Oxford International Primary

6

# Maths

## Practice Book

Second edition

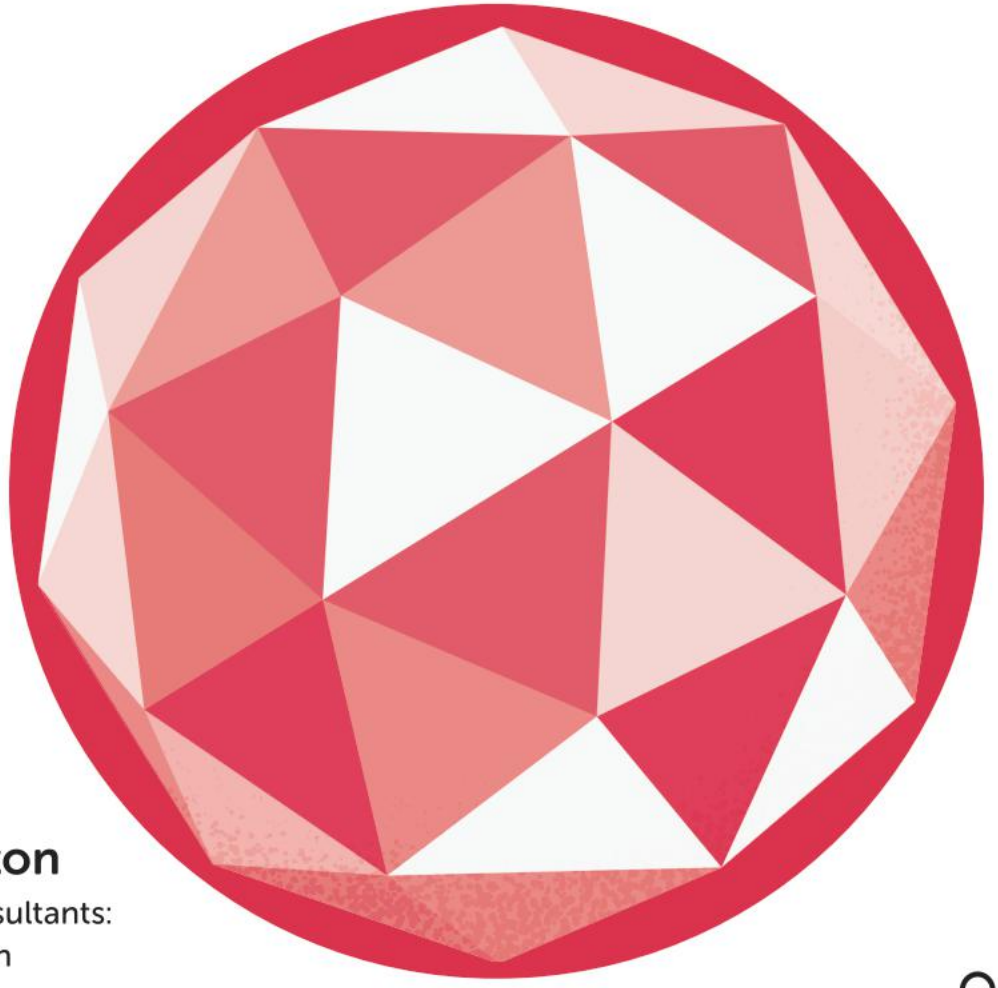
OXFORD

Oxford International Primary

6

# Maths

## Practice Book



**Tony Cotton**

Language consultants:
John McMahon
Liz McMahon

OXFORD

# Contents

# 1 Number and place value

## What students will learn

This unit further develops students' understanding of place value and number sequences. In the decimal number system, the value of a digit depends on its place, or position, in a number. For example, in the number 8 642 537, the 8 is worth 8 million and the 2 is worth 2 thousand. Students will read, write, order and round numbers up to 10 million. When we work with very large numbers, rounding can help us to make estimates before calculating. Students will also develop their understanding of negative numbers, mainly in the context of temperature.

Finally, they will use all this knowledge to solve real-life problems.

**Learning objectives:**

- read and compare numbers up to 10 000 000
- round any whole number to a required degree of accuracy
- use negative numbers
- solve number problems.

