Mathematics Stage 4 (Year 7) – unit of learning

Length and area

Contents

[Rationale 6](#_Toc161139806)

[Overview 7](#_Toc161139807)

[Outcomes 8](#_Toc161139808)

[Core 8](#_Toc161139809)

[Lesson sequence and details 11](#_Toc161139810)

[Learning episode 1 – getting around 11](#_Toc161139811)

[Teaching and learning activity 11](#_Toc161139812)

[Syllabus content 11](#_Toc161139813)

[Learning episode 2 – express yourself 13](#_Toc161139814)

[Teaching and learning activity 13](#_Toc161139815)

[Syllabus content 13](#_Toc161139816)

[Learning episode 3 – boundary battle 15](#_Toc161139817)

[Teaching and learning activity 15](#_Toc161139818)

[Syllabus content 15](#_Toc161139819)

[Learning episode 4 – uncovering shape secrets 17](#_Toc161139820)

[Teaching and learning activity 17](#_Toc161139821)

[Syllabus content 17](#_Toc161139822)

[Learning episode 5 – perimeter pals 19](#_Toc161139823)

[Teaching and learning activity 19](#_Toc161139824)

[Syllabus content 19](#_Toc161139825)

[Learning episode 6 – enough room for all 21](#_Toc161139826)

[Teaching and learning activity 21](#_Toc161139827)

[Syllabus content 21](#_Toc161139828)

[Learning episode 7 – are all areas created equal? 23](#_Toc161139829)

[Teaching and learning activity 23](#_Toc161139830)

[Syllabus content 23](#_Toc161139831)

[Learning episode 8 – which quadrat? 25](#_Toc161139832)

[Teaching and learning activity 25](#_Toc161139833)

[Syllabus content 25](#_Toc161139834)

[Learning episode 9 – which way is up? 27](#_Toc161139835)

[Teaching and learning activity 27](#_Toc161139836)

[Syllabus content 27](#_Toc161139837)

[Learning episode 10 – Escher-llations 29](#_Toc161139838)

[Teaching and learning activity 29](#_Toc161139839)

[Syllabus content 29](#_Toc161139840)

[Learning episode 11 – a slant on solar energy 31](#_Toc161139841)

[Teaching and learning activity 31](#_Toc161139842)

[Syllabus content 31](#_Toc161139843)

[Learning episode 12 – too clever by half 33](#_Toc161139844)

[Teaching and learning activity 33](#_Toc161139845)

[Syllabus content 33](#_Toc161139846)

[Learning episode 13 – quickly counting kites 35](#_Toc161139847)

[Teaching and learning activity 35](#_Toc161139848)

[Syllabus content 35](#_Toc161139849)

[Learning episode 14 – property trap 37](#_Toc161139850)

[Teaching and learning activity 37](#_Toc161139851)

[Syllabus content 37](#_Toc161139852)

[Learning episode 15 – growing pains 39](#_Toc161139853)

[Teaching and learning activity 39](#_Toc161139854)

[Syllabus content 39](#_Toc161139855)

[Learning episode 16 – it’s a sign 41](#_Toc161139856)

[Teaching and learning activity 41](#_Toc161139857)

[Syllabus content 41](#_Toc161139858)

[References 43](#_Toc161139859)

# Rationale

The NSW Department of Education publishes a range of curriculum support materials, including samples of lesson sequences, scope and sequences, assessment tasks, examinations, student and teacher resource booklets, and curriculum planning and curriculum evaluation templates. The samples are not exhaustive and do not represent the only way to complete or engage in each of these processes. Curriculum design and implementation is a dynamic and contextually-specific process. While the mandatory components of syllabus implementation must be met by all schools, it is important that the approach taken by teachers is reflective of their needs, and faculty or school processes.

The NSW Education Standards Authority (NESA) defines [programming](https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/understanding-the-curriculum/programming) as ‘the process of selecting and sequencing learning experiences which enable students to engage with syllabus outcomes and develop subject specific skills and knowledge’ (NESA 2022). A program is developed collaboratively within a faculty. It differs from a unit in important ways, as outlined by NESA on their [Advice on units](https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/understanding-the-curriculum/programming/advice-on-units) page. A unit is a contextually-specific plan for the intended teaching and learning for a particular class for a particular period. The organisation of the content in a unit is flexible and it may vary according to the school, the teacher, the class and the learning space. They should be working documents that reflect the thoughtful planning and reflection that takes place during the teaching and learning cycle. There are mandatory components of programming and unit development, and this template provides one option for the delivery of these requirements. The NESA and department guidelines that have influenced this template are elaborated upon at the end of the document.

