# Contents

## INTRODUCTION

3

## LEARNING OBJECTS

4

- Finding symmetry series (Years P–2) 4
- Shape overlays series (Years P–4) 6
- Tessellate decorate series (Years 1–2) 7
- Direct a robot series (Years 2–4) 9
- Face painter series (Years 2–5) 10
- Shape maker series (Years 2–6) 11
- Shape sorter series (Years 3–8) 13
- Building site series (Years 4–9) 16
- Photo hunt series (Years 4–9) 18
- Viewfinder series (Years 4–9) 20
- Shape maker: assessment series (Years 5–7) 21
- Contours series (Years 5–9) 22
- Journey planner series (Years 6–9) 23

## CONTENT FROM OTHER SOURCES

24

- Space manipulatives series (Years P–9) 24
- Toby jigsaw puzzle: assessment (Years 5–6) 27
- Treasure hunt: assessment (Years 5–6) 27
- Lion trainer: assessment (Years 6–8) 28
- Exploring space series (Years 6–9) 28
- HOTmaths: using a centre of enlargement (Years 7–8) 30
- HOTmaths: exploring bearings (Years 7–10) 30
- Interacting with Mathematics (IWM) (Years 11–12) 31
Introduction

This catalogue contains details about the digital resources for the Mathematics and Numeracy strand Space available from The Learning Federation (TLF). The resources have either been created by TLF or licensed from other sources and made available by TLF to all schools in Australia and New Zealand.

The Space digital resources support and enhance students' understanding of key Mathematics concepts in a range of contexts for the P–12 years.

TLF-created content

Mathematics and numeracy digital curriculum resources created by TLF are interactive multimedia learning objects. The learning objects are based on current research findings in mathematics education and pedagogy. They focus on concepts that are often the most difficult for students to learn and for teachers to teach, and encourage higher-order thinking and problem-solving approaches.

The learning objects make use of the digital environment in innovative ways to enhance student learning. For example, some objects allow teachers to set up learning opportunities in mathematics that are normally too complex in a standard classroom; others allow students to visualise and apply mathematics concepts in new ways; others provide opportunities for repeated use by students through randomisation of learning activities; relevant and authentic contexts for exploration and skill application are a feature of others.

Scaffolding of student learning and feedback in various multimodal formats are incorporated into all the learning objects.

The learning objects are generally published in series and some learning objects within a series are aggregated into single learning objects. Aggregated learning objects are identified with the symbol.

Some learning objects contain non-TLF content. See the acknowledgements and conditions of use in the learning objects for details.

Content from other sources

TLF licenses digital content from other sources to include in the pool of online curriculum content available to Australian and New Zealand schools. Mathematics and numeracy content licensed from the National Library of Virtual Manipulatives, USA, and from Alberta Education, Canada, is now available.

Other catalogues

You can download catalogues for each of the Mathematics and numeracy strands at:

www.ndlrn.edu.au

A comprehensive Index of mathematics and numeracy digital curriculum content is also available for download.

Accessing and viewing the content

Government and non-government education authorities in each Australian state and territory and in New Zealand have responsibility for facilitating access to the pool of digital content. Full details about how to access the content, including the necessary technical and software requirements for viewing it, can be found at:

www.ndlrn.edu.au
Learning objects

Finding symmetry series (Years P–2)

Students determine whether shapes have one, two or three lines of symmetry by using a digital tool that allows shapes to be folded in different ways.

Features include:

- opportunities for students to test axes of symmetry using a shape-folding tool
- a summary of shapes found.

Students:

- explore 2D shapes to develop an understanding of symmetry by folding them into matching halves in different ways
- distinguish between symmetrical and non-symmetrical 2D shapes
- test a shape for reflectional symmetry by folding it into a matching half
- analyse shapes with more than one axis of symmetry.

Finding symmetry: one line: garden
L7800 – Years P–2

Students explore a fantasy garden to find shapes with one line of symmetry.

Finding symmetry: two lines: garden
L7799 – Years 1–2

Students explore a fantasy garden to find shapes with two lines of symmetry.

Finding symmetry: three lines: garden
L7798 – Year 2

In a fantasy garden setting, students locate shapes that have three or more lines of symmetry.

Finding symmetry: one line: city
L7803 – Years P–2

Students explore a futuristic city to find shapes with one line of symmetry.
Finding symmetry: two lines: city  
L7802 – Years 1–2  
Students explore a futuristic city to find shapes with two lines of symmetry.

Finding symmetry: three lines: city  
L7801 – Year 2  
Students explore a futuristic city to find shapes with at least three lines of symmetry.
Shape overlays series (Years P–4)

Students manipulate 2D shapes, by sliding and overlapping, to create other 2D shapes.

Features include:
- a progressive increase in level of difficulty, with the gradual introduction of more complex shapes and the option to rotate them.

Students:
- cut, rotate and arrange 2D shapes
- consider the properties of the two original shapes and visualise how they might be overlapped to create the properties needed for a specific new shape.

Shape overlays: picture studio
L1071 – Years P–4

Students cut, rotate and arrange shapes to create their own picture. A number of starter ideas are provided and students can print their final work.