## Key words

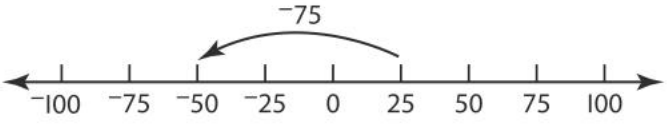
| | | |
|---|---|---|
| place value | greater than (>) | place-value grid |
| 4-, 5-, 6-, 7-digit number | less than (<) | power of 10 |
| multiple of 10 | halfway between | positive/negative number |
| ten thousand, hundred thousand | estimate | number pairs |
| million, ten million | approximate | known facts |
| | round to the nearest | derive |

## Ways to help

- Many people say that when we multiply by 10 we 'add a zero'. This works with whole numbers, but not with decimals. For example, 24.31 × 100 = 2431, not 24.3100. Instead, encourage students to use (or imagine) a place-value grid and move the digits two places to the left:

| | Thousands | Hundreds | Tens | Ones | . | Tenths | Hundredths |
|---|---|---|---|---|---|---|---|
| | | | 2 | 4 | . | 3 | 1 |
| × 100 | 2 | 4 | 3 | 1 | . | | |

- Encourage students to use a number line to help them visualise calculations that go across zero, and say the complete calculation. For example, 25 – 75 = ⁻50:




- When you see large numbers in newspapers or magazines, discuss how you could round them to a suitable degree of accuracy.

# 2 Addition, subtraction, multiplication and division

## What students will learn

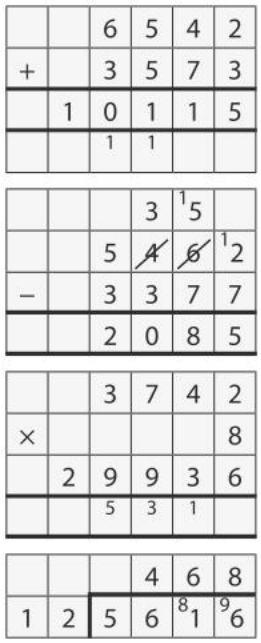
Mental calculation is one of the most important skills that students can learn. Using known facts to derive new ones is at the heart of problem solving. The first response to any problem should be 'Can I calculate that mentally?' Calculators or a written method should be a last resort. When using these, students should always make an estimate first so that they can check their answer.

Once the firm foundations of mental calculation have been reinforced, students will move on to rehearsing formal written methods for calculating.

Students will also learn about the order of operations, using the acronym 'BIDMAS' as a reminder: brackets, indices, division/multiplication, addition/subtraction.

**Learning objectives:**

- perform mental calculations, including with mixed operations and large numbers
- use estimation to check answers to calculations
- solve addition, subtraction, multiplication and division problems using written methods
- interpret remainders to division problems as whole number remainders or fractions
- identify common factors, common multiples and prime numbers
- use your knowledge of the order of operations to carry out calculations involving the four operations.




## Key words

| | | | |
|---|---|---|---|
| addition | division, divisor | estimate | partition/partitioning |
| subtraction | dividend | mental strategy/ method | recombine |
| total | remainder | grid method | brackets |
| sum | factor | column method | order of operations |
| difference | multiple | written method | BIDMAS |
| place value | near multiple | long/short multiplication | commutative law |
| multiplication | common multiple | long/short division | associative law |
| multiples of 10 | prime number | known facts | distributive law |
| pairs to 10 | composite number | derive | |
| product | prime factor | | |
| quotient | divisibility rules | | |

## Ways to help

- Ask students to explain their strategies. This will help them understand much more clearly how they are approaching calculations, and how to use the same methods for other similar problems.
- Some methods may be different from the ones you were taught at school. Ask students to explain *how* the methods work; this will help them understand the methods better.
- Encourage students always to estimate before calculating. After calculating, remind them to compare their answer to their estimate. If these are very different, students should recheck their work.

# 3 Fractions, decimals and percentages

## What students will learn

The most important thing to understand about fractions is the idea of 'equality' – fractions are 'equal areas' or 'equal shares'. The denominator (bottom number) tells us how many equal parts the whole is divided into. The numerator (top number) tells us how many parts we need to find.

