

ACTIVITIES AND EXTENSIONS FOR GIFTED AND ADVANCED
LEARNERS IN

**Challenging
Australian Curriculum
Maths Lessons**

YEAR 5

MOLLY BRYAN TALBOT



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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 5 mathematics content. In Year 5, 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

STANDARDS FOR 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

Factor Pairs and Multiples

Australian Curriculum: Mathematics Content Description

- Identify and describe factors and multiples of whole numbers and use them to solve problems (ACMNA098)

Mathematical Practices

- 1, 2, 3 and 4

Estimated Time

- 60–90 minutes

Key Terms

- Prime number
- Composite number
- Factor pair
- Multiple
- Square number (This term may not have been covered yet, so it may need to be explained.)

Materials

- Lesson 1.1 Activity: Factor Pairs and Multiples
- Lesson 1.1 Number Cards (one set per group)
- Lesson 1.1 Practice: Factor Pairs and Multiples
- Lesson 1.1 Australian Curriculum Assessment Practice
- Counters (100 per group)
- Grid or poster paper
- Hundreds chart (one per student; needs to be made in advance)
- Crayons or coloured pencils

Objectives

In this lesson, students will

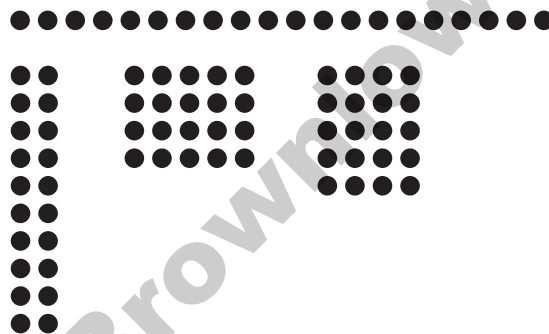
- design arrays to find all factor pairs for a whole number in the range of 1–100
- recognise that a whole number is a multiple of each of its factors
- apply knowledge of multiples to determine whether a given whole number in the range of 1–100 is a multiple of a given one-digit number
- determine whether a given whole number in the range of 1–100 is prime or composite.

Lesson 1.1 Activity: Factor Pairs and Multiples

In this activity, students will work in pairs and take turns randomly choosing a number card. Students will design all arrays using counters for the number on their card as they work as artists to design patterns for artwork (see examples below). Students will record all arrays, including length and width, on the grid or poster paper provided. Students will then list all factor pairs for their card numbers and work to find a specified multiple for their numbers. Students will determine generalised rules for when a number is a multiple of another number.

Teacher's Note. This lesson includes questions about prime numbers. You may have to explain the misconception that 0 and 1 are neither prime nor composite numbers and that 2 is the only even prime number.

2×10
Possible Arrays



3×11
Possible Arrays



LESSON 2.3

Add and Subtract Mixed Numbers

Australian Curriculum: Mathematics Content Description

- Investigate strategies to solve problems involving addition and subtraction of fractions with the same denominator (ACMNA103)

Mathematical Practices

- 1, 2, 3 and 4

Estimated Time

- 60–90 minutes

Key Terms

- Mixed number
- Denominator
- Numerator

Teacher's Note. Adjust the time or partitions of the playground according to your needs. If your school has a large playground, you might want to increase the time limit per person, as you want each child to make at least $1\frac{1}{2}$ laps around the playground per turn, but not more than five laps around per turn so as not to wear them out.

Materials

- Lesson 2.3 Activity: Playground Maths
- Lesson 2.3 Practice: Merriment With Mixed Numbers
- Lesson 2.3 Australian Curriculum Assessment Practice
- Stopwatch or timer
- Markers such as cones or ribbons for the fence
- Recipe books for practice extension (optional)

Objectives

In this lesson, students will

- analyse mixed numbers in data to solve problems
- restate a mixed number as an improper fraction
- relate addition and subtraction of mixed numbers to prior knowledge.

Lesson 2.3 Activity: Playground Maths

In this activity, students will work with at least three other people in their class to take turns recording how many times each person can run around the perimeter of the playground in three minutes. Before students begin gathering data, students need to mark places on the playground fence or asphalt so as to divide the perimeter into 12 parts to help make the recording easier.

LESSON 4.1

Perimeter of Polygons

Australian Curriculum: Mathematics Content Description

- Calculate perimeter and area of rectangles using familiar metric units (ACMMG109)

Mathematical Practices

- 1 and 3

Estimated Time

- 60 minutes

Key Terms

- Perimeter
- Polygon

Materials

- Lesson 4.1 Activity: Polygon Perimeter
- Lesson 4.1 Practice: Perimeter of Polygons
- Lesson 4.1 Australian Curriculum Assessment Practice
- Unifix Cubes
- Grid paper

Objectives

In this lesson, students will

- solve for the perimeter of polygons
- create polygons based on given perimeter information.

Lesson 4.1 Activity: Polygon Perimeter

In this activity, students will work together to figure out various layouts for swimming pools based on given data. Unifix Cubes (each representing 1 square metre) will be used to create the pools. Students will sketch the shape of the pool created by the cubes onto a sheet of paper and then label each side based on the number of cubes. As students build the various options for each pool based on the data given, a chart will be filled in for students to discover patterns once all of the pools are complete.

LESSON 5.1

Lines of Symmetry

Australian Curriculum: Mathematics Content Description

- Describe translations, reflections and rotations of two-dimensional shapes. Identify line and rotational symmetries (ACMMG114)

Mathematical Practices

- 1, 2, 3 and 4

Estimated Time

- 60–90 minutes

Key Terms

- Line symmetry
- Vertical symmetry
- Horizontal symmetry
- Polygon

Materials

- Lesson 5.1 Activity: Symmetry in Design
- Lesson 5.1 Practice: Seeing Symmetry
- Lesson 5.1 Australian Curriculum Assessment Practice
- Plain white paper
- Tracing paper
- Notebooks for practice extension (optional)

Objectives

In this lesson, students will

- develop a design that meets several guidelines for properties of shapes and lines of symmetry
- manipulate polygons to discover lines of symmetry
- analyse shapes to determine patterns of symmetry.

Lesson 5.1 Activity: Symmetry In Design

In this activity, students will take on the role of an architect participating in a design contest to design a stained glass window for a local courthouse. Students must adhere to the guidelines in their design drawing.