

Maths in the Real World of
DESIGN & ART

GEOMETRY, MEASUREMENTS AND PROJECTIONS

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Introduction

Teachers have always known the importance of making learning meaningful to students, while the Australian Curriculum: Mathematics reinforces the idea that teachers need to help students become problem-solvers by linking maths to the real world and to other areas of the curriculum. For students, numbers should be more than mere figures on the page – they should represent solutions to real-life situations and problems.

Maths in the Real World of Design and Art provides a hands-on learning experience in an authentic mathematics environment. The book focuses on real-world links while helping students to refine problem-solving skills. The culminating activity – construction of a model Geo-Lab – draws these skills together with a product-oriented project that also serves as a maths assessment.

Students will become involved in studying two-dimensional and three-dimensional geometric shapes; properties of angles, triangles, quadrilaterals and polygons; symmetry; measurement; perimeter; area; volume; tessellations; and pentominoes. Each section of the book stands alone for mini-lessons or flexible grouping instruction. Students may work in teams, pairs or independently throughout the course of the unit.

Several artistic projects are integrated with the maths, as geometry lends itself naturally to art and design. Students will have an opportunity to create original tessellations and three-dimensional figures of unusual shape as well as geometric quilt patterns and tiling designs.

In the Geo-Lab Planning Log, students organise their work and involve their peers in the solution of problems as they create a model of the Geo-Lab. This also helps them to evaluate the group experience and incorporates writing into the maths experience.

Links to the Australian Curriculum: Mathematics for Years 5–8

The following table shows how each topic covered in *Maths in the World of Design and Art* relates to content descriptions in the Australian Curriculum: Mathematics for Years 5–8. Teachers can use this table to plan curriculum-aligned lessons incorporating activities from this book.

TOPIC	YEAR 5	YEAR 6
Angles and Triangles	Estimate, measure and compare angles using degrees. Construct angles using a protractor (ACMMG112)	Investigate, with and without digital technologies, angles on a straight line, angles at a point and vertically opposite angles. Use results to find unknown angles (ACMMG141)
Polygons and Circles	Choose appropriate units of measurement for length, area, volume, capacity and mass (ACMMG108) Calculate the perimeter and area of rectangles using familiar metric units (ACMMG109)	Solve problems involving the comparison of lengths and areas using appropriate units (ACMMG137)
Patterns	Describe translations, reflections and rotations of two-dimensional shapes. Identify line and rotational symmetries (ACMMG114)	Investigate combinations of translations, reflections and rotations, with and without the use of digital technologies (ACMMG142)
Symmetry	Describe translations, reflections and rotations of two-dimensional shapes. Identify line and rotational symmetries (ACMMG114)	Investigate combinations of translations, reflections and rotations, with and without the use of digital technologies (ACMMG142)
Shapes and Length	Describe translations, reflections and rotations of two-dimensional shapes. Identify line and rotational symmetries (ACMMG114)	Investigate combinations of translations, reflections and rotations, with and without the use of digital technologies (ACMMG142)
Perimeter	Choose appropriate units of measurement for length, area, volume, capacity and mass (ACMMG108) Calculate the perimeter and area of rectangles using familiar metric units (ACMMG109)	Solve problems involving the comparison of lengths and areas using appropriate units (ACMMG137)
Area	Choose appropriate units of measurement for length, area, volume, capacity and mass (ACMMG108) Calculate the perimeter and area of rectangles using familiar metric units (ACMMG109)	Solve problems involving the comparison of lengths and areas using appropriate units (ACMMG137)
Three-Dimensional Shapes	Choose appropriate units of measurement for length, area, volume, capacity and mass (ACMMG108) Connect three-dimensional objects with their nets and other two-dimensional representations (ACMMG111)	Solve problems involving the comparison of lengths and areas using appropriate units (ACMMG137) Construct simple prisms and pyramids (ACMMG140)
Fantastic Shapes	Connect three-dimensional objects with their nets and other two-dimensional representations (ACMMG111)	Construct simple prisms and pyramids (ACMMG140)

Links to the Australian Curriculum: Mathematics for Years 5–8

(continued)

TOPIC	YEAR 7	YEAR 8
Angles and Triangles	Demonstrate that the angle sum of a triangle is 180° and use this to find the angle sum of a quadrilateral (ACMMG166) Classify triangles according to their side and angle properties and describe quadrilaterals (ACMMG165)	Develop the conditions for congruence of triangles (ACMMG201)
Polygons and Circles	Classify triangles according to their side and angle properties and describe quadrilaterals (ACMMG165)	Find perimeters and areas of parallelograms, trapeziums, rhombuses and kites (ACMMG196) Investigate the relationship between features of circles such as circumference, area, radius and diameter. Use formulas to solve problems involving circumference and area (ACMMG197) Establish properties of quadrilaterals using congruent triangles and angle properties, and solve related numerical problems using reasoning (ACMMG202)
Patterns	Describe translations, reflections in an axis, and rotations of multiples of 90° on the Cartesian plane using coordinates. Identify line and rotational symmetries (ACMMG181)	Define congruence of plane shapes using transformations (ACMMG200)
Symmetry	Describe translations, reflections in an axis, and rotations of multiples of 90° on the Cartesian plane using coordinates. Identify line and rotational symmetries (ACMMG181)	Define congruence of plane shapes using transformations (ACMMG200)
Shapes and Length	Describe translations, reflections in an axis, and rotations of multiples of 90° on the Cartesian plane using coordinates. Identify line and rotational symmetries (ACMMG181)	
Perimeter		Find perimeters and areas of parallelograms, trapeziums, rhombuses and kites (ACMMG196)
Area	Establish the formulas for areas of rectangles, triangles and parallelograms and use these in problem solving (ACMMG159)	Find perimeters and areas of parallelograms, trapeziums, rhombuses and kites (ACMMG196)
Three-Dimensional Shapes	Calculate volumes of rectangular prisms (ACMMG160) Draw different views of prisms and solids formed from combinations of prisms (ACMMG161)	Choose appropriate units of measurement for area and volume and convert from one unit to another (ACMMG195) Develop the formulas for volumes of rectangular and triangular prisms and prisms in general. Use formulas to solve problems involving volume (ACMMG198)
Fantastic Shapes	Draw different views of prisms and solids formed from combinations of prisms (ACMMG161)	

Source: Australian Curriculum, Assessment and Reporting Authority (ACARA) 2014, Australian Curriculum: Mathematics v7.2, <http://www.australiancurriculum.edu.au/mathematics/curriculum/f-10>

The Geo-Lab

Students working on the Geo-Lab will participate in creative problem-solving while using geometric concepts and measuring skills to create a product model.

In teams of three or four, students will form companies in order to design a special maths laboratory that could be purchased by their school to further the study of mathematics. A model of the lab will then be created by each team using newspaper dowels. Design requirements and directions for the construction of the dowels are found in the Planning Log.

The project should be completed within seven work periods. The length of time may be modified to fit your timetable. As you oversee the project, you will control the supply of dowels and tape. The following guidelines are offered to make the project run more smoothly.

- Students may purchase dowels from you only three times. Encourage them to plan carefully. They may use tape at any time and then estimate their total use at the end and record the expense in their Expense Logs.
- Geo-Lab structures will be judged on sturdiness, appropriateness to the task, originality, visual appeal and innovative features.
- Presentations will be judged on preparation, clarity of speech, involvement of all members of the company, accuracy of records, quality of brochures and journal preparation.
- At the end of the project, students will be asked to fill out an evaluation of their participation.