Oxford International Primary Maths

Thinking and working mathematically with Oxford International Primary Maths

The Cambridge Primary Mathematics framework identifies eight learner attributes which contribute to learners working mathematically. Oxford International Primary Maths is a comprehensive mathematics programme which will support all learners in developing the skills necessary to become 'mathematical thinkers'.

Oxford International Primary Maths takes a problem solving approach to learning and teaching mathematics and thinking mathematically is one of the core aims. To support this, the course focuses on developing a series of important skills including working systematically, specialising, pattern spotting, trial and improvement, visualising, conjecturing and generalising. These skills will ensure that learners become successful mathematical thinkers.

The eight learner attributes in the Cambridge Primary Mathematics framework are:

- **Specialising**: Choosing an example and checking to see if it satisfies or does not satisfy specific mathematical criteria.
- **Generalising**: Recognising an underlying pattern by identifying many examples that satisfy the same mathematical criteria.
- **Conjecturing**: Forming mathematical questions or ideas.
- **Convincing**: Presenting evidence to justify or challenge a mathematical idea or solution.
- **Characterising**: Identifying and describing the mathematical properties of an object.
- **Classifying**: Organising objects into groups according to their mathematical properties.
- **Critiquing**: Comparing and evaluating mathematical ideas, representations or solutions to identify advantages and disadvantages.
- **Improving**: Refining mathematical ideas or representations to develop a more effective approach or solution.

The following extracts from Oxford International Primary Maths show how these attributes are developed. There are three main components of the course: Student Books; Practice Books and Teacher's Guides. The following exemplars draw on all three components. They also draw from across the age range of learners, from Stage 1 to Stage 6.

Meet the author team

Dr Tony Cotton is the Series Editor and lead author for Oxford International Primary Maths.

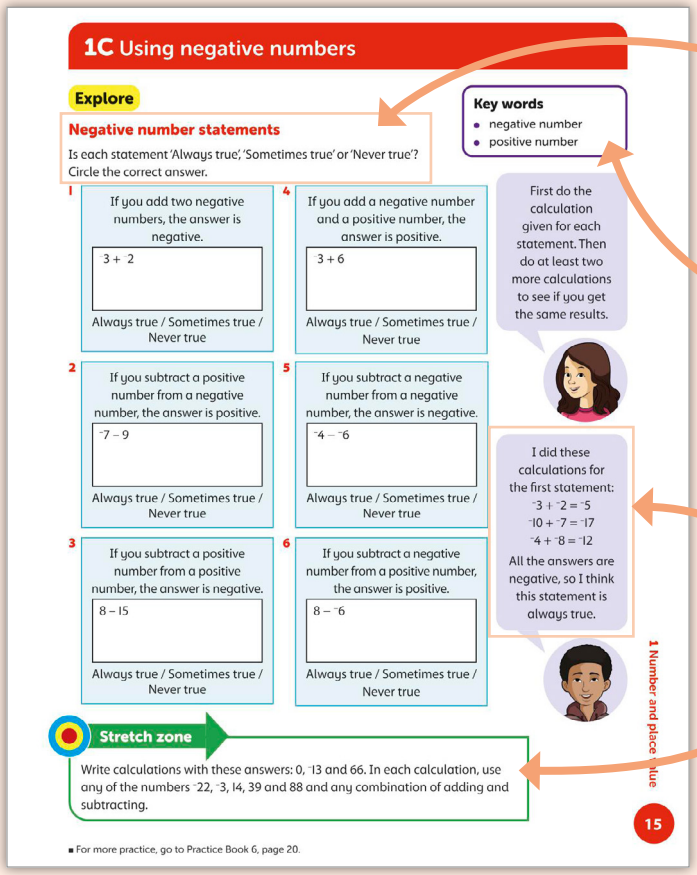
He is an independent educational consultant with over 40 years' experience in teaching mathematics and teacher education.

Tony is the author of *Approaches to Learning and Teaching Primary: A Toolkit for International Teachers,* for teachers in international schools following the Cambridge Assessment International Education (CAIE) curriculum framework. Tony has recently worked with Ministries of Education in Macedonia and Oman to develop and implement new mathematics curricula based on the CAIE curriculum framework.

Dr Ray Huntley is an author for Oxford International Primary Maths. He is an independent educational consultant with over 40 years' experience in teaching mathematics in schools and developing teacher education and Professional Development programmes.