This resource has been developed to assist teachers in NSW Department of Education schools to create learning that is contextualised to their classroom. It can be used as a basis for the teacher’s own program, assessment, or scope and sequence, or be used as an example of how the new curriculum could be implemented. The resource has suggested timeframes that may need to be adjusted by the teacher to meet the needs of their students.

# Overview

**Description**: this program of learning addresses content from the focus areas of Fractions, decimals and percentages, Algebraic techniques, Equations, Length and Area. The lessons and sequences in this program of learning are designed to allow students to explore the spatial properties of 2-dimensional figures, focusing specifically on length and area, as well as the usefulness of related numerical and algebraic tools.

**Duration**: this program of learning is designed to be completed over a period of approximately 6 weeks but can be adapted to suit the school context.

**Explicit teaching**: suggested learning intentions and success criteria are available for some lessons provided. Learning intentions and success criteria are most effective when they are contextualised to meet the needs of students in the class. The examples provided in this document are generalised to demonstrate how learning intentions and success criteria could be created.

# Outcomes

## Core

A student:

* develops understanding and fluency in mathematics through exploring and connecting mathematical concepts, choosing and applying mathematical techniques to solve problems, and communicating their thinking and reasoning coherently and clearly   
  **MAO-WM-01**
* **generalises number properties to operate with algebraic expressions including expansion and factorisation MA4-ALG-C-01**
* **solves linear equations of up to 2 steps and quadratic equations of the form MA4-EQU-C-01**
* **applies knowledge of the perimeter of plane shapes and the circumference of circles to solve problems MA4-LEN-C-01**
* **applies knowledge of area and composite area involving triangles, quadrilaterals and circles to solve problems MA4-ARE-C-01**

The identified Life Skills outcomes that relate to this unit are **MALS-DEP-01** – demonstrates knowledge of decimals and percentages in everyday contexts, **MALS-PAT-01** – recognises and applies patterns in everyday contexts, **MALS-LEN-01** – measures and uses length in everyday contexts, **MALS-ARE-01** – measures and uses area in everyday contexts.

[Mathematics K**–**10 Syllabus](https://curriculum.nsw.edu.au/learning-areas/mathematics/mathematics-k-10-2022/overview) © NSW Education Standards Authority (NESA) for and on behalf of the Crown in right of the State of New South Wales, 2022.

**Prior to planning for teaching and learning, please consider the following:**

**Engagement**

* How will I provide authentic, relevant learning opportunities for students to personally connect with lesson content?
* How will I support every student to grow in independence, confidence, and self-regulation?
* How will I facilitate every student to have high expectations for themselves?
* How will I identify and provide the support each student needs to sustain their learning efforts?

**Representation**

* What are some different ways I can present content to enable every student to access and understand it?
* How will I identify and address language and/or cultural considerations that may limit access to content for students?
* How will I make lesson content and learning materials more accessible?
* How will I plan learning experiences that are relevant and challenging for the full range of students in the classroom?

**Expression**

* How will I provide multiple ways for students to respond and express what they know?
* What tools and resources can students use to demonstrate their understanding?
* How will I know every student has understood the concepts and language presented in each lesson?
* How will I monitor if every student has achieved the learning outcomes and learning growth?

# Lesson sequence and details

## Learning episode 1 – getting around

### Teaching and learning activity

Students formalise the concept of perimeter by exploring different strategies to approach problems.