This unit further develops students' understanding of the equivalence between fractions, decimals and percentages. For example, $\frac{3}{4}$ is equivalent to 0.75 and to 75%. Students can then decide which fractional form is the best to use in a particular context.

Students will gain a deeper understanding of fractions greater than 1. These can be written as either improper fractions or mixed numbers. For example, $\frac{7}{4}$ is an improper fraction. The equivalent mixed number is $1\frac{3}{4}$.

Finally, students learn how they can carry out calculations when adding, subtracting, multiplying or dividing fractions and decimals.

**Learning objectives:**

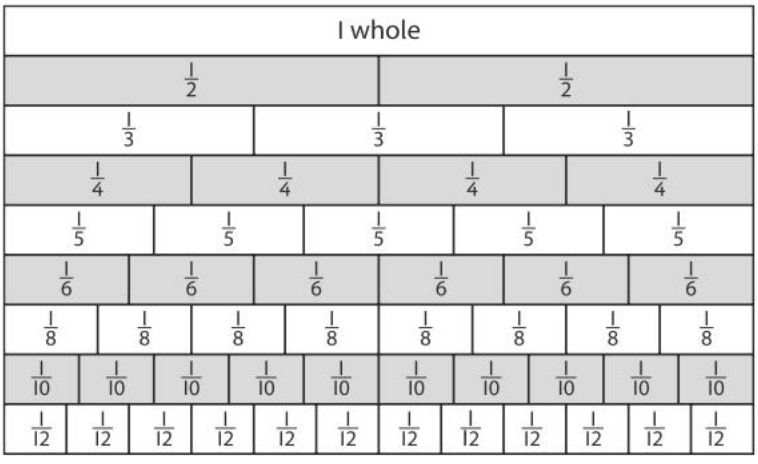
- use common factors to simplify fractions and use common multiples to write fractions with the same denominator
- compare and order fractions, including fractions greater than 1
- add, subtract, multiply and divide with fractions and decimals
- convert fractions to decimals and decimals to fractions
- understand place value in numbers with up to three decimal places
- solve problems involving fractions, decimals and percentages.

## Key words

| | | | |
|---|---|---|---|
| proper fraction | numerator | decimal equivalent | decimal place |
| improper fraction | denominator | tenths | round |
| mixed number | common multiple | nearest tenth | percentages |
| equivalent fraction | common denominator | hundredths | equivalent |
| simplest form | decimal fraction | thousandths | bar model |

## Ways to help

- Students still need to see fractions modelled practically as often as possible, for example by folding paper strips or cutting up cakes or pizzas.
- You could display a fraction wall like this, to help students understand equivalent fractions. Ask students to write the equivalent decimal fractions and percentages on each section of the wall.
- Encourage students to look out for fractions, decimals and percentages in real life. For example, percentages are often used when shops advertise sales, and you could ask students to mentally calculate the new prices.



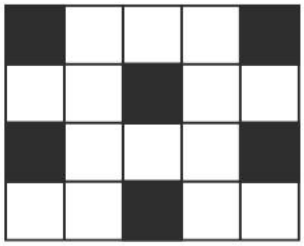
# 4 Ratio and proportion

## What students will learn

In this unit, students use their knowledge of fractions to calculate ratios and proportions.

Ratio compares part to part. For example, 1 to 4 is a ratio. If there is one adult to every four children on a school trip, the ratio of adults to children is 1 : 4. The ratio of children to adults is 4 : 1.

Proportion compares a part to the whole. For example, 1 out of 5 is a proportion. One out of every five people on the trip is an adult. Four out of every five people on the trip are children. Proportions can be expressed as fractions or percentages. For example, $\frac{1}{5}$, or 20%, of the people on the trip are adults; $\frac{4}{5}$, or 80%, of the people on the trip are children.



In this pattern of floor tiles:

- the ratio of black to white tiles is 3 : 7
- the ratio of white to black tiles is 7 : 3.
- the proportion of black tiles is $\frac{3}{10}$, or 30%
- the proportion of white tiles is $\frac{7}{10}$, or 70%.

**Learning objectives:**

- solve problems using ratio and proportion
- use your knowledge of factors and multiples to solve problems
- solve problems using percentages
- use scale factors to solve problems.

