form** الصيغة الموسعة — writing a number as a sum of place values (e.g., 40,000 + 5,000 + 200 + 30)

## Reading and Writing Large Numbers

To read a large number, first separate the digits into periods of three using commas. Starting from the right, count three digits and place a comma. For 5382000, write 5,382,000. Read each period as if it were a hundreds number, then add the period name: 'five million, three hundred eighty-two thousand.' The comma tells you where each period begins. Always start from the left when reading. Practice with 12,456,789: 'twelve million, four hundred fifty-six thousand, seven hundred eighty-nine.' Writing numbers in word form follows the same pattern: say each period as a regular number, then add its period name.

## Understanding the Relationships Between Places

Each place value is 10 times the value of the place to its right. In the number 4,500: the 4 is in the thousands place (4,000) and the 5 is in the hundreds place (500). 4,000 is 10 times 400, and 500 is 10 times 50. This pattern continues forever! Moving a digit one place to the left makes it 10 times bigger. Moving a digit one place to the right makes it one-tenth as big. This is why our number system is called a base-10 system. Understanding this relationship helps you understand multiplication and division by 10, 100, and 1,000.

**تطبيق في الحياة الحقيقية / Real-Life Application**

A city planner in London needs to know the population of different areas. London has about 8,982,000 people. Reading this number correctly is essential for planning schools, hospitals, and transportation. A bank in Dubai handles transactions worth millions of dirhams daily. If a transfer of 3,450,000 AED comes through, the teller must read and understand this number correctly. Place value errors in banking can cost millions! Scientists use very large numbers too: the distance from Earth to the Sun is about 93,000,000 miles.

**لماذا نتعلم قيمة المكان؟ / Why Learn Place Value?**

Place value is the foundation of our entire number system! Without understanding place value, you cannot add, subtract, multiply, or divide large numbers. Every calculation you do with numbers larger than 9 depends on place value. When you buy a car for $25,000, you need to understand what that number means. When you read the population of a country, place value helps you comprehend the scale. All careers in finance, engineering, science, and technology require a deep understanding of place value!

**مثال من الحياة / Everyday Example**

A family in Houston is buying a house for $345,000. In expanded form: $300,000 + $40,000 + $5,000. The 3 represents three hundred thousand dollars! A student in Kuwait reads that the country's population is about 4,290,000. That is four million, two hundred ninety thousand people. Understanding large numbers helps you make sense of the world around you!

## Module 2: Compare and Order Whole Numbers; Round Whole Numbers

الموديول الثاني: مقارنة وترتيب الأعداد الصحيحة؛ تقريب الأعداد الصحيحة

Now that you understand place value for large numbers, you can compare them! To compare two numbers, start by looking at the largest place value. If one number has more digits, it is automatically larger. For example, 12,345 is larger than 9,876 because it has five digits while 9,876 has only four. If two numbers have the same number of digits, compare from left to right: 45,230 is greater than 44,999 because in the thousands place, 5 is greater than 4. Ordering numbers means arranging them from least to greatest or greatest to least using the same comparison strategy.

### Rounding Whole Numbers

Rounding means finding the nearest multiple of a place value. In Grade 4, you round to the nearest ten, hundred, thousand, ten thousand, or even hundred thousand! To round 45,678 to the nearest thousand: look at the digit in the hundreds place (6). Since 6 is 5 or greater, round up: 46,000. To round 45,678 to the nearest ten thousand: look at the digit in the thousands place (5). Since 5 is 5 or greater, round up: 50,000. The rule is always the same: look one place to the right of the place you are rounding to. If that digit is 5 or more, round up. If it is less than 5, round down.

**Compare** مقارنة — to determine which number is greater

**Order** ترتيب — arranging numbers from least to greatest or greatest to least

**Round** تقريب — finding the nearest multiple of a place value

**تطبيق في الحياة الحقيقية / Real-Life Application**

A real estate agent in New York compares house prices: House A costs $345,900 and House B costs $349,500. By comparing from left to right: both have 3 hundred thousands and 4 ten thousands, but House A has 5 thousands while House B has 9 thousands, so House B costs more. Rounding is used every day in estimating costs! If a renovation costs $4,780, you might round to $5,000 to make sure your budget covers it. A school in Manchester has 1,234 students and the school down the road has 1,189. Rounding both to 1,200 helps estimate total enrollment.

**نقطة مهمة / Key Point**

When comparing numbers, always start from the largest place value and work your way to the right. Never just compare individual digits without considering their place! For example, 9,999 is less than 10,000 even though it has more 9s, because 10,000 has one more digit. More digits always means a larger number, regardless of what the individual digits are.

# Unit 2: Multiplication and Division Problems

الوحدة الثانية: مشاكل الضرب والقسمة

## Module 3: Multiply by 1-Digit Numbers

الموديول الثالث: الضرب بأعداد من خانة واحدة

In Grade 3, you learned basic multiplication facts. Now in Grade 4, you take the big step of multiplying larger numbers by a single digit! You can use place value to break this down. For example, 4 x 236 = (4 x 200) + (4 x 30) + (4 x 6) = 800 + 120 + 24 = 944. This is the Distributive Property in action! You can also use the standard algorithm: multiply each digit from right to left, regrouping (carrying) when the product is 10 or more. This method is efficient and works for any size number.

### Key Vocabulary

**Regroup** إعادة تجميع — to exchange 10 ones for 1 ten, 10 tens for 1 hundred, etc.

**Algorithm** خوارزمية — a step-by-step procedure for calculating

**Partial Products** نواتج جزئية — the products obtained when multiplying each digit separately

### Using the Distributive Property to Multiply

The Distributive Property is your most powerful tool for multiplication. To multiply 7 x 483, break 483 into 400 + 80 + 3. Then: 7 x 400 = 2,800; 7 x 80 = 560; 7 x 3 = 21. Add: 2,800 + 560 + 21 = 3,381. Each of these products is called a partial product. This method works perfectly because it breaks a hard problem into three easy ones. You only need to know your basic multiplication facts and how to add! The Distributive Property is the mathematical justification for why the standard algorithm works.

### The Standard Multiplication Algorithm

The standard algorithm is a faster way to do the same thing. To multiply 7 x 483: Start with the ones: 7 x 3 = 21. Write the 1 in the ones place and carry the 2 to the tens. Then 7 x 8 = 56, plus the carried 2 = 58. Write the 8 and carry the 5. Then 7 x 4 = 28, plus the carried 5 = 33. Write 33. The answer is 3,381. Each step combines the multiplication with the regrouping, making it faster than writing all partial products separately. Practice both methods until you are confident with the standard algorithm!