### Syllabus content

* Solve problems involving the perimeter of plane shapes, including parallelograms, trapeziums, rhombuses and kites
* Compare methods of solution for finding perimeter and evaluate the efficiency of those methods

Table – lesson sequence and details

|  |  |  |
| --- | --- | --- |
| Teaching and learning activities | Required resources | Registration, adjustments and evaluation notes |
| [Getting around (DOCX 440 KB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l01-getting-around.docx)  Duration**:** 1 lesson  Learning intention   * To be able to find the length around an object.   Success criteria   * I can define the perimeter of an object. * I can find the perimeter of an object. * I can explain the most efficient method to find the perimeter of an object. | * Optional: Appendix A, class set (if not using digital devices) * Appendix B and C (one per 3 students) * Class set of Appendix D * Centicubes (20 per student) * Optional: one device per student |  |

## Learning episode 2 – express yourself

### Teaching and learning activity

Students explore finding the perimeter of shapes whose sides are represented by variables.

### Syllabus content

* Generate algebraic expressions by translating descriptions and vice versa
* Substitute numbers into algebraic expressions and evaluate the result
* Solve problems involving the perimeter of plane shapes, including parallelograms, trapeziums, rhombuses and kites
* Compare methods of solution for finding perimeter and evaluate the efficiency of those methods

Table – lesson sequence and details

|  |  |  |
| --- | --- | --- |
| Teaching and learning activities | Required resources | Registration, adjustments and evaluation notes |
| [Express yourself (DOCX 490 KB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l02-express-yourself.docx)  Duration**:** 1 lesson  Learning intentions   * To be able to solve problems involving perimeter. * To be able to simplify algebraic expressions.   Success criteria   * I can create an expression for the perimeter of a shape. * I can substitute values into an expression. * I can justify the most efficient way to solve a problem. | * Class set of Appendix A and C * Appendix B (one per 3 students) * [*Express yourself* (PPTX 583 KB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l02-express-yourself.pptx)PowerPoint |  |

## Learning episode 3 – boundary battle

### Teaching and learning activity

Students explore which perimeter is larger by comparing rectangles and compound shapes. Students then progress to using different strategies to find the perimeter of simple composite shapes, including those with lengths represented by pronumerals.

### Syllabus content

* Solve problems relating to the perimeter of simple composite figures
* Compare methods of solution for finding perimeter and evaluate the efficiency of those methods
* Represent number sentences involving unknown quantities using pronumerals
* Verify solutions to equations by substitution

Table – lesson sequence and details

|  |  |  |
| --- | --- | --- |
| Teaching and learning activities | Required resources | Registration, adjustments and evaluation notes |
| [Boundary battle (DOCX 2.6 MB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l03-boundary-battle.docx)  Duration**:** 1–2 lessons  Learning intention   * To be able to find the perimeter of a simple composite shape.   Success criteria   * I can find the value of missing sides on a composite shape. * I can calculate the perimeter of a simple composite shape. * I can explain the different methods I can use to find the perimeter of a composite shape. | * Appendix A, D and E (one per 3 students) * Class set of Appendix B and C * [*Boundary battle* (PPTX 1019 KB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l03-boundary-battle.pptx) PowerPoint * Optional: one device per pair of students |  |

## Learning episode 4 – uncovering shape secrets

### Teaching and learning activity

Students use the concept of perimeter to delve into solving equations involving 2 steps using bar models.

### Syllabus content

* Solve problems relating to the perimeter of simple composite figures
* Describe number sentences as equations
* Distinguish between and compare algebraic expressions and equations
* Solve linear equations with integer and non-integer solutions using algebraic techniques that involve up to 2 steps, including equations with pronumerals on both sides
* Model and solve word problems using equations of up to 2 steps
* Solve and verify linear equations by substitution
* Verify solutions to equations by substitution
* Solve problems involving linear equations, including those arising from substituting given values into formulas

Table – lesson sequence and details

|  |  |  |
| --- | --- | --- |
| Teaching and learning activities | Required resources | Registration, adjustments and evaluation notes |
| [Uncovering shape secrets (DOCX 558 KB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l04-uncovering-shape-secrets.docx)  Duration**:** 2 lessons  Learning intention   * To be able to solve equations.   Success criteria   * I can explain the difference between an expression and an equation. * I can solve equations involving 2 steps. * I can represent the perimeter of a shape as an equation. | * Appendix A (one per pair) * Class set of Appendix B and C * Appendix D (one per 3 students) * [*Uncovering shape secrets* (PPTX 1.2 MB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l04-uncovering-shape-secrets.pptx) PowerPoint |  |

## Learning episode 5 – perimeter pals

### Teaching and learning activity

Students use the concept of perimeter to delve into solving equations with pronumerals on both sides using bar models.