## Key words

| | |
|---|---|
| ratio | percentage decrease |
| one to four (1 : 4) | scale factor |
| proportion | enlarge |
| percentage | enlargement |
| percentage increase | bar model |

## Ways to help

- Look in newspapers for reports that use percentages to explain information. Discuss what this means with students.
- Parents/carers: whenever you are using scaling in the home, you could ask students to help. For example, when cooking, students could help to calculate the amount of each ingredient needed for the correct number of people.

# 5 Algebra

## What students will learn

Algebra is used to explore and explain number patterns, but we also use algebra in our day-to-day lives. In this unit, students will create their own number patterns and will find the rules that make the patterns. They will use formulae both from mathematics (for example calculating areas of shapes) and from real life (for example calculating how long a journey will take if we know the speed and the distance to travel).

Students will also begin to solve equations, a skill they will build on in the next phase of their education.

Although this is likely to be the first time students are formally 'introduced' to algebra, they should quickly see the links to work they have done in previous Stages. For example, they will be familiar with missing number problems, such as 92 – ? = 86. They will encounter similar equations in this unit, with shapes or letters representing the missing numbers.

**Learning objectives:**

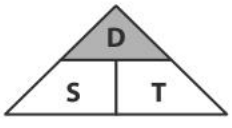
- use simple formulae
- generate and describe linear number sequences
- solve missing number problems
- solve equations with unknown values
- solve problems with variables.

## Key words

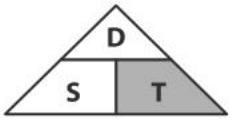
| | | |
|---|---|---|
| number sequence | formula, formulae | variable |
| linear number sequence | equation | constant |
| rule | missing number | solve |
| term | unknown | substitute, substitution |

## Ways to help

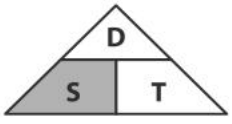
- Look out for algebra in real life and involve students in solving problems. If you are planning a trip, use the time/speed/distance formulae to calculate how long it might take. If you have completed a journey, calculate your average speed.




Distance = Speed × Time




$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$




$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

# 6 Length, mass and capacity

## What students will learn

By Stage 6, students will have a good understanding of how to measure and compare length, mass and capacity. This unit develops their ability to use their understanding of the decimal number system to convert between metric units. They should remember that, in the context of measures, the prefix 'kilo' means 1000, 'centi' means $\frac{1}{100}$ and 'milli' means $\frac{1}{1000}$.

In this unit students are introduced to the idea that all measurements are approximations. For example, when measuring length we measure to the nearest millimetre, centimetre, metre or kilometre, depending on what we are measuring and the required degree of accuracy.

Students also use imperial units and make approximate conversions to metric units, for example as shown here.

| Imperial | Metric (approximate) |
|---|---|
| 1 inch | 2.54 centimetres |
| 1 mile | 1.6 kilometres |
| 1 pound | 0.45 kilograms |
| 1 pint | 0.57 litres |

**Learning objectives:**

- use different units of measure, with up to three decimal places
- convert between different units of measure, with up to three decimal places
- convert between miles and kilometres
- solve measurement problems, including converting between units.

## Key words

| | | | |
|---|---|---|---|
| metric unit | millimetre (mm) | imperial unit | gallon |
| standard unit | tonne (t) | mile | pint |
| milli- | kilogram (kg) | yard | convert |
| centi- | gram (g) | foot, feet | conversion graph |
| kilo- | milligram (mg) | inch | scale drawing |
| kilometre (km) | litre (ℓ) | stone | degree of accuracy |
| metre (m) | centilitre (cl) | pound | |
| centimetre (cm) | millilitre (ml) | ounce | |

## Ways to help

- As in previous Stages, the best way to reinforce students' measuring skills is to provide lots of opportunities for physical measuring. If you are making something that requires measuring (such as cooking), ask students to carry out the measurements for you.
- Encourage students always to estimate first. This will help to improve their sense of the size of the different units of measurement.