Shape overlays: find and cut
L752 – Years P–2

Students are presented with a missing shape in a partially covered picture. To find the missing shape and see the final picture, students slide a 2D shape over a fixed 2D shape. They cut the shape to check that they are correct. When they have matched the missing piece the picture is revealed.

Shape overlays: find, cut and turn
L1072 – Years 1–2

Students are presented with a missing shape in a partially covered picture. To find the missing shape and see the final picture, students select from two 2D shapes (including an obtuse triangle, a pentagon and a trapezium) and slide it over a given fixed 2D shape. They cut and rotate the shape to match the missing piece and reveal the picture.

Shape overlays: picture puzzle
L1073 – Years 3–4

Students make a target shape by positioning a simple shape over another shape. They cut out the new shape formed by the combination of the other two shapes then use the shape overlay to complete a picture.
**Tessellate decorate series** *(Years 1–2)*

Students use a range of shapes, or combinations of shapes, to make tessellations to decorate rooms in a house.

**Features include:**
- a virtual sample book of tessellations
- models of different tessellations of the same shape or combinations of shapes to demonstrate the properties of tessellations
- supportive feedback for the students
- a print option that captures students' experiments in the play space.

**Students:**
- choose a part of a living room, kitchen or bedroom to decorate and select a tessellation to make
- copy the pattern by moving tiles onto a work space without creating overlaps or leaving gaps, and then select a colour scheme
- watch patterns expand automatically to fill a large space, allowing students to see the continuous multi-directional nature of tessellations in their own designs
- create their own designs in the play space.

---

**Tessellate decorate: rectangles**

L7781 – Years 1–2

Students select one of four tessellations made from rectangles and copy it to decorate different parts of a living room.

**Tessellate decorate: squares**

L7782 – Years 1–2

Students select one of four tessellations made from squares and copy it to decorate different parts of a room in a house.

**Tessellate decorate: equilateral triangles**

L7783 – Years 1–2

Students select one of four tessellations made from equilateral triangles and copy it to decorate a room in a house.

**Tessellate decorate: rhombuses**

L7785 – Years 1–2

Students select one of four tessellations made from rhombuses and copy it to decorate a room in a house.
**Tessellate decorate: trapeziums**  
L7787 – Years 1–2  
Students select one of four tessellations made from trapeziums and copy it to decorate a room in a house.

**Tessellate decorate: hexagons and triangles**  
L7784 – Years 1–2  
Students select one of four tessellations made from hexagons and triangles and copy it to decorate a room in a house with patterns made from hexagons and triangles.

**Tessellate decorate: three shapes**  
L7788 – Years 1–2  
Students select one of four tessellations made from rhombuses, squares and equilateral triangles, and copy it to decorate a room in a house.

**Tessellate decorate: right-angled triangles**  
L7786 – Years 1–2  
Students select one of four tessellations made from right-angled triangles and copy it to decorate a room in a house.
**Direct a robot series (Years 2–4)**

Students interpret diagram features as 2D representations of a 3D environment to direct a robot around obstacles, collect as many samples as possible (each having a value attached) and return to the mother ship using the least amount of fuel.

**Features include:**
- a grid to help determine units of distance
- a mission report with a score
- an option to print.

**Students:**
- develop their understanding of the concepts of 2D representations of 3D environments, relative position and relative direction
- are shown a map of a planet's surface including the locations of the robot, obstacles and samples
- program a pathway using direction and/or number of distance units to move the robot around the surface of a planet
- visualise the pathway assisted by the map of a planet's surface to determine the location and required movement of the robot.

### Direct a robot: how far?

L1075 – Years 2–4

Students are presented with a partially finished route. The direction steps have been predetermined but the number of units for the moves is missing. Students select the numbers of units needed to complete the pathway, collect the samples and return to the mother ship.

### Direct a robot: which way?

L1074 – Years 2–4

Students are presented with a partially finished route, this time with the distance steps predetermined. Students must determine the best direction to collect all the samples and return to the ship.

### Direct a robot: collector

L753 – Years 2–4

Students program a pathway by selecting both the direction and number of units the robot will move to collect all the samples and return to the ship.
Face painter series (Years 2–5)

Students explore the properties of, and relationship between, 2D shapes (polygons) and 3D objects (polyhedrons) by visualising the shapes of the faces of objects, including those distorted by perspective and hidden from view.

Features include:
- automatic recording of correctly painted shapes enabling the student to compare their estimate with the result
- a more systematic approach to the exploration of the structure of the shapes than would normally be possible through physical handling of the objects.

Students:
- estimate how many of a specific 2D shape can be found on a given 3D object
- rotate and view the 3D object from all perspectives and identify each instance of the 2D shape by painting it
- visualise relationships between 2D figures and 3D objects.

**Face painter: finding faces 1**
L1068 – Years 2–3

Students estimate how many of a specific 2D shape can be found on a given simple 3D object.

**Face painter: finding faces 2**
L653 – Years 3–4

Students estimate how many of a specific 2D shape can be found on a given complex 3D object.