Ray has written many other mathematics resources including textbooks and online materials. He has worked with international schools as a Mathematics Adviser and works with Cambridge Assessment International Education (CAIE) developing assessment items for global clients, as well as collaborating internationally on research into teaching and learning mathematics.

Specialising and Generalising



1C Using negative numbers

Explore

Negative number statements

Is each statement 'Always true', 'Sometimes true' or 'Never true'? Circle the correct answer.

Key words
- negative number
- positive number

1 If you add two negative numbers, the answer is negative.
$^{-}3 + ^{-}2$
Always true / Sometimes true / Never true

2 If you subtract a positive number from a negative number, the answer is positive.
$^{-}7 - 9$
Always true / Sometimes true / Never true

3 If you subtract a positive number from a positive number, the answer is negative.
$8 - 15$
Always true / Sometimes true / Never true

4 If you add a negative number and a positive number, the answer is positive.
$3 + ^{-}6$
Always true / Sometimes true / Never true

5 If you subtract a negative number from a negative number, the answer is negative.
$^{-}4 - ^{-}6$
Always true / Sometimes true / Never true

6 If you subtract a negative number from a positive number, the answer is positive.
$8 - ^{-}6$
Always true / Sometimes true / Never true

First do the calculation given for each statement. Then do at least two more calculations to see if you get the same results.

I did these calculations for the first statement:
$^{-}3 + ^{-}2 = ^{-}5$
$^{-}10 + ^{-}7 = ^{-}17$
$^{-}4 + ^{-}8 = ^{-}12$
All the answers are negative, so I think this statement is always true.

Stretch zone

Write calculations with these answers: 0, $^{-}13$ and 66. In each calculation, use any of the numbers $^{-}22$, $^{-}3$, 14, 39 and 88 and any combination of adding and subtracting.

For more practice, go to Practice Book 6, page 20.

1 Number and place value

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Always true/sometimes true/never true categorisations, as well as looking for and spotting patterns, are used to support specialising and generalising.

There is a focus on key mathematical vocabulary to support generalisation and specialisation.

Characters try different examples and make general statements to formulate rules.

Rules are applied to other examples.

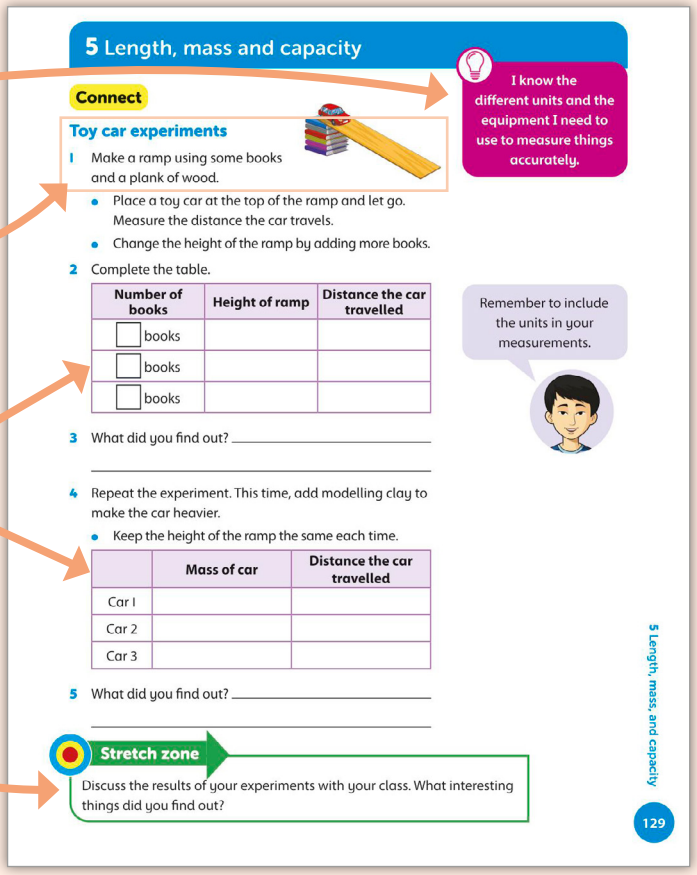
Conjecturing

Students draw on prior experience and relatable context to support confidence in making predictions.