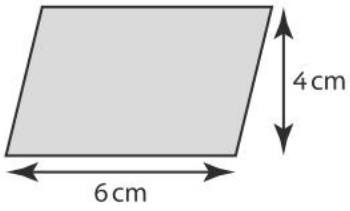
# 7 Area, perimeter and volume

## What students will learn

Students have learned how to calculate area (amount of space covered by a shape) and perimeter (the distance around the edge of a shape) in previous Stages. In this unit, they learn that we use standard measures for these measurements. Perimeter is measured in units of length (for example cm, m, km) and area is measured in square units (for example $cm^2$, $m^2$, $km^2$). This means that we calculate an area by finding out how many unit squares would fit inside the shape.

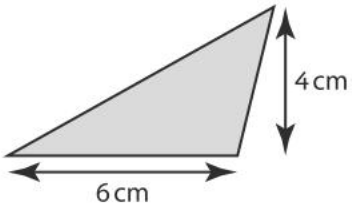
This unit introduces students to the formulae for calculating areas of parallelograms and triangles.

area of a parallelogram
= base × perpendicular height




area = $6 \times 4 = 24\,cm^2$

area of a triangle
= $\frac{1}{2}$ (base × perpendicular height)




area = $\frac{1}{2}(6 \times 4) = 12\,cm^2$

Finally, they will find volumes of a range of containers. Volume is measured in cubic units (for example $cm^3$, $m^3$, $km^3$).

**Learning objectives:**

- recognise that shapes with the same area can have different perimeters and vice versa
- recognise when it is possible to use formulae to calculate the area and volume of shapes
- calculate the area of parallelograms and triangles
- calculate, estimate and compare the volume of cubes and cuboids.

## Key words

| | | |
|---|---|---|
| perimeter | height | cubic metre ($m^3$) |
| area | perpendicular height | rectilinear shape |
| surface area | base | composite shape |
| volume | square centimetre ($cm^2$) | formula |
| length | square metre ($m^2$) | tangram |
| width | cubic centimetre ($cm^3$) | dimension |

## Ways to help

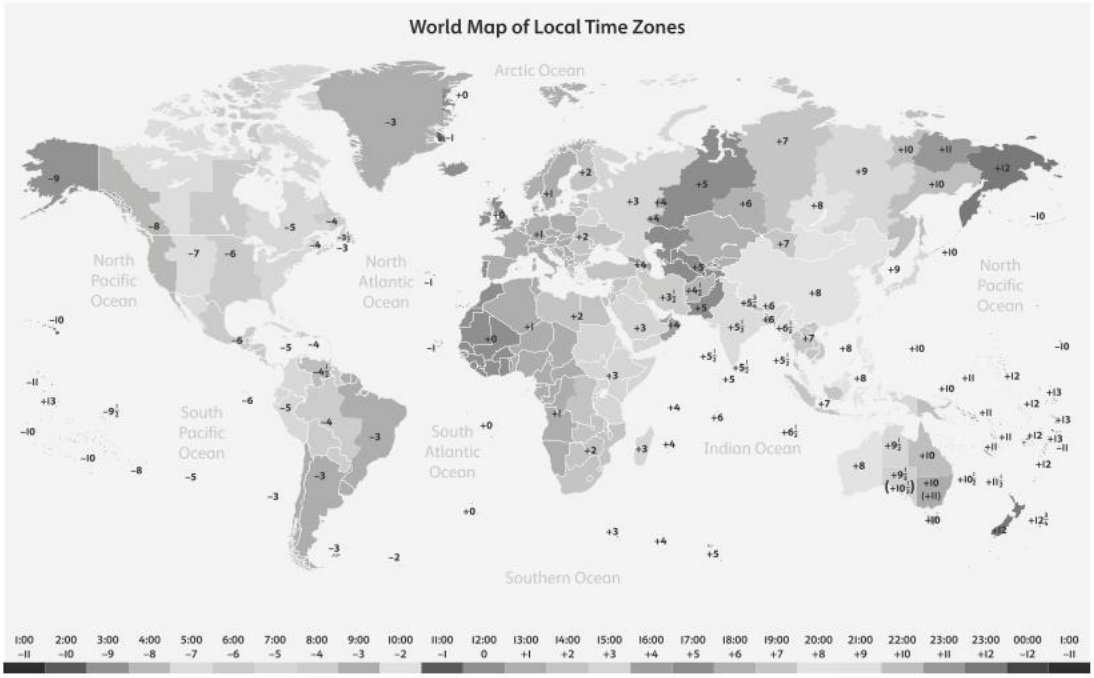
- Sometimes students confuse area and perimeter. You can help by looking at shapes and pointing out the perimeter and the area. For example, you could use identical-sized square mats or cards, place them together to make different shapes and ask students to compare the areas and perimeters.
- Ask students to calculate the area and perimeter of rooms at home or at school.
- Ask students to measure the dimensions of packaging boxes to find out the volume.

