

ACTIVITIES AND EXTENSIONS FOR GIFTED AND
ADVANCED LEARNERS IN

Challenging Australian Curriculum Maths Lessons

YEAR 4

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INTRODUCTION

The Australian Curriculum: Mathematics is a framework for F–10 curriculum standards that describe the mathematics skills and concepts students need to develop for success in higher education and the 21st-century workplace. The structure of the Australian Curriculum: Mathematics consists of two parts:

- Content strands, which describe what students should be taught and be able to do in their study of mathematics. These content strands are Number and Algebra, Measurement and Geometry, and Statistics and Probability, and are made up of a number of individual sub-strands.
- Proficiency strands, which describe how the content should be explored and developed. These proficiency strands have been integrated into the content strands, and help to ensure that students' mathematical skills become more sophisticated as their learning progresses.

With the adoption of the Australian Curriculum nation-wide, gifted and advanced learners need opportunities to master year-level standards and mathematical practices with greater depth, rigour and understanding. This revised edition of *Challenging Common Core Maths Lessons* is one of a series of books developed in conjunction with the Center for Gifted Education at William & Mary intended to give gifted and advanced learners additional practice and activities to master and engage with the Australian Curriculum: Mathematics. Each book in the series is organised by the content standards in one year level.

The lessons in this book cover Year 4 mathematics content. In Year 4, the content descriptions are addressed in 10 sub-strands:

- Number and Algebra
 - Number and Place Value
 - Fractions and Decimals
 - Money and Financial Mathematics
 - Patterns and Algebra
- Measurement and Geometry
 - Using Units of Measurement
 - Shape
 - Location and Transformation
 - Geometric Reasoning
- Statistics and Probability
 - Chance
 - Data Representation and Interpretation

PROFICIENCY IN MATHEMATICAL PRACTICE

To engage learners with the content strands, the Australian Curriculum: Mathematics provides four proficiency strands – ways in which the student can engage with the content descriptions at every year level:

1. Understanding
2. Fluency
3. Problem-Solving
4. Reasoning

Each lesson in this book identifies the proficiency strands by number. Activities and practice problems are structured to develop proficiency in learners. Teachers should be aware of the proficiency strands and look for opportunities to connect these practices to content understanding in every lesson.

PURPOSE

The lessons in this book were written with the assumption that a teacher has already introduced a mathematical content description through a primary curriculum source. Problem solving, practice problems, and activities enrich and extend current year-level mathematics content rather than accelerate students to above-year-level content. Each lesson is specific to a sub-strand, usually only focusing on one or two content descriptions, and provides additional support and enrichment for gifted and advanced learners.

LESSON STRUCTURE

Each lesson follows a predictable structure. It first begins by naming the focal content description(s) – what students should already know or to which they have been introduced. Next, the proficiency strands covered within the activities and problems are listed by number. The lesson includes an estimate for the time it might take to complete the lesson, but this will vary by teacher and classroom. Key terms are listed, and are included based on when the terms are first introduced in the Australian Curriculum or are a prerequisite for understanding the activity or problems in a lesson. Teachers should be sure their students already have a working knowledge of these terms before beginning the lesson.

Every lesson includes a list of materials needed, including handouts. It is assumed that students will have access to commonplace items such as pencils and paper, and the materials noted are those items that teachers will need to obtain/acquire in advance. The lesson objectives highlight what students will learn or be able to do as a result of completing the activities and problems.

All lessons include an opening activity to allow students to explore the concept (e.g. multiple representations, open-ended problems, observing number patterns). Each activity is followed by practice problems that challenge students (e.g. harder or less familiar numbers) and – more importantly – extend students' thinking beyond calculating an answer. The practice problems ask students to grapple with their understanding of the lesson concepts. The lessons conclude with an assessment practice that allows teachers to evaluate student learning. The practice problems were written to engage gifted and advanced learners in higher level thinking and deeper understanding of a mathematical concept. The Australian Curriculum Assessment Practice problems in this book were intentionally written for students to prepare for on-level standardised test questions similar to Australian Curriculum-based year-level assessments, given all students are required to take these types of assessments.

GROUPING OPTIONS

The lessons in this book can be used for whole-group, small-group and individual instruction.

Whole-Group Instruction

Teachers can use this book in one academic year in conjunction with the primary curriculum in a gifted or advanced mathematics class. All students would complete each lesson after being introduced to a particular content description. Teachers can integrate the lessons into the primary curriculum taught to a whole group and address higher-order thinking questions through the lesson activity and practice problems.

Small-Group Instruction

Teachers can use this book to differentiate learning in any mathematics class by creating flexible student groups and giving students who need enrichment an opportunity for deeper understanding and engagement with a concept. Students can complete activities and practise at a self-guided pace with a partner or small group and engage in peer discussion, with or without directed supervision or intervention from the teacher.

Individual Instruction

The practice problems and assessment questions in each lesson are a good way to determine individual understanding of a certain mathematics concept on a deeper level. Nearly every practice problem emphasises making sense of and communicating the process of problem solving and asks students to explain their thinking.