**تطبيق في الحياة الحقيقية / Real-Life Application**

A school in Boston orders 6 boxes of pencils for each of 238 classrooms. Total boxes = 6 x 238 = 1,428 boxes! A restaurant in Dubai buys 8 bags of rice, each containing 375 kilograms. Total rice = 8 x 375 = 3,000 kilograms. A car factory in Detroit produces 9 car engines per hour for 168 hours. Total engines = 9 x 168 = 1,512 engines. Every business that produces, sells, or distributes items uses multi-digit multiplication daily!

**مثال من الحياة / Everyday Example**

At a KFC in Riyadh, each family bucket contains 9 pieces of chicken. If 476 buckets are sold on a busy day, how many pieces of chicken is that? 9 x 476 = 4,284 pieces! A Starbucks in London sells 5 cups of hot chocolate per minute during peak hours. In 165 minutes: 5 x 165 = 825 cups!

## Module 4: Multiply by 2-Digit Numbers

الموديول الرابع: الضرب بأعداد من خانتين

Multiplying by a 2-digit number means you multiply twice and then add the results! For example, 23 x 15 means: (20 + 3) x 15 = (20 x 15) + (3 x 15) = 300 + 45 = 345. Using the standard algorithm: first multiply 23 x 5 (the ones digit) = 115. Then multiply 23 x 10 (the tens digit, shifted one place to the left) = 230. Add: 115 + 230 = 345. The key insight is that when you multiply by the tens digit, you are actually multiplying by tens, so you shift one place to the left. This is why we write a zero as a placeholder when using the standard algorithm!

### Using Partial Products for 2-Digit Multiplication

For 34 x 26, break both numbers by place value: 34 = 30 + 4 and 26 = 20 + 6. Then find four partial products: 30 x 20 = 600; 30 x 6 = 180; 4 x 20 = 80; 4 x 6 = 24. Add them all: 600 + 180 + 80 + 24 = 884. This method shows exactly why the algorithm works. When you master this, the standard algorithm becomes much easier to understand because you know the reasoning behind every step!

### The Standard Algorithm for 2-Digit Multiplication

For 34 x 26 using the standard algorithm: First, multiply 34 x 6 = 204. Write 204. Then multiply 34 x 2 tens = 68 tens. Write 680 (shifting one place left, or writing a 0 first). Add: 204 + 680 = 884. The zero placeholder is crucial! It ensures you are multiplying by 20, not by 2. Many students forget this zero and get the wrong answer. Always remember: when you multiply by the tens digit, you are multiplying by tens, so shift one place to the left!

**تطبيق في الحياة الحقيقية / Real-Life Application**

A school bus in Chicago carries 45 students. If there are 32 buses in the district, how many students ride the bus? 45 x 32 = 1,440 students! A hotel in Abu Dhabi has 24 floors with 18 rooms on each floor. Total rooms = 24 x 18 = 432 rooms! A factory in Manchester produces 56 toy cars per hour for 12 hours. Total = 56 x 12 = 672 toy cars! Two-digit multiplication is essential for calculating area, inventory, production, and costs in every industry.

**نقطة مهمة / Key Point**

Never forget the zero placeholder! When multiplying by the tens digit in the standard algorithm, always shift one place to the left. For example, in 23 x 15: after multiplying 23 x 5 = 115, when you multiply 23 x 1 (which is really 1 ten), write it as 230, not 23. Missing this zero is the most common mistake in 2-digit multiplication!

## Module 5: Use Multiplication to Solve Problems

الموديول الخامس: استخدام الضرب لحل المشاكل

Now you can use your multiplication skills to solve real-world problems! Multiplication word problems often use key phrases like 'each,' 'per,' 'every,' 'times,' and 'groups of.' When you see these words, think multiplication. For example: 'A store sells 24 notebooks each day for 15 days. How many notebooks were sold?' This is 24 x 15 = 360 notebooks. Always identify what is being multiplied and make sure your answer makes sense by estimating first. If 24 x 15 is about 25 x 15 = 375, then 360 is a reasonable answer.

### Multi-Step Multiplication Problems

Some problems require more than one step. Example: 'A school has 16 classrooms. Each classroom has 28 students. If each student brings 3 pencils, how many pencils total?' Step 1: Find total students: 16 x 28 = 448. Step 2: Find total pencils: 448 x 3 = 1,344 pencils. Always read the problem carefully, identify what you need to find, and break it into steps. Drawing a picture or making a table can help you organize the information.

**تطبيق في الحياة الحقيقية / Real-Life Application**

An event planner in Dubai is organizing a conference for 35 companies. Each company sends 12 representatives. Each representative receives 4 name badges. Step 1: 35 x 12 = 420 representatives. Step 2: 420 x 4 = 1,680 name badges. Without multi-step multiplication, event planning would be impossible! Architects use multi-step multiplication to calculate materials: a building has 22 floors, each floor needs 48 windows, each window needs 6 pieces of glass. Total glass pieces = 22 x 48 x 6 = 6,336!

## Module 6: Divide by 1-Digit Numbers

الموديول السادس: القسمة على أعداد من خانة واحدة

In Grade 3, you learned basic division. Now in Grade 4, you learn long division! Long division is a step-by-step method for dividing larger numbers. The process has four steps that repeat: Divide, Multiply, Subtract, Bring down. You can remember this as D-M-S-B. For example, to divide 765 by 5: Divide 7 by 5 = 1. Multiply 1 x 5 = 5. Subtract 7 - 5 = 2. Bring down 6 to make 26. Divide 26 by 5 = 5. Multiply 5 x 5 = 25. Subtract 26 - 25 = 1. Bring down 5 to make 15. Divide 15 by 5 = 3. Multiply 3 x 5 = 15. Subtract 15 - 15 = 0. Answer: 153.

**Long Division** القسمة الطويلة — a step-by-step method for dividing multi-digit numbers

**Remainder** باقي — the amount left over when a number does not divide evenly

**Divisible** قابل للقسمة — a number that can be divided without a remainder

### Division with Remainders

Sometimes a number does not divide evenly, and you have a remainder. For example, 38 divided by 5: 5 goes into 38 seven times (5 x 7 = 35), with 3 left over. So 38 / 5 = 7 remainder 3. In long division, when you subtract and get a number smaller than the divisor, that is your remainder. Remainders are important in real life! If 38 students need to sit in rows of 5, there will be 7 full rows and 3 students left over. Those 3 students still need a row, so you would actually need 8 rows!

### Checking Division with Multiplication

You can always check your division answer using multiplication! If 765 / 5 = 153, then 153 x 5 should equal 765. If there is a remainder, add it: if 38 / 5 = 7 R3, then 7 x 5 + 3 = 35 + 3 = 38. This check always works because multiplication and division are inverse operations. Make checking your answer a habit! It takes only a few seconds and catches many errors.