# 8 Time

## What students will learn

In this unit, students continue to tell the time to the nearest minute using analogue and digital clocks, and using 12-hour and 24-hour time. They will extend their skills in reading timetables and calendars, and carry out calculations involving converting between units of time.

They will be introduced to the concept of time zones and learn how to calculate the time in different places around the world.




**Learning objectives:**

- solve problems that involve converting between units of time.

## Key words

| | | |
|---|---|---|
| digital clock | century | hour |
| analogue clock | decade | second |
| 12-hour clock | year | millisecond |
| 24-hour clock | leap year | timetable |
| a.m. | month | time zone |
| p.m. | week | time difference |
| millennium | day | |

## Ways to help

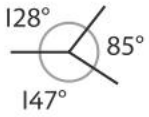
- Explore different time zones using the Internet. Find a website that shows clocks telling the time in different cities around the world. If students have family members in other countries, ask them to work out what the time is where their relative lives. For example, at lunchtime ask: 'What time is it where [name of family member] lives? What do you think they are doing now?'

# 9 Geometry – properties of shapes

## What students will learn

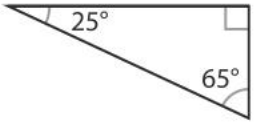
In this unit, students continue to classify (sort) 2-dimensional (2D) and 3-dimensional (3D) shapes, using increasingly complex properties. They will draw and make 2D and 3D shapes and compare them. By this Stage, students should be able to name all the common 2D and 3D shapes.

They learn how to recognise acute, obtuse and reflex angles, and measure angles to the nearest degree. They use this information to draw shapes accurately. They find missing angles, using their knowledge of the sum of angles at a point, on a straight line and within shapes.




angles at a point
total 360°


angles on a straight line
total 180°




angles in a triangle
total 180°

They also learn the names of different parts of a circle.

**Learning objectives:**

- draw 2D shapes using given dimensions and angles
- recognise, describe and build simple 3D shapes
- compare and classify geometric shapes
- illustrate and name parts of a circle
- recognise angles and find missing angles.

## Key words

| | | | |
|---|---|---|---|
| 2D/3D shape | edge | missing angle | diameter, radius, circumference |
| polygon | corner | parallel | rotational symmetry |
| polyhedron | vertex, vertices | cube, net of cube | order of rotational symmetry |
| regular/irregular | face | dimensions | isometric paper |
| properties | right angle | volume | plan |
| volume | acute, obtuse, reflex | protractor | front/side elevation |
| side | internal angle | centre | |

## Ways to help

- As in the units on shape in earlier Stages, the best way to help students is to point out, name and talk about all the shapes that you see in the environment around you. There will be lots of different shapes at home and in the local area. Take photographs of shapes you see around you and ask students to describe their properties.

# 10 Geometry – position and direction

## What students will learn

This unit develops students' ability to describe the position and movement of objects on coordinate grids, using all four quadrants. We use coordinates to describe position and we use transformations such as reflections, rotations and translations to describe how objects move around the grid.

**Learning objectives:**

- draw, translate and reflect simple shapes on a coordinate grid
- describe position using all four quadrants on a coordinate grid.

## Key words

| | | |
|---|---|---|
| coordinate grid | origin | mirror line |
| coordinates | transformation | parallel |
| axis, axes | translate (slide), translation | perpendicular |
| quadrants | rotate, rotation | clockwise |
| first, second, third, fourth quadrant | symmetry, symmetrical | anti-clockwise |
| | line of symmetry | |

## Ways to help

- Make copies of a coordinate grid like this one and use cut-out copies of shapes. Students can then physically move the shapes around the grid, giving the coordinates of the vertices and describing the movements. Encourage them to use the correct terminology when they do this.
- Look out for patterns around the home or school that include symmetry and translations. Sketch them on coordinate grids and discuss them.