Practical examples support conjecturing.

Repeat activities test conjectures.

Students communicate the results of testing conjectures.



5 Length, mass and capacity

I know the different units and the equipment I need to use to measure things accurately.

Connect

Toy car experiments

1 Make a ramp using some books and a plank of wood.
- Place a toy car at the top of the ramp and let go. Measure the distance the car travels.
- Change the height of the ramp by adding more books.

2 Complete the table.

Number of books	Height of ramp	Distance the car travelled
☐ books		
☐ books		
☐ books		

Remember to include the units in your measurements.

3 What did you find out? _____

4 Repeat the experiment. This time, add modelling clay to make the car heavier.
- Keep the height of the ramp the same each time.

	Mass of car	Distance the car travelled
Car 1		
Car 2		
Car 3		

5 What did you find out? _____

Stretch zone

Discuss the results of your experiments with your class. What interesting things did you find out?

5 Length, mass and capacity

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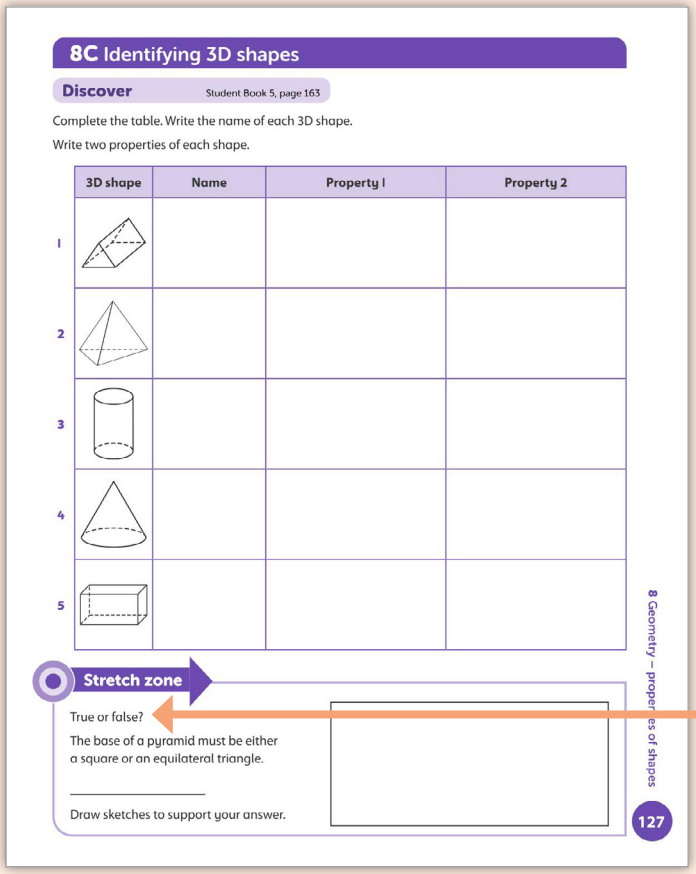
Convincing



8C Identifying 3D shapes

Discover Student Book 5, page 163

Complete the table. Write the name of each 3D shape.

Write two properties of each shape.

	3D shape	Name	Property 1	Property 2
1				
2				
3				
4				
5				

Stretch zone

True or false?

The base of a pyramid must be either a square or an equilateral triangle.

Draw sketches to support your answer.