LESSON 1.1

Addition and Subtraction With Place Value and Rounding

Australian Curriculum: Mathematics Content Descriptions

- Recognise, represent and order numbers to at least tens of thousands (ACMNA072)
- Apply place value to partition, rearrange and regroup numbers to at least tens of thousands to assist calculations and solve problems (ACMNA073)

Proficiency Strands

- 1, 2, 3 and 4

Estimated Time

- 60 minutes

Key Terms

- Precise
- Estimate
- Addends

Materials

- Lesson 1.1 Activity: Budget Plans for Businesses
- Lesson 1.1 Practice: Place Value and Rounding
- Lesson 1.1 Australian Curriculum Assessment Practice

Objectives

In this lesson, students will

- formulate a budget plan using place value and rounding
- explain the relationship between two expressions using properties of multiplication
- model rounding of numbers on a number line.

Lesson 1.1 Activity: Budget Plans for Businesses

In this activity, students will work in pairs to develop a business plan. Students will be asked to start a business for the local outdoor community market day where various vendors sell their items. To begin, students will formulate a budget plan that meets the given requirements. Each business is loaned \$350 and must choose three start-up items to purchase from a list of items. Students will determine the precise amount of money spent, the precise amount of money left over, and an estimate of how much money would be needed to purchase all of the start-up items on the list. Students will also explain the relationship between two different business scenarios, making the connection to properties of addition and subtraction. Students will represent the rounding of numbers within their businesses on a number line.

LESSON 2.4

Fractions and Number Lines

Australian Curriculum: Mathematics Content Description

- Count by quarters halves and thirds, including with mixed numerals. Locate and represent these fractions on a number line (ACMNA078)

Proficiency Strands

- 1 and 3

Estimated Time

- 60 minutes

Key Terms

- Partition

Materials

- Lesson 2.4 Activity: Fractional Lengths
- Lesson 2.4 Practice: Fractions and Number Lines
- Lesson 2.4 Australian Curriculum Assessment Practice
- Straws
- Whiteboard markers
- Scissors
- Rulers

Objectives

In this lesson, students will

- partition wholes into fractional pieces
- represent fractions on a number line.

Lesson 2.4 Activity: Fractional Lengths

In this activity, students are in charge of the plumbing at a new construction site. Students will measure and cut various lengths of pipe (straws) based on fractional measurements. Each pair of students needs eight straws that are about 20 centimetres long. The first straw represents the whole, and is never cut. All fractional measurements are referencing this whole. Students will read a scenario and then cut various straws into $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{6}$, $\frac{1}{8}$, $\frac{1}{10}$ and $\frac{1}{12}$. You can give students these

measurements, or have them use a ruler to determine how long each fractional piece should be. After reading each scenario and after each pipe is cut, students will locate and mark that fraction on a 20-centimetre number line (p. 118). Students can use the fractional pieces they cut to help them locate where the fraction should be located on the number line.

LESSON 3.1

Multi-Step Word Problems

Australian Curriculum: Mathematics Content Descriptions

- Solve word problems by using number sentences involving multiplication or division where there is no remainder (ACMNA082)
- Find unknown quantities in number sentences involving addition and subtraction and identify equivalent number sentences involving addition and subtraction (ACMNA083)

Proficiency Strands

- 1, 3 and 4

Estimated Time

- 60 minutes

Key Terms

- Variable
- Operations

Materials

- Lesson 3.1 Activity: Chef's Choice
- Lesson 3.1 Meal Request Cards
- Lesson 3.1 Food Fact Sheet
- Lesson 3.1 Menu
- Lesson 3.1 Practice: Multi-Step Word Problems
- Lesson 3.1 Australian Curriculum Assessment Practice

Objectives

In this lesson, students will

- solve multi-step word problems to solve real-world scenarios
- construct meal plans to solve word problems.

Lesson 3.1 Activity: Chef's Choice

In this activity, students will become chefs who are making meals for individuals with specific dietary needs. Each pair of students needs a set of meal request cards, which indicate the specific kilojoule-related requirements and requested food categories for the individuals. Each student will use the Food Fact Sheet to determine how many kilojoules are in each food type. They will create a meal based on the information provided on the Meal Request Cards and Food Fact Sheets by filling in the menu. Each group of students will need four menus.

LESSON 4.1

Time

Australian Curriculum: Mathematics Content Description

- Use 'am' and 'pm' notation and solve simple time problems (ACMMG086)

Proficiency Strands

- 1, 2 and 3

Estimated Time

- 60 minutes

Key Terms

- Schedule

Materials

- Lesson 4.1 Activity: Scheduling
- Lesson 4.1 School Schedule
- Lesson 4.1 Practice: Time
- Lesson 4.1 Australian Curriculum Assessment Practice

Objectives

In this lesson, students will

- create a schedule based on given time requirements
- solve elapsed time problems related to real-world scenarios.

Lesson 4.1 Activity: Scheduling

In this lesson, students will create a school day schedule based on given requirements. They are asked to include maths, science, humanities and social sciences, English, languages, physical education, music, lunch and recess. All classes except music are designated with a specific length of time (they will have to decide how long music class will be, given the other parameters). Students are aware that school starts at 8.50, and lasts for exactly 6 hours and 30 minutes. Students will arrange the subjects in any order they desire, as long as the day starts and ends on time. In addition, they are restricted by two 15-minute breaks that cannot be changed.