**تطبيق في الحياة الحقيقية / Real-Life Application**

A teacher in Kuwait has 287 pencils to distribute equally among 6 tables. 287 / 6 = 47 R5. Each table gets 47 pencils, and 5 pencils are left over. A pizza shop in Chicago makes 345 slices and needs to pack them into boxes of 8. 345 / 8 = 43 R1. They fill 43 boxes completely and have 1 slice left. A charity in London receives 950 books to give to 4 schools equally. 950 / 4 = 237 R2. Each school gets 237 books and 2 books remain. Division with remainders happens constantly in distribution and packaging!

**نقطة مهمة / Key Point**

The remainder is ALWAYS less than the divisor! If your remainder is equal to or greater than the divisor, you can divide one more time. For example, if you divide 47 by 5 and get 8 R7, that is wrong because 7 is greater than 5. The correct answer is 9 R2. Always check that your remainder is smaller than the divisor!

## Module 7: Use Division to Solve Problems

الموديول السابع: استخدام القسمة لحل المشاكل

Division word problems often use phrases like 'share equally,' 'divide into groups,' 'each gets,' and 'how many in each group.' For example: 'A factory produced 846 toys and packed them equally into 6 boxes. How many toys are in each box?' 846 / 6 = 141 toys per box. Multi-step division problems combine division with other operations. Example: 'A school has 936 students in 8 classrooms. If each classroom has 3 reading groups, how many students are in each reading group?' Step 1: 936 / 8 = 117 students per classroom. Step 2: 117 / 3 = 39 students per reading group.

**تطبيق في الحياة الحقيقية / Real-Life Application**

A hospital in Boston receives 1,248 doses of medicine to distribute equally among 6 clinics. 1,248 / 6 = 208 doses per clinic. A charity in Dubai collects 3,750 blankets for 5 refugee camps. 3,750 / 5 = 750 blankets per camp. Division is essential in fair distribution, resource allocation, and planning. Every organization that needs to divide resources equally uses division daily!

**لماذا نتعلم الضرب والقسمة بأعداد كبيرة؟ / Why Learn Multi-Digit Multiplication and Division?**

These operations are used in every career! Engineers calculate materials and costs. Doctors determine medicine dosages. Scientists analyze data. Business owners calculate profits and distribute resources. Pilots calculate fuel. Chefs scale recipes. Without multi-digit multiplication and division, none of these professionals could do their jobs! These are truly life skills that open doors to every field.

# Unit 3: Extend and Apply Multiplication

الوحدة الثالثة: توسيع الضرب وتطبيقه

## Module 8: Multiply by Multiples of 10 and 100

الموديول الثامن: الضرب بمضاعفات 10 و 100

In Grade 3, you learned to multiply by multiples of 10. Now you extend this to multiples of 100 and even 1,000! The pattern is simple: when you multiply by a multiple of 10, count the zeros in the multiplier and add them to the product. For 6 x 300: first multiply 6 x 3 = 18, then add two zeros: 1,800. For 7 x 4,000: multiply 7 x 4 = 28, then add three zeros: 28,000. This works because of place value: 300 means 3 hundreds, so 6 x 3 hundreds = 18 hundreds = 1,800. The Associative Property also helps: 6 x 300 = 6 x (3 x 100) = (6 x 3) x 100 = 18 x 100 = 1,800.

### Multiplying Two Multiples of 10

When both numbers end in zeros, multiply the non-zero parts and then add all the zeros! For 40 x 30: 4 x 3 = 12, then add two zeros (one from each number): 1,200. For 200 x 50: 2 x 5 = 10, then add three zeros: 10,000. This pattern makes these multiplications very fast! Understanding this also helps you estimate products: 38 x 42 is about 40 x 40 = 1,600, so the actual answer should be close to 1,600 (the exact answer is 1,596).

**تطبيق في الحياة الحقيقية / Real-Life Application**

A stadium in Dallas has 400 rows with 25 seats each. Total seats = 400 x 25 = 10,000! A factory in Birmingham produces 300 toy cars per day for 12 days. Total = 300 x 12 = 3,600 cars. A supermarket in Jeddah orders 50 crates of juice, each containing 200 cartons. Total cartons = 50 x 200 = 10,000! Multiplying by multiples of 10 and 100 is essential for inventory, production, and capacity calculations in every industry.

**مثال من الحياة / Everyday Example**

A Burger King in Abu Dhabi sells 200 Whoppers per day. In 30 days: 200 x 30 = 6,000 Whoppers! An Apple store in London receives 40 iPads per shipment, and gets 20 shipments per month: 40 x 20 = 800 iPads per month!

## Module 9: Multiply 2-Digit by 2-Digit Numbers

الموديول التاسع: ضرب أعداد من خانتين في أعداد من خانتين

This module extends your skills to multiply any two 2-digit numbers together. You already learned the basics in Module 4; now you practice with larger numbers and more complex regrouping. For 67 x 84: First, 67 x 4 = 268. Then, 67 x 80 = 5,360 (remember the zero placeholder!). Add: 268 + 5,360 = 5,628. Using partial products: 60 x 80 = 4,800; 60 x 4 = 240; 7 x 80 = 560; 7 x 4 = 28. Total = 4,800 + 240 + 560 + 28 = 5,628. Both methods give the same answer! Practice with estimation: 67 x 84 is about 70 x 80 = 5,600, which confirms 5,628 is reasonable.

### Strategies for Accuracy

Here are strategies to avoid mistakes: (1) Estimate first so you know roughly what the answer should be. (2) Use the zero placeholder every time you multiply by a tens digit. (3) Line up your numbers carefully in columns. (4) Check your answer by multiplying in a different order or using partial products. (5) Double-check your addition when combining partial products. The most common errors are forgetting the zero placeholder and making addition mistakes when adding partial products. Taking a few extra seconds to estimate and check saves you from costly errors!

**تطبيق في الحياة الحقيقية / Real-Life Application**

A farmer in Texas has 78 acres of land, and each acre produces 56 bushels of corn. Total corn = 78 x 56 = 4,368 bushels! A hotel in Dubai has 85 rooms on each of 24 floors. Total rooms = 85 x 24 = 2,040 rooms! A warehouse in Manchester stores 47 pallets on each of 36 shelves. Total pallets = 47 x 36 = 1,692. Two-digit by two-digit multiplication is used constantly in agriculture, construction, logistics, and manufacturing!

**نقطة مهمة / Key Point**

Always estimate before calculating! Round both numbers to the nearest ten and multiply. If 67 x 84 gives 5,628, and 70 x 80 = 5,600, you know your answer is reasonable. If you got 562 or 56,280, you would immediately know something is wrong. Estimating is your best tool for catching errors!