8 Geometry – properties of shapes

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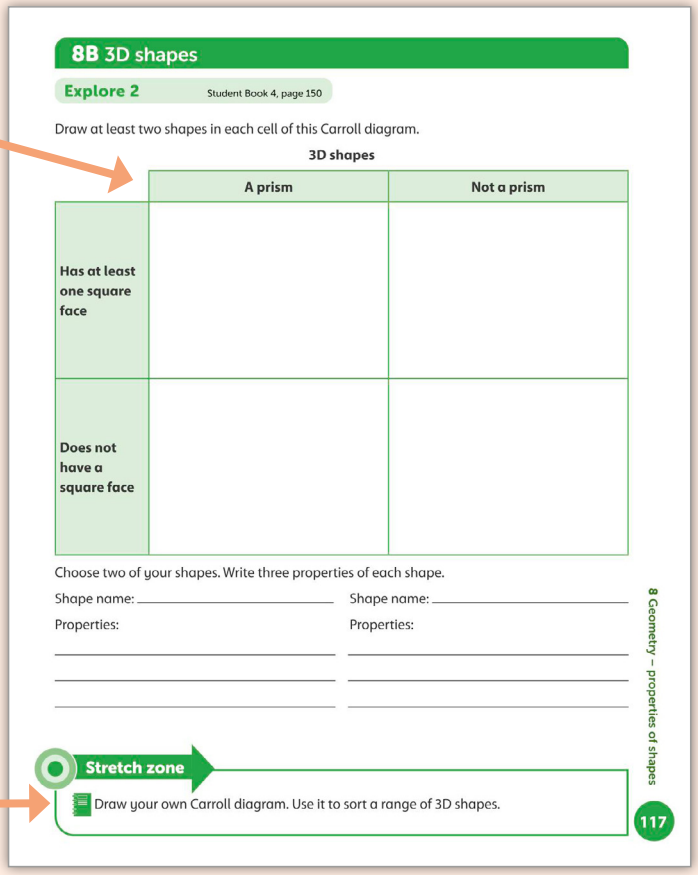
True or false questions are used to ask students for evidence and proof.

Characterising and Classifying

Charts are used to classify and sort objects into groups using properties.



8B 3D shapes

Explore 2 Student Book 4, page 150

Draw at least two shapes in each cell of this Carroll diagram.

3D shapes

	A prism	Not a prism
Has at least one square face		
Does not have a square face		

Choose two of your shapes. Write three properties of each shape.

Shape name: _____ Shape name: _____

Properties: Properties:

Stretch zone

Draw your own Carroll diagram. Use it to sort a range of 3D shapes.

8 Geometry – properties of shapes

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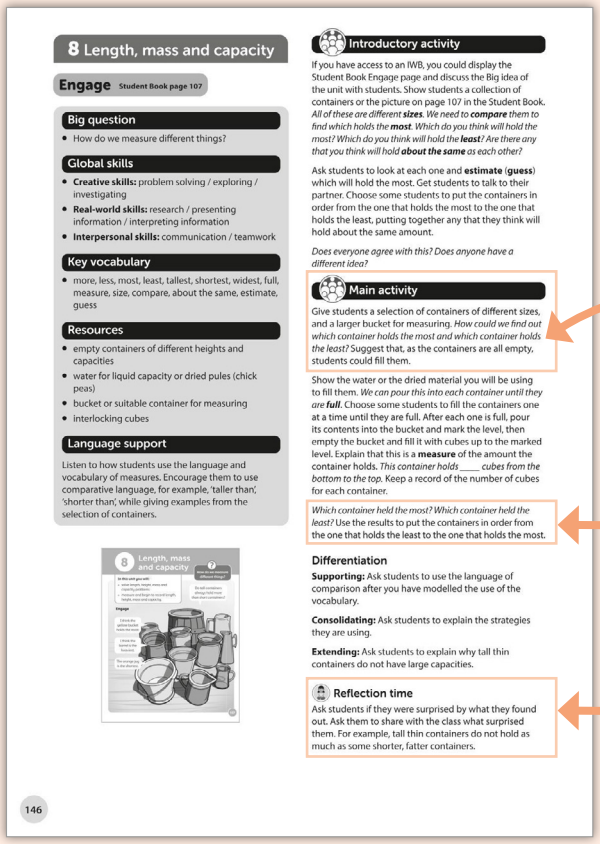
Students notice that shapes are defined by their properties.

Critiquing



8 Length, mass and capacity

Engage Student Book page 107

Big question
- How do we measure different things?

Global skills
- **Creative skills:** problem solving / exploring / investigating
- **Real-world skills:** research / presenting information / interpreting information
- **Interpersonal skills:** communication / teamwork

Key vocabulary
- more, less, most, least, tallest, shortest, widest, full, measure, size, compare, about the same, estimate, guess

Resources
- empty containers of different heights and capacities
- water for liquid capacity or dried pules (chick peas)
- bucket or suitable container for measuring
- interlocking cubes

Language support

Listen to how students use the language and vocabulary of measures. Encourage them to use comparative language, for example, 'taller than', 'shorter than', while giving examples from the selection of containers.