### Syllabus content

* Solve problems relating to the perimeter of simple composite figures
* Compare methods of solution for finding perimeter and evaluate the efficiency of those methods
* Solve linear equations with integer and non-integer solutions using algebraic techniques that involve up to 2 steps, including equations with pronumerals on both sides
* Model and solve word problems using equations of up to 2 steps

Table – lesson sequence and details

|  |  |  |
| --- | --- | --- |
| Teaching and learning activities | Required resources | Registration, adjustments and evaluation notes |
| [Perimeter pals (DOCX 643 KB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l05-perimeter-pals.docx)  Duration**:** 1 lesson  Learning intention   * To be able to solve equations with pronumerals on both sides.   Success criteria   * I can represent the perimeter of a shape as an equation. * I can solve an equation with pronumerals both sides. * I can explain different ways to solve an equation with pronumerals on both sides. * I can check my solutions to equations using substitution. | * Appendix A and B (one per 3 students) * Class set of Appendix C * Appendix D, (one per pair of students) * [*Perimeter pals* (PPTX 553 KB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l05-perimeter-pals.pptx) PowerPoint |  |

## Learning episode 6 – enough room for all

### Teaching and learning activity

Students will compare area and perimeter, considering the impact on one when the other is changed.

### Syllabus content

* Solve problems relating to the perimeter of simple composite figures
* Compare methods of solution for finding perimeter and evaluate the efficiency of those methods
* Develop and apply the formula to find the area of a rectangle: , where is the length and is the breadth

Table – lesson sequence and details

|  |  |  |
| --- | --- | --- |
| Teaching and learning activities | Required resources | Registration, adjustments and evaluation notes |
| [Enough room for all (DOCX 533 KB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l06-enough-room-for-all.docx)  Duration**:** 1 lesson  Learning intention   * To understand how perimeter and area are related.   Success criteria   * I can define perimeter and area. * I can choose appropriate strategies for calculating perimeter. * I can choose appropriate strategies for calculating area. * I can explain which shapes will have the largest perimeter and which shapes will have the smallest perimeter. | * Appendix A, printed A3 (one per 3 students) * Class set of Appendix B and D * [*Enough room for all* (PPTX 5 MB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l06-enough-room-for-all.pptx) PowerPoint * Optional: class set of Appendix C * Optional: one device per pair of students |  |

## Learning episode 7 – are all areas created equal?

### Teaching and learning activity

Students design spaces for handball ‘squares’ and learn to differentiate between the concept of perimeter and area.

### Syllabus content

* Apply the formula to find the area of a rectangle or square: , where is the length and is the breadth (or width) of the rectangle or square

Table – lesson sequence and details

|  |  |  |
| --- | --- | --- |
| Teaching and learning activities | Required resources | Registration, adjustments and evaluation notes |
| [Are all areas created equal (DOCX 1 MB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l07-are-all-areas-created-equal.docx)  Duration**:** 1–2 lessons  Learning intentions   * To understand that the same perimeter can create many different shapes and areas. * To know that the maximum area of a rectangle with a given perimeter is a square.   Success criteria   * I can explain how 2 shapes with the same perimeter can have different areas. * I can solve problems that require a maximum area. | * Grid paper (at least one per group) * Rulers (one per group of 3 students) * Chalk, 5 pieces * 5 tennis balls * 5 large rulers or tape measures * Class set of Appendix A, C and D, printed * String cut into 12 cm lengths * [*Are all areas created equal* (PPTX 1.3 MB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l07-are-all-areas-created-equal.pptx) PowerPoint |  |

## Learning episode 8 – which quadrat?

### Teaching and learning activity

A quadrat is a small area of a habitat, typically of one square metre, selected at random to act as samples for assessing the local distribution of plants or animals. Students explore identifying units of area and converting between them through the idea of using quadrats to sample population sizes.