# Unit 4: Fractions and Decimals

الوحدة الرابعة: الكسور والأعداد العشرية

## Module 10: Understand Fractions

الموديول العاشر: فهم الكسور

A fraction represents a part of a whole! When you cut a pizza into 8 equal slices and eat 3 slices, you have eaten 3/8 of the pizza. The top number is called the numerator (it counts how many parts you have), and the bottom number is called the denominator (it tells how many equal parts the whole is divided into). Think of the denominator as the size of the pieces and the numerator as the number of pieces. A larger denominator means smaller pieces! Fractions are everywhere in daily life: cooking recipes (1/2 cup of flour), sharing food (1/4 of a cake), measuring time (3/4 of an hour), and sports statistics (a player makes 7/10 free throws).

**الترجمة العربية**

الكسر يمثل جزءًا من كل! الرقم العلوي يسمى البسط ويحسب كم جزءًا لديك، والرقم السفلي يسمى المقام ويخبرك كم جزءًا متساويًا قسم الكل إليه.

**Fraction** كسر — a number that represents part of a whole

**Numerator** البسط — the top number; how many parts you have

**Denominator** المقام — the bottom number; how many equal parts in the whole

**Unit Fraction** كسر الوحدة — a fraction with numerator 1 (e.g., 1/4, 1/6)

### Fractions on a Number Line

You can show fractions on a number line! Divide the space between 0 and 1 into equal parts based on the denominator. For thirds, make 3 equal sections. For fifths, make 5 equal sections. Then count from 0 using the numerator. For 3/5, make 5 sections between 0 and 1, and mark the third tick mark. Fractions can also be greater than 1! For 7/4, the number line extends past 1 to show 1 and 3/4 more. Fractions greater than 1 are called improper fractions, and they can also be written as mixed numbers: 7/4 = 1 3/4.

**تطبيق في الحياة الحقيقية / Real-Life Application**

A chef in Paris uses fractions constantly! A recipe calls for 3/4 cup of sugar and 1/3 cup of olive oil. A carpenter in Edinburgh measures a shelf as 2 1/2 feet long. A musician reads music where a half note lasts 1/2 of a beat and a quarter note lasts 1/4 of a beat. A gas gauge in a car shows 3/8 full. Fractions are essential in cooking, construction, music, and everyday measurement! Without understanding fractions, you cannot follow recipes, build things, or read measurements accurately.

**مثال من الحياة / Everyday Example**

At a Pizza Hut in Dubai, a family orders a large pizza cut into 8 equal slices. If Ahmad eats 3 slices, he ate 3/8 of the pizza! At a Tim Hortons in Canada, you order a half-dozen donuts (6). If you eat 2, you ate 2/6 = 1/3 of the donuts! A chocolate bar divided into 12 pieces: eating 5 pieces means you ate 5/12 of the bar.

## Module 11: Equivalent Fractions

الموديول الحادي عشر: الكسور المكافئة

Equivalent fractions are different fractions that represent the same amount! For example, 1/2 = 2/4 = 3/6 = 4/8. Think about a pizza: whether you cut it into 2 slices and eat 1, or cut it into 4 slices and eat 2, or cut it into 8 slices and eat 4, you are eating the same amount of pizza! To find equivalent fractions, multiply or divide both the numerator and denominator by the same number. For example: 1/2 x 4/4 = 4/8. And 6/8 divided by 2/2 = 3/4. The key rule is: whatever you do to the numerator, you must also do to the denominator! This keeps the fraction the same size.

**Equivalent Fractions** الكسور المكافئة — different fractions that name the same amount

**Simplest Form** الصيغة الأبسط — a fraction with the smallest possible numerator and denominator

### Finding Equivalent Fractions

To find an equivalent fraction, multiply both the numerator and denominator by the same number. For 2/3: multiply by 2 to get 4/6, multiply by 3 to get 6/9, multiply by 4 to get 8/12. All of these are equivalent to 2/3! You can also go the other direction: divide both the numerator and denominator by the same number. For 12/16: divide by 2 to get 6/8, divide by 4 to get 3/4. The simplest form is when the numerator and denominator have no common factor other than 1. For 12/16, the simplest form is 3/4.

### Using Area Models and Number Lines

You can see equivalent fractions using area models. Draw two equal rectangles. Divide the first into 4 parts and shade 2 (2/4). Divide the second into 8 parts and shade 4 (4/8). The same area is shaded in both! On a number line, 1/2 and 2/4 and 3/6 all land on the same point between 0 and 1. Visual models prove that equivalent fractions represent the same quantity, just expressed differently. This is one of the most important concepts in all of mathematics!

**تطبيق في الحياة الحقيقية / Real-Life Application**

A recipe in New York calls for 3/4 cup of milk, but your measuring cup only has marks for eighths. You need 6/8 cup, which is the same as 3/4! A builder in Manchester needs a board that is 2/3 of a meter long, but his ruler shows sixths. He measures 4/6 of a meter, which equals 2/3. Equivalent fractions let you use the tools and measurements you have available to get the exact amount you need! In music, a half note equals two quarter notes: 1/2 = 2/4. Understanding equivalent fractions makes you more flexible and practical in every situation.

## Module 12: Compare Fractions

الموديول الثاني عشر: مقارنة الكسور

Comparing fractions means determining which fraction is larger or smaller. There are several strategies: (1) Same denominator: if the denominators are the same, the fraction with the larger numerator is bigger. 5/8 is greater than 3/8 because 5 pieces out of 8 is more than 3 pieces out of 8. (2) Same numerator: if the numerators are the same, the fraction with the smaller denominator is bigger! 1/3 is greater than 1/5 because when you divide a whole into 3 pieces, each piece is larger than when you divide it into 5 pieces. (3) Different numerators and denominators: find equivalent fractions with the same denominator, then compare the numerators.

### Using Benchmark Fractions

Benchmark fractions are common fractions you can use as reference points: 0, 1/4, 1/2, 3/4, and 1. To compare 3/8 and 5/6: 3/8 is close to 1/2 (but less), while 5/6 is close to 1. So 5/6 is greater than 3/8. Benchmarks give you a quick way to compare without finding common denominators. Another useful strategy: compare each fraction to 1/2. If one fraction is greater than 1/2 and the other is less than 1/2, you know immediately which is bigger!

**تطبيق في الحياة الحقيقية / Real-Life Application**

Two students in London are comparing their test scores. Ahmad got 7/10 correct and Sarah got 3/5 correct. Which is better? Convert 3/5 to sixths or tenths: 3/5 = 6/10. Now compare 7/10 and 6/10: Ahmad scored higher! A factory in Abu Dhabi produces chips. Machine A fills 5/8 of a container and Machine B fills 2/3. Which fills more? Convert to common denominator 24: 5/8 = 15/24 and 2/3 = 16/24. Machine B fills slightly more! Comparing fractions is essential for evaluating performance, quality, and efficiency.