Introductory activity

If you have access to an IWB, you could display the Student Book Engage page and discuss the Big idea of the unit with students. Show students a collection of containers or the picture on page 107 in the Student Book. *All of these are different **sizes**. We need to **compare** them to find which holds the **most**. Which do you think will hold the most? Which do you think will hold the **least**? Are there any that you think will hold **about the same** as each other?*

Ask students to look at each one and **estimate** (**guess**) which will hold the most. Get students to talk to their partner. Choose some students to put the containers in order from the one that holds the most to the one that holds the least, putting together any that they think will hold about the same amount.

Does everyone agree with this? Does anyone have a different idea?

Main activity

Give students a selection of containers of different sizes, and a larger bucket for measuring. *How could we find out which container holds the most and which container holds the least?* Suggest that, as the containers are all empty, students could fill them.

Show the water or the dried material you will be using to fill them. *We can pour this into each container until they are **full**.* Choose some students to fill the containers one at a time until they are full. After each one is full, pour its contents into the bucket and mark the level, then empty the bucket and fill it with cubes up to the marked level. Explain that this is a **measure** of the amount the container holds. *This container holds ___ cubes from the bottom to the top.* Keep a record of the number of cubes for each container.

Which container held the most? Which container held the least? Use the results to put the containers in order from the one that holds the least to the one that holds the most.

Differentiation

Supporting: Ask students to use the language of comparison after you have modelled the use of the vocabulary.

Consolidating: Ask students to explain the strategies they are using.

Extending: Ask students to explain why tall thin containers do not have large capacities.

Reflection time

Ask students if they were surprised by what they found out. Ask them to share with the class what surprised them. For example, tall thin containers do not hold as much as some shorter, fatter containers.

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Whole class activity explores different estimates, with a focus on questioning to support discussion of ideas.

Students' skills are applied to find a solution.

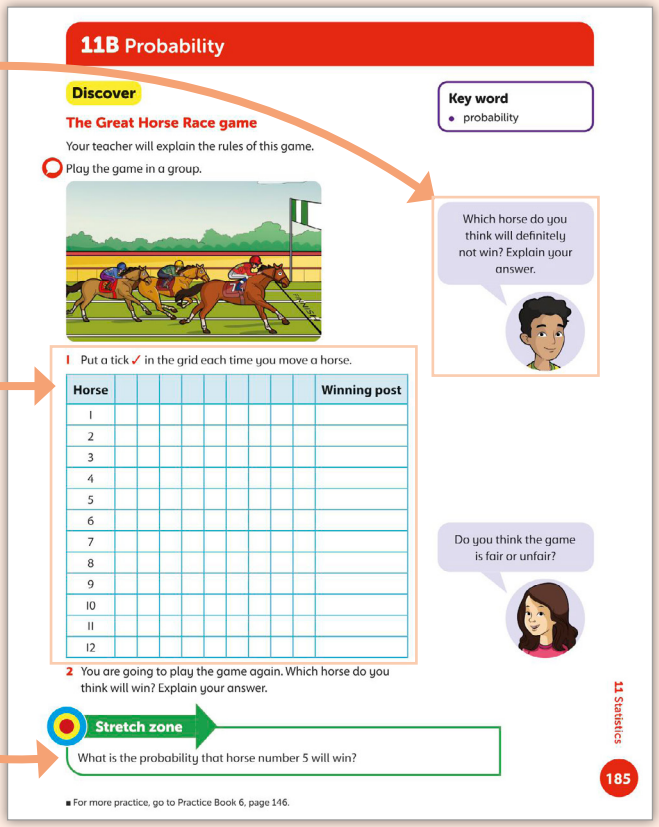
Group discussion is used to evaluate and compare ideas.

Improving

Students are asked to make conjectures.

Games are played several times to enable students to notice results.

Students' experience is used to make more effective predictions, applying the skills they have learnt as a result of playing the game.



11B Probability

Discover

The Great Horse Race game

Your teacher will explain the rules of this game.

Play the game in a group.

Key word
- probability

Which horse do you think will definitely not win? Explain your answer.

1 Put a tick ✓ in the grid each time you move a horse.

Horse										Winning post
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										

Do you think the game is fair or unfair?

2 You are going to play the game again. Which horse do you think will win? Explain your answer.

Stretch zone

What is the probability that horse number 5 will win?

11 Statistics

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■ For more practice, go to Practice Book 6, page 146.