### Syllabus content

* Choose an appropriate unit to measure the area of different shapes and surfaces, and justify the choice
* Convert between metric units of area using , , and

Table – lesson sequence and details

|  |  |  |
| --- | --- | --- |
| Teaching and learning activities | Required resources | Registration, adjustments and evaluation notes |
| [Which quadrat? (DOCX 3.3 MB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l08-which-quadrat.docx)  Duration****:**** 1 lesson  Learning intentions   * To know and use appropriate units of area. * To be able to convert between units of area.   Success criteria   * I can identify units of area. * I can select appropriate units of area to measure different objects. * I can convert between units of area. | * Class set of Appendix A, B, C and D * [*Which quadrat* (PPTX 3.5 MB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l08-which-quadrat.pptx) PowerPoint * Optional: one device per pair of students |  |

## Learning episode 9 – which way is up?

### Teaching and learning activity

Students will use their understanding of how to find the area of a rectangle to develop a formula and use it to solve problems. Students will consider the language we use when describing the dimensions of a rectangle.

### Syllabus content

* Develop and apply the formula to find the area of a rectangle: , where is the length and is the breadth

Table – lesson sequence and details

|  |  |  |
| --- | --- | --- |
| Teaching and learning activities | Required resources | Registration, adjustments and evaluation notes |
| [Which way is up (DOCX 842 KB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l09-which-way-is-up.docx)  Duration**:** 1 lesson  Learning intention   * To develop the formula for the area of a rectangle.   Success criteria   * I can explain how the formula for the area of a rectangle is obtained. * I can use various terms to describe the dimensions of a rectangle. * I can correctly substitute values into the formula for the area of a rectangle. * I can solve equations involving the area of a rectangle. | * Class set of Appendix A and C * Appendix B, printed on A3 paper (one per 3 students) * Appendix D (one per 3 students) * [*Which way is up* (PPTX 808 KB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l09-which-way-is-up.pptx) PowerPoint * Two 10-sided dice per pair of students * Highlighter (one per student) |  |

## Learning episode 10 – Escher-llations

### Teaching and learning activity

Students explore tessellations in artworks by MC Escher and create their own artworks by constructing images from rectangles. Students then reverse this process to consider how constructing rectangles from more complex shapes can simplify area calculations and comparisons.

### Syllabus content

* Develop and apply the formula to find the area of a parallelogram: where is the base length and is the perpendicular height
* Develop and apply the formula to find the area of a kite or rhombus: , where and are the lengths of the diagonals
* Develop and apply the formula to find the area of a trapezium: , where is the perpendicular height and and are the lengths of the parallel sides

Table – lesson sequence and details

|  |  |  |
| --- | --- | --- |
| Teaching and learning activities | Required resources | Registration, adjustments and evaluation notes |
| [Escher-llations (DOCX 607 KB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l10-escher-llations.docx)  Duration**:** 1–2 lessons  Learning intentions   * To understand rectangles can be used to find the area of more complex shapes. * To be able to deconstruct complex shapes into rectangles.   Success criteria   * I can use measuring tools to calculate the area of rectangles. * I can identify where to cut complex shapes to rearrange into rectangles. | * Appendix A and B, printed (one per pair of students) * Appendix C and D, printed (one per group of 3 students) * 1 square of paper or cardboard per student * 1 large poster or A3 piece of paper per student * Scissors, coloured pencils, adhesive tape and rulers for groups of students * Optional: one device per pair of students |  |

## Learning episode 11 – a slant on solar energy

### Teaching and learning activity

Students practise fitting rectangular and parallelogram-shaped solar panels onto various roof shapes and learn about the area of a parallelogram by considering the amount of solar energy absorbed.

### Syllabus content

* Develop and apply the formula to find the area of a parallelogram: where is the base length and is the perpendicular height

Table – lesson sequence and details

|  |  |  |
| --- | --- | --- |
| Teaching and learning activities | Required resources | Registration, adjustments and evaluation notes |
| [A slant on solar energy (DOCX 1 MB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l11-a-slant-on-solar-energy.docx)  Duration**:** 1 lesson  Learning intentions   * To understand the relationship between the area of a parallelogram and related rectangles. * To be able to calculate the area of a parallelogram.   Success criteria   * I can explain how the area of a parallelogram relates to rectangles. * I can identify the base and height of a parallelogram. * I can use the formula for the area of a parallelogram to solve problems. | * A device with internet access per pair of students, or a class set of Appendix A, printed * [*A slant on solar energy* (PPTX 1.6 MB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l11-a-slant-on-solar-energy.pptx) PowerPoint * Class sets of Appendix B and C, printed |  |

## Learning episode 12 – too clever by half

### Teaching and learning activity

Students will develop the formula for the area of a triangle and use the formula to solve problems.