**نقطة مهمة / Key Point**

When numerators are the same, a SMALLER denominator means a LARGER fraction! This is the opposite of what many students expect. 1/4 is greater than 1/8 because when you cut something into 4 pieces, each piece is bigger than when you cut it into 8 pieces. Think of it as sharing a chocolate bar: would you rather share it with 4 people (1/4 each) or 8 people (1/8 each)? You get more with fewer people!

## Module 13: Understand Decimals

الموديول الثالث عشر: فهم الأعداد العشرية

Decimals are another way to write fractions! The decimal point separates whole numbers from parts of a whole. In money, $3.45 means 3 dollars and 45 cents. The digits after the decimal point represent tenths, hundredths, and thousandths. Just like whole numbers follow the pattern of ones, tens, hundreds (each 10 times bigger), decimal places follow tenths, hundredths, thousandths (each 10 times smaller). So 0.1 = 1/10, 0.01 = 1/100, and 0.001 = 1/1000. The first digit after the decimal point is tenths, the second is hundredths, the third is thousandths. Understanding decimals is crucial because money, measurements, and science all use decimals!

**الترجمة العربية**

الأعداد العشرية هي طريقة أخرى لكتابة الكسور! النقطة العشرية تفصل الأعداد الكاملة عن أجزاء الكل.
0.1 = 1/10 و
0.01 = 1/100 و
0.001 = 1/1000.

**Decimal Point** النقطة العشرية — the dot separating whole numbers from decimal parts

**Tenths** الأعشار — the first decimal place (1/10)

**Hundredths** المئات — the second decimal place (1/100)

**Thousandths** الآلاف — the third decimal place (1/1000)

### Fractions and Decimals

Every fraction with a denominator of 10, 100, or 1000 can be written as a decimal! 3/10 = 0.3, 45/100 = 0.45, 127/1000 = 0.127. For other fractions, divide the numerator by the denominator: 1/4 = 0.25 because 1 divided by 4 equals 0.25. And 3/8 = 0.375 because 3 divided by 8 equals 0.375. Going the other direction, 0.7 = 7/10 and 0.35 = 35/100. Understanding this connection between fractions and decimals is essential for working with money and measurements!

### Comparing Decimals

To compare decimals, line up the decimal points and compare from left to right, just like whole numbers. For 0.45 and 0.5: compare tenths first. 4 tenths is less than 5 tenths, so 0.45 < 0.5. Be careful with zeros! 0.5 is the same as 0.50, which is the same as 0.500. Adding zeros to the right of a decimal does not change its value. However, zeros between the decimal point and other digits DO matter: 0.05 is NOT the same as 0.5! 0.05 = 5/100 while 0.5 = 5/10 = 50/100.

**تطبيق في الحياة الحقيقية / Real-Life Application**

Every time you use money, you use decimals! A gallon of gas in Houston costs $3.49. That is 3 dollars and 49 hundredths of a dollar. A runner in London finishes a race in 10.25 seconds. That is 10 seconds and 25 hundredths of a second. A scientist measures 0.003 grams of a chemical. Understanding decimals is essential for finance, science, sports, engineering, and everyday shopping! Olympic races are won by hundredths of a second, so every decimal place matters!

**مثال من الحياة / Everyday Example**

At a McDonald's in Dubai, a Big Mac costs AED 18.50. That is 18 dirhams and 50 fils. At a Tesco in London, strawberries cost £2.99 per pound. At a Target in New York, a T-shirt costs $12.75. All prices use decimals! Every purchase you make involves understanding decimal notation.

# Unit 5: Operations with Fractions

الوحدة الخامسة: عمليات الكسور

## Module 14: Add and Subtract Fractions with Like Denominators

الموديول الرابع عشر: جمع وطرح الكسور ذات المقامات المتساوية

Adding and subtracting fractions with like (same) denominators is straightforward! Keep the denominator the same and add or subtract the numerators. For 3/8 + 2/8 = 5/8 (you have three eighths plus two eighths equals five eighths). For 7/10 - 4/10 = 3/10. Think of it logically: if you have 3 slices of a pizza cut into 8, and someone gives you 2 more slices from the same pizza, you now have 5 slices out of 8. The pizza is still cut into 8 slices (denominator stays the same), but you have more slices (numerator increases). Always simplify your answer if possible!

### Adding Fractions Greater Than One

Sometimes the sum is greater than 1! For example, 5/8 + 5/8 = 10/8. This is an improper fraction (numerator greater than denominator). You can convert it to a mixed number: 10/8 = 1 2/8 = 1 1/4 (simplified). Another example: 7/12 + 9/12 = 16/12 = 1 4/12 = 1 1/3. The process is: add the numerators, keep the denominator, then convert to a mixed number and simplify. Mixed numbers show the whole number part and the fractional part separately, which is more useful in real life.

### Subtracting Fractions from Whole Numbers and Mixed Numbers

To subtract a fraction from a whole number, convert the whole number to a fraction. For 3 - 1/4: rewrite 3 as 12/4 (since 3 = 3 x 4/4 = 12/4). Then 12/4 - 1/4 = 11/4 = 2 3/4. For mixed numbers with like denominators: 5 3/8 - 2 5/8. Subtract the fractions: 3/8 - 5/8. Since 3 is less than 5, borrow 1 from the whole number: 3/8 becomes 11/8 (adding 8/8 from the borrowed 1). Then 11/8 - 5/8 = 6/8 = 3/4. And the whole numbers: 4 - 2 = 2. Answer: 2 3/4.

**تطبيق في الحياة الحقيقية / Real-Life Application**

A baker in London uses 3/8 cup of sugar for cookies and 5/8 cup for a cake. Total sugar = 3/8 + 5/8 = 1 cup! A carpenter in Riyadh cuts 7/12 of a board in the morning and 5/12 in the afternoon. How much is left of the original board? 12/12 - 7/12 - 5/12 = 0. The entire board was used! A runner in Boston runs 5/10 of a mile, rests, then runs 3/10 more. Total = 8/10 = 4/5 of a mile. Fraction addition and subtraction are used in every recipe, construction project, and measurement task!

## Module 15: Multiply Fractions by Whole Numbers

الموديول الخامس عشر: ضرب الكسور بأعداد صحيحة

Multiplying a fraction by a whole number means adding that fraction to itself multiple times! For 3 x 2/5: this means 2/5 + 2/5 + 2/5 = 6/5 = 1 1/5. The shortcut: multiply the whole number by the numerator and keep the denominator. So 3 x 2/5 = (3 x 2)/5 = 6/5 = 1 1/5. Why does this work? Because 3 x 2/5 means 'three groups of two fifths,' which is 6/5 total. The denominator never changes because the size of the pieces does not change; you just have more of them!

### Using Models to Understand Fraction Multiplication

Number lines and area models help you see fraction multiplication. For 4 x 1/3 on a number line: make 4 jumps of 1/3 each. You land on 4/3 = 1 1/3. Using an area model: shade 1/3 of a rectangle, then repeat it 4 times. You get 4/3 shaded. For 2 x 3/4: shade 3/4 of a rectangle and repeat it twice. Total = 6/4 = 1 1/2. Visual models confirm that the algorithm (multiply the whole number by the numerator) always gives the correct answer!

**تطبيق في الحياة الحقيقية / Real-Life Application**

A recipe in Chicago calls for 2/3 cup of flour for one batch of cookies. If you want to make 4 batches, how much flour? 4 x 2/3 = 8/3 = 2 2/3 cups! A construction worker in Dubai uses 3/8 of a bag of cement for one wall. For 6 walls: 6 x 3/8 = 18/8 = 2 1/4 bags. A music student practices 1/2 hour each day for 5 days: 5 x 1/2 = 5/2 = 2 1/2 hours total. Multiplying fractions by whole numbers is used constantly in cooking, construction, scheduling, and budgeting!

**نقطة مهمة / Key Point**

When multiplying a fraction by a whole number, multiply the whole number by the NUMERATOR only! The denominator stays the same. For 5 x 3/7 = 15/7. Never multiply the denominator! The denominator represents the size of the pieces, and that does not change. You are just getting more pieces, not changing the size of each piece.

## Module 16: Relate Fractions and Decimals

الموديول السادس عشر: العلاقة بين الكسور والأعداد العشرية

Fractions and decimals are two different ways to write the same number! Every fraction can be written as a decimal, and every decimal can be written as a fraction. To convert a fraction to a decimal, divide the numerator by the denominator. For 3/4: 3 divided by 4 = 0.75. For 1/8: 1 divided by 8 = 0.125. To convert a decimal to a fraction, read the decimal as a fraction: 0.6 = 6/10 = 3/5 (simplified). 0.35 = 35/100 = 7/20. This connection is vital because some situations are easier with fractions (like recipes) and others are easier with decimals (like money).

### Common Fraction-Decimal Equivalents

Some fraction-decimal equivalents are so common that you should memorize them: 1/2 = 0.5; 1/4 = 0.25; 3/4 = 0.75; 1/5 = 0.2; 1/10 = 0.1; 1/8 = 0.125; 3/8 = 0.375; 5/8 = 0.625; 7/8 = 0.875. These come up constantly in daily life! When you see a price of $0.75, you know it is 3/4 of a dollar. When a recipe calls for 0.5 cups, you know it is 1/2 cup. Memorizing these equivalents saves you time and prevents errors.

**تطبيق في الحياة الحقيقية / Real-Life Application**

A stock market trader in New York sees that a stock price rose by 3/4 of a dollar. That is $0.75! A tailor in Kuwait measures fabric as 2.5 meters. That is 2 1/2 meters! A pharmacist in London measures 0.375 liters of medicine. That is 3/8 of a liter! Being able to convert between fractions and decimals quickly is essential in finance, healthcare, engineering, and cooking. Some professions use fractions (like carpentry), while others use decimals (like finance). You need to be fluent in both!

**لماذا نتعلم الكسور والأعداد العشرية؟ / Why Learn Fractions and Decimals?**

Fractions and decimals are used in every single career and daily activity! Chefs use fractions for recipes. Bankers use decimals for interest rates. Engineers use both for measurements. Doctors use decimals for medicine dosages. Athletes use decimals for timing. Musicians use fractions for rhythm. Without understanding fractions and decimals, you cannot cook, manage money, build things, or understand science. These concepts are the gateway to algebra, geometry, and all higher mathematics!

# Unit 6: Two-Dimensional Figures and Symmetry

الوحدة السادسة: الأشكال المستوية والتناظر

## Module 17: Lines, Rays, and Angles

الموديول السابع عشر: الخطوط والأشعة والزوايا

Geometry is the study of shapes, and it starts with understanding the basic building blocks: points, lines, rays, and angles. A point is a single location with no size. A line extends forever in both directions. A ray starts at a point and extends forever in one direction (like a ray of sunlight). A line segment has two endpoints and a definite length. When two rays share an endpoint, they form an angle. The shared endpoint is called the vertex. Angles are measured in degrees using a tool called a protractor. Understanding these basics is essential for everything in geometry, architecture, and engineering!

**الترجمة العربية**

الهندسة هي دراسة الأشكال، وتبدأ بفهم العناصر الأساسية: النقاط والخطوط والأشعة والزوايا. الزاوية تقاس بالدرجات باستخدام أداة تسمى المنقل.

**Point** نقطة — a single location in space

**Line** خط — extends forever in both directions

**Line Segment** قطعة مستقيمة — part of a line with two endpoints

**Ray** شعاع — starts at a point and extends forever in one direction

**Angle** زاوية — formed by two rays sharing an endpoint

**Vertex** رأس الزاوية — the shared endpoint of an angle

**Degree** درجة — the unit for measuring angles

## Types of Angles

There are several important types of angles: A right angle measures exactly 90 degrees and forms a perfect 'L' shape (like the corner of a book). An acute angle measures less than 90 degrees (smaller than a right angle). An obtuse angle measures more than 90 degrees but less than 180 degrees (larger than a right angle). A straight angle measures exactly 180 degrees (a straight line). You can identify angle types by comparing them to a right angle. If an angle looks smaller than the corner of a book, it is acute. If it looks larger, it is obtuse. If it makes a perfect corner, it is right!

## Measuring Angles with a Protractor

A protractor is a semi-circular tool marked with degrees from 0 to 180. To measure an angle: (1) Place the center point of the protractor on the vertex of the angle. (2) Line up one ray with the 0-degree mark. (3) Read the degree where the other ray crosses the protractor scale. Make sure you use the correct scale (inner or outer) depending on which side your 0-degree ray is on. Practice measuring different angles until you can do it accurately every time!

### تطبيق في الحياة الحقيقية / Real-Life Application

An architect in New York designs buildings with specific angles for stability and beauty. A right angle (90 degrees) is used for every wall corner! A pilot in Dubai adjusts the plane's angle of climb to about 15 degrees after takeoff. A carpenter in Manchester cuts wood at 45-degree angles to create picture frames. A soccer player in London kicks the ball at an angle to curve it around the goalkeeper. Angles are everywhere: in roads, furniture, art, sports, and nature! Understanding angles is essential for architecture, engineering, navigation, and design.

**مثال من الحياة / Everyday Example**

A clock in London shows 3:00. The hands form a right angle (90 degrees). At 6:00, they form a straight angle (180 degrees). At 1:00, they form an acute angle (30 degrees). A door opened halfway forms an obtuse angle. A slice of pizza forms an acute angle at its tip. Look around you right now — you can find angles everywhere!