### Syllabus content

* Develop and apply the formula to find the area of a triangle: , where is the base length and is the perpendicular height

Table – lesson sequence and details

|  |  |  |
| --- | --- | --- |
| Teaching and learning activities | Required resources | Registration, adjustments and evaluation notes |
| [Too clever by half (DOCX 1.5 MB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l12-too-clever-by-half.docx)  Duration****:**** 1 lesson  Learning intention   * To establish the formula for the area of a triangle.   Success criteria   * I can explain why the area of a triangle is half the area of a parallelogram. * I can identify the base and height of a triangle. * I can find the area of a triangle. * I can substitute values into the formula for the area of a triangle. | * Appendix A and B (one per pair of students) * Class set of Appendix C * [*Too clever by half* (PPTX 2.9 MB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l12-too-clever-by-half.pptx) PowerPoint * Class set of scissors * A4 paper * Class set of rulers * Optional: Appendix D and E (one per 3 students) |  |

## Learning episode 13 – quickly counting kites

### Teaching and learning activity

Students examine how many kites would fit into a pattern on a rectangular wall as context for investigating and developing a formula for the area of a kite.

### Syllabus content

* Develop and apply the formula to find the area of a kite or rhombus: , where and are the lengths of the diagonals

Table – lesson sequence and details

|  |  |  |
| --- | --- | --- |
| Teaching and learning activities | Required resources | Registration, adjustments and evaluation notes |
| [Quickly counting kites (DOCX 2.6 MB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l13-quickly-counting-kites.docx)  Duration**:** 1 lesson  Learning intentions   * To understand the relationship between the area of a kite and related rectangles. * To be able to calculate the area of a kite.   Success criteria   * I can identify the diagonals of a kite. * I can use the formula for the area of a kite to solve problems. * I can explain how the formula for the area of a kite can be found using a rectangle. | * Class set of Appendix A, printed * [*Quickly counting kites* (PPTX 3.3 MB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l13-quickly-counting-kites.pptx) PowerPoint. * Grid paper, rulers, plastic sleeves, whiteboard markers (one per group of 3 students) |  |

## Learning episode 14 – property trap

### Teaching and learning activity

Students will investigate and use the formula for the area of a trapezium to estimate the size of a block of land.

### Syllabus content

* Develop and apply the formula to find the area of a trapezium: , where is the perpendicular height and and are the lengths of the parallel sides

Table – lesson sequence and details

|  |  |  |
| --- | --- | --- |
| Teaching and learning activities | Required resources | Registration, adjustments and evaluation notes |
| [Property trap (DOCX 626 KB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l14-property-trap.docx)  Duration**:** 1 lesson  Learning intention   * To be able to find the area of a trapezium.   Success criteria   * I can identify the parallel sides and the perpendicular height of a trapezium. * I can explain how the formula for the area of a trapezium is developed. * I can correctly substitute values into the area of a trapezium formula. | * Class set of Appendix A * [*Property trap* (PPTX 2.6 MB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l14-property-trap.pptx) PowerPoint * Class set of scissors * A4 paper * Class set of rulers |  |

## Learning episode 15 – growing pains

### Teaching and learning activity

Students generate number patterns from exploring the change in area that results from an increase in the dimensions of a quadrilateral.

### Syllabus content

* Generate a number pattern from an algebraic expression
* Apply the formula to find the area of a rectangle or square: , where is the length and is the breadth (or width) of the rectangle or square
* Develop and apply the formula to find the area of a triangle: , where is the base length and is the perpendicular height
* Develop and apply the formula to find the area of a parallelogram: where is the base length and is the perpendicular height
* Develop and apply the formula to find the area of a kite or rhombus: , where and are the lengths of the diagonals
* Develop and apply the formula to find the area of a trapezium: where is the perpendicular height and and are the lengths of the parallel sides

Table – lesson sequence and details

|  |  |  |
| --- | --- | --- |
| Teaching and learning activities | Required resources | Registration, adjustments and evaluation notes |
| [Growing pains (DOCX 701 KB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l15-growing-pains.docx)  Duration**:** 1 lesson  Learning intention   * To be able to generate a number pattern from a formula.   Success criteria   * I can substitute values into a formula and evaluate it. * I can fill out a table of values. * I can explain what happens to the area of shapes as their sides increase. | * Appendix A and B (one per 3 students) * [*Growing pains* (PPTX 829 KB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l15-growing-pain.pptx) PowerPoint |  |

## Learning episode 16 – it’s a sign

### Teaching and learning activity

Students use street signs to explore how to find the area of composite shapes involving special quadrilaterals and triangles.