## Module 18: Two-Dimensional Figures and Symmetry

الموديول الثامن عشر: الأشكال المستوية والتناضر

Two-dimensional (2D) figures are flat shapes that have length and width but no thickness. The main categories are: Polygons (closed shapes with straight sides) and non-polygons (shapes with curves, like circles). Polygons are classified by their number of sides: triangle (3 sides), quadrilateral (4 sides), pentagon (5 sides), hexagon (6 sides), octagon (8 sides). Quadrilaterals have their own subcategories: parallelogram (opposite sides parallel), rectangle (parallelogram with right angles), square (rectangle with all sides equal), rhombus (parallelogram with all sides equal), and trapezoid (exactly one pair of parallel sides). Understanding these classifications helps you see the relationships between shapes!

**Polygon** مضلع — a closed shape with straight sides

**Triangle** مثلث — a polygon with 3 sides

**Quadrilateral** رباعي الأضلاع — a polygon with 4 sides

**Parallelogram** متوازي الأضلاع — a quadrilateral with opposite sides parallel

**Symmetry** تناضر — when a shape can be folded along a line and both halves match

**Line of Symmetry** خط التناضر — a line that divides a shape into two matching halves

### Classifying Triangles

Triangles can be classified by their sides: equilateral (all sides equal), isosceles (at least two sides equal), and scalene (all sides different). They can also be classified by their angles: acute triangle (all angles less than 90 degrees), right triangle (one angle equals 90 degrees), and obtuse triangle (one angle greater than 90 degrees). A triangle can have both a side classification and an angle classification. For example, an isosceles right triangle has two equal sides and one 90-degree angle. The sum of the angles in ANY triangle always equals 180 degrees!

### Lines of Symmetry

A shape has line symmetry if you can draw a line through it and both halves match exactly when folded along that line. A square has 4 lines of symmetry (vertical, horizontal, and two diagonals). A rectangle has 2 lines of symmetry (vertical and horizontal, but NOT diagonal). A regular hexagon has 6 lines of symmetry. An equilateral triangle has 3 lines of symmetry. A circle has infinitely many lines of symmetry (any diameter works)! Some shapes have no lines of symmetry, like a scalene triangle. Symmetry is important in art, architecture, nature, and design. Think of butterfly wings, snowflakes, and human faces — they all show symmetry!

**تطبيق في الحياة الحقيقية / Real-Life Application**

An architect in Dubai designs a building with bilateral symmetry — the left side mirrors the right side, creating a balanced, beautiful structure. A graphic designer in London creates a company logo with rotational symmetry. A farmer in Texas uses the properties of rectangles to plan fields with straight, parallel boundaries. Traffic signs use specific shapes: octagon for stop, triangle for yield, rectangle for information. Understanding shapes and symmetry is essential for architecture, art, design, engineering, and even road safety!

**نقطة مهمة / Key Point**

A square is a special type of rectangle, and a rectangle is a special type of parallelogram! All squares are rectangles because they have 4 right angles and opposite sides parallel and equal. But not all rectangles are squares because rectangles do not need all sides equal. This hierarchy of shapes is important: square > rectangle > parallelogram > quadrilateral > polygon. Each smaller category is a special case of the larger one!

# Unit 7: Measurement, Data, and Time

الوحدة السابعة: القياس والبيانات والوقت

## Module 19: Measurement

الموديول التاسع عشر: القياس

Measurement means finding the size, length, weight, or capacity of something. In Grade 4, you learn both customary units (used mainly in the United States) and metric units (used in most of the world, including the Gulf countries and UK). Customary units of length include inches, feet, yards, and miles. Metric units of length include millimeters, centimeters, meters, and kilometers. Understanding both systems is important because different countries and professions use different systems. Scientists worldwide use the metric system, while the US uses customary units for everyday measurements.

**Inch** بوصة — a customary unit of length (about 2.54 cm)

**Foot** قدم — 12 inches = 1 foot

**Yard** ياردة — 3 feet = 1 yard

**Centimeter** سنتيمتر — a metric unit of length (about 0.4 inches)

**Meter** متر — 100 centimeters = 1 meter

**Kilometer** كيلومتر — 1,000 meters = 1 kilometer

## Converting Between Units

Converting between units is a crucial skill. In the customary system: 12 inches = 1 foot, 3 feet = 1 yard, 5,280 feet = 1 mile. In the metric system: 10 mm = 1 cm, 100 cm = 1 m, 1,000 m = 1 km. To convert from a larger unit to a smaller unit, multiply. For example, 3 feet = 3 x 12 = 36 inches. To convert from a smaller unit to a larger unit, divide. For example, 500 cm = 500 / 100 = 5 meters. The metric system is easier because all conversions are powers of 10, just like our number system!

## Weight and Capacity

Customary weight units: ounce (oz), pound (lb = 16 oz), ton (2,000 lb). Metric mass units: gram (g), kilogram (kg = 1,000 g). Customary capacity: cup, pint (2 cups), quart (2 pints), gallon (4 quarts). Metric capacity: milliliter (mL), liter (L = 1,000 mL). These conversions are used every day in cooking, shipping, construction, and healthcare. A recipe in Houston might call for 2 cups of milk, while the same recipe in Dubai would specify 475 milliliters!

**تطبيق في الحياة الحقيقية / Real-Life Application**

A shipping company in Dubai weighs packages in kilograms for international shipping. A 25 kg package equals about 55 pounds. A builder in Manchester orders 50 meters of cable, but the supplier lists it in yards: 50 m is about 55 yards. A doctor in Boston prescribes 15 mL of medicine, which is about 1 tablespoon. A chef in Kuwait follows an American recipe calling for 2 gallons of soup: that is 8 quarts or about 7.6 liters. Unit conversions are essential for international trade, travel, cooking, healthcare, and construction!

**مثال من الحياة / Everyday Example**

A runner in London trains on a 400-meter track. She runs 10 laps: 400 x 10 = 4,000 meters = 4 kilometers. A student in Texas measures his height as 5 feet 6 inches. That is 66 inches total (5 x 12 + 6). A family in Abu Dhabi buys a 2-liter bottle of Pepsi. That is 2,000 milliliters! At a gas station in New York, gas costs $3.50 per gallon. In London, petrol costs £1.50 per liter. Understanding both measurement systems helps you navigate the world!

# Module 20: Perimeter and Area

الموديول العشرون: المحيط والمساحة

Perimeter is the distance around the outside of a shape, and area is the space inside the shape. These are two of the most important measurements in geometry! For a rectangle, perimeter = 2 x (length + width). For example, a rectangle 8 cm long and 5 cm wide has perimeter = 2 x (8 + 5) = 2 x 13 = 26 cm. Area = length x width = 8 x 5 = 40 square cm. Notice that perimeter is measured in regular units (cm) while area is measured in square units (square cm). This is because perimeter measures a length (one-dimensional) while area measures a surface (two-dimensional).

**Perimeter** المحيط — the distance around a shape

**Area** المساحة — the space inside a shape

**Square Unit** وحدة مربعة — a unit for measuring area (e.g., sq cm, sq ft)

## Perimeter of Rectangles and Squares

For any rectangle, Perimeter = 2L + 2W (where L is length and W is width). You can also write P = 2(L + W). For a square, since all sides are equal, P = 4s (where s is the side length). Example: A square playground with sides of 25 meters has a perimeter of 4 x 25 = 100 meters. If you want to put a fence around it, you need 100 meters of fencing. A rectangular garden 12 feet by 9 feet needs 2(12 + 9) = 42 feet of fencing. Perimeter problems always involve going all the way around the outside edge of the shape.

## Area of Rectangles and Squares

Area of a rectangle = L x W. Area of a square = s x s (or s squared). Example: A bedroom is 14 feet by 12 feet. Area = 14 x 12 = 168 square feet. This tells you how much carpet or flooring you need. If carpet costs $8 per square foot, total cost = 168 x 8 = $1,344. A square tile is 30 cm on each side. Area = 30 x 30 = 900 square cm. Area is always measured in square units because you are counting how many unit squares fit inside the shape.

## Finding Unknown Dimensions

Sometimes you know the perimeter or area and need to find a missing side. If the perimeter of a rectangle is 40 cm and the length is 12 cm, find the width: P = 2(L + W), so 40 = 2(12 + W), 40 = 24 + 2W, 2W = 16, W = 8 cm. If the area is 48 square feet and the width is 6 feet, find the length: A = L x W, so 48 = L x 6, L = 48 / 6 = 8 feet. Use the formula, substitute what you know, and solve for the unknown using the inverse operation!

**تطبيق في الحياة الحقيقية / Real-Life Application**

A homeowner in Dallas wants to install new flooring in a 15 ft by 20 ft living room. Area = 15 x 20 = 300 square feet. If hardwood costs $12 per square foot, the total is $3,600. He also needs baseboards around the perimeter: P = 2(15 + 20) = 70 feet of baseboard at $3 per foot = $210. A farmer in Al Ain wants to fence a rectangular field 200 meters by 150 meters. Perimeter = 2(200 + 150) = 700 meters of fencing. If fencing costs 25 AED per meter, total = 700 x 25 = 17,500 AED. Perimeter and area calculations are used in every construction, landscaping, and home improvement project!

**نقطة مهمة / Key Point**

Perimeter and area are completely different measurements! Perimeter is a length (measured in units like cm, ft, m) and area is a surface (measured in square units like sq cm, sq ft, sq m). Two rectangles can have the same perimeter but different areas! For example, a 1 x 9 rectangle has perimeter 20 and area 9, while a 5 x 5 square has perimeter 20 and area 25. Same perimeter, very different areas. Always know which measurement you need!

## Module 21: Data and Time

الموديول الحادي والعشرون: البيانات والوقت

Data is information collected about people, things, or events. In Grade 4, you learn to organize, display, and interpret data using tables, bar graphs, line plots, and pictographs. You also learn to solve problems involving time, including calculating elapsed time (how much time passes between two events). These skills are essential because data is everywhere: weather reports, sports statistics, business reports, and scientific studies all use data. Understanding data helps you make informed decisions and see patterns in the world around you.

**Data** بيانات — information collected for analysis

**Bar Graph** رسم بياني عمودي — a graph using bars to show and compare data

**Line Plot** رسم بياني خطي — a graph showing data on a number line with X marks

**Elapsed Time** الوقت المنقضي — the amount of time between two events

### Organizing and Displaying Data

Raw data is just a list of numbers. To make sense of it, you need to organize it! A frequency table shows how often each value appears. A bar graph uses bars of different heights to compare categories.

A line plot shows each data value as an X above a number line. Each type of display is best for different situations. Bar graphs are great for comparing categories (like favorite foods). Line plots are great for showing how data is distributed (like test scores). When creating any graph, always include a title, labels, and a consistent scale!

## Solving Problems with Data

Once data is organized, you can analyze it to find patterns and answer questions. Common questions include: What is the most frequent value (mode)? What is the difference between the greatest and least values (range)? How many data points are there in total? For example, if a class measures the lengths of 20 beetles and records them on a line plot, you can find the most common length, the shortest and longest, and how many are longer than 2 cm. Data analysis skills are used in every profession: doctors analyze patient data, teachers analyze test scores, and businesses analyze sales data.

## Elapsed Time

Elapsed time is the time that passes from a start time to an end time. To find elapsed time, subtract the start time from the end time. For example, if a movie starts at 2:15 PM and ends at 4:05 PM: from 2:15 to 3:00 is 45 minutes, from 3:00 to 4:00 is 1 hour, from 4:00 to 4:05 is 5 minutes. Total = 1 hour 50 minutes. When the end time is smaller (crossing over an hour), borrow 60 minutes from the hours. For 9:45 AM to 11:30 AM: hours: 11 - 9 = 2, minutes: 30 - 45 (borrow): (60 + 30) - 45 = 45 minutes, and the hours become 1. So elapsed time = 1 hour 45 minutes.

### تطبيق في الحياة الحقيقية / Real-Life Application

A meteorologist in London records daily temperatures for a month and displays them on a line plot. The most common temperature (mode) was 18 degrees C, and the range was 12 to 25 degrees C. A business in Dubai tracks daily sales on a bar graph to see which day of the week has the most customers. A train schedule in Tokyo shows departure at 8:47 AM and arrival at 11:23 AM. Elapsed time = 2 hours 36 minutes. Data and time skills are essential in weather forecasting, business planning, transportation, sports, and every career that involves scheduling or tracking information!

### مثال من الحياة / Everyday Example

A student in Riyadh tracks how many pages he reads each day for a week: 12, 15, 8, 20, 12, 10, 15. He makes a line plot and finds the mode is 12 pages, the range is 8 to 20 pages, and the total is 92 pages. A family in Manchester takes a flight at 6:45 AM and lands at 9:20 AM. The flight took 2 hours 35 minutes! A football fan in Boston checks that a game started at 1:00 PM and ended at 3:47 PM. The game lasted 2 hours 47 minutes. Data and time are part of every single day!

### لماذا نتعلم القياس والبيانات والوقت؟ / Why Learn Measurement, Data, and Time?

These three topics are used more than any other math in daily life! Every time you check the time, measure ingredients, read a graph, or compare prices, you use these skills. Doctors measure medicine doses. Builders measure materials. Athletes track time. Scientists collect data. Business people analyze data to make decisions. Chefs measure ingredients. Pilots calculate flight times. Without measurement, data, and time skills, you cannot function in modern society! These are truly life skills that you will use every day, forever.