### Syllabus content

* Calculate the area of composite figures that can be dissected into rectangles, squares, parallelograms or triangles to solve problems
* Calculate the area of composite shapes involving trapeziums, kites and rhombuses to solve problems

Table – lesson sequence and details

|  |  |  |
| --- | --- | --- |
| Teaching and learning activities | Required resources | Registration, adjustments and evaluation notes |
| [It’s a sign (DOCX 1.0 MB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l16-its-a-sign.docx)  Duration**:** 1 lesson  Learning intention   * To be able to find the area of composite shapes.   Success criteria   * I can separate a figure into known quadrilaterals and triangles. * I can explain how to calculate the area of a composite shape. * I can pick the most effective method to find the area of a composite figure. | * Appendix A and B (one per 3 students) * Class set of Appendix C * [*It’s a sign* (PPTX 1.1 MB)](https://education.nsw.gov.au/content/dam/main-education/en/home/teaching-and-learning/curriculum/mathematics/documents/mathematics-s4-unit-07-l16-its-a-sign.pptx) PowerPoint * Graph paper |  |

# References

This resource contains NSW Curriculum and syllabus content. The NSW Curriculum is developed by the NSW Education Standards Authority. This content is prepared by NESA for and on behalf of the Crown in right of the State of New South Wales. The material is protected by Crown copyright.

Please refer to the NESA Copyright Disclaimer for more information <https://educationstandards.nsw.edu.au/wps/portal/nesa/mini-footer/copyright>.

NESA holds the only official and up-to-date versions of the NSW Curriculum and syllabus documents. Please visit the NSW Education Standards Authority (NESA) website <https://educationstandards.nsw.edu.au> and the NSW Curriculum website <https://curriculum.nsw.edu.au>.

[Mathematics K**–**10 Syllabus](https://curriculum.nsw.edu.au/learning-areas/mathematics/mathematics-k-10-2022/overview) © NSW Education Standards Authority (NESA) for and on behalf of the Crown in right of the State of New South Wales, 2022.

NESA (NSW Education Standards Authority) (2022) ‘[Programming](https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/understanding-the-curriculum/programming/advice-on-units)’, Understanding the curriculum, NESA website, accessed [5 February 2024].

**© State of New South Wales (Department of Education), 2024**

The copyright material published in this resource is subject to the Copyright Act 1968 (Cth) and is owned by the NSW Department of Education or, where indicated, by a party other than the NSW Department of Education (third-party material).

Copyright material available in this resource and owned by the NSW Department of Education is licensed under a [Creative Commons Attribution 4.0 International (CC BY 4.0) license](https://creativecommons.org/licenses/by/4.0/).

[](https://creativecommons.org/licenses/by/4.0/)

This license allows you to share and adapt the material for any purpose, even commercially.

Attribution should be given to © State of New South Wales (Department of Education), 2024.

Material in this resource not available under a Creative Commons license:

* the NSW Department of Education logo, other logos and trademark-protected material
* material owned by a third party that has been reproduced with permission. You will need to obtain permission from the third party to reuse its material.

**Links to third-party material and websites**

Please note that the provided (reading/viewing material/list/links/texts) are a suggestion only and implies no endorsement, by the New South Wales Department of Education, of any author, publisher, or book title. School principals and teachers are best placed to assess the suitability of resources that would complement the curriculum and reflect the needs and interests of their students.

If you use the links provided in this document to access a third-party's website, you acknowledge that the terms of use, including licence terms set out on the third-party's website apply to the use which may be made of the materials on that third-party website or where permitted by the Copyright Act 1968 (Cth). The department accepts no responsibility for content on third-party websites.