**Face painter: locating faces**
L1069 – Years 4–5

Students estimate the number of faces on a given complex 3D object (including a triangular pyramid, a pentagonal prism or an L-shaped block). The faces vary in shape.

**Face painter: predicting faces**
L1070 – Years 4–5

Students are presented with a number of 2D shapes on a given complex 3D object. They predict how many of each type of shape make up the complex 3D object.
Shape maker series (Years 2–6)

Students explore the relationships between 2D shapes and 3D objects by visualising the movement (translation or rotation) of the 2D shape and predicting the resulting 3D object.

Features include:
- cross-sections of the 3D objects created
- printouts of all objects.

Students:
- visualise the result from spinning or extruding 2D shapes
- select from the shapes available then apply a spin or extrude action to it
- spin the shape and select the axis for spinning.

Shape maker: simple objects
L1060 – Years 2–3

Students select either a square or circle and build a stack of eight objects.

Shape maker: blocker
L1058 – Years 3–4

Students select from a square or circle. They then predict the resulting 3D object. If the choice is correct, the transition from 2D to 3D is shown. Students build a stack of six objects they have created.

Shape maker: stacker
L588 – Years 3–4

Students select from a diamond, circle and rectangle then predict the resulting 3D object. If the choice is correct, the transition from 2D to 3D is shown. Students build a stack of six objects that they have created.

Shape maker: complex objects 1
L1061 – Years 4–6

Students select from a diamond, circle and rectangle and build a stack of eight objects.

Shape maker: complex objects 2
L1062 – Years 4–6
Students select from three more complex 2D objects: a crescent, a trapezium and a rhombus. The student builds a stack of eight objects which can be printed out.

**Shape maker: replicator**  
L1059 – Years 4–6

Students break down an object made of several 3D objects into its components, and then replicate them. They identify a component, then select the 2D shape to match the chosen 3D component. The interaction ends when the entire object has been replicated.
Shape sorter series (Years 3–8)

Students use interactive tools to move through several steps of concept formation in order to understand why certain shapes or shape pairs are part of a set. They use tools to test for lines of symmetry on single shapes and to flip, slide, rotate, enlarge or reduce one shape in a pair.

Features include:
- a concept-formation process of presenting both positive and negative examples of sets of shapes
- interactive tools for exploring properties of shapes
- identification of the essential shape features through the selection of word statements
- scaffolded feedback.

Students:
- students compare shape features in order to identify the geometric properties that define a set of shapes.

**Shape sorter: basic shapes**  
L8163 – Years 3–4

Students sort single shapes, or pairs of shapes, in the shape factory. They work out what features of the shapes are important, test their ideas, then program a robot to see if it sorts the shapes correctly.

**Shape sorter: basic shapes: singles**  
L8168 – Years 3–4

Students sort single shapes in the shape factory. They work out what features of the shapes are important, test their ideas and then program a robot to see if it sorts the shapes correctly.

**Shape sorter: basic shapes: pairs**  
L10331 – Years 3–4

Students sort pairs of shapes in the shape factory. They examine examples of basic shapes that belong or do not belong in the set to work out what features of the shapes are important.

**Shape sorter: more shapes**  
L8164 – Years 5–6

Students sort single shapes, or pairs of shapes, in the shape factory. They work out what features of the shapes are important, test their idea, then program a robot and see if it sorts the shapes correctly.
**Shape sorter: triangles**  
L8165 – Years 5–6  
Students sort triangles in the shape factory. They examine examples of triangles that belong or do not belong in the set to work out what features of the shapes are important.

**Shape sorter: quadrilaterals**  
L8166 – Years 7–8  
Students examine examples of shapes and determine if they are quadrilaterals. They work out what features of the shapes are important, test their idea, then program a robot and see if it sorts the shapes correctly.

**Shape sorter: polygons**  
L8167 – Years 3–4  
Students examine examples of shapes and determine if they are polygons. They work out what features of the shapes are important, test their idea, then program a robot and see if it sorts the shapes correctly.

**Shape sorter: wand tool**  
L10736 – Years 3–4  
Students examine examples of single shapes. They use the Wand tool to compare the sides, right angles and lines of symmetry for each shape.

**Shape sorter: modify tool**  
L10737 – Years 3–4  
Students examine examples of pairs of shapes. They use the Modify tool to rotate, enlarge, reduce and flip
each shape in a pair.
**Building site series (Years 4–9)**

Students explore the concepts of angles, buildings (structures), cubes, projection, side elevation, technical drawing, transformations and visual perception.

**Features include:**

- demonstrations showing that the perceived shape of an object depends on the observer's viewing point
- views of objects from different angles to use to construct a 3D scene
- objects that increase in difficulty through the series.

**Students:**

- translate an aerial view or angled view to a profile view, producing the required front, back or side views as seen from ground level
- use visualisation skills to imagine different perspectives for viewing the same objects.

<table>
<thead>
<tr>
<th>Building site: level 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>L849 – Years 4–9</td>
</tr>
</tbody>
</table>

Students look down (bird's eye view) on single-storey building plans and analyse how they can be seen by a person standing on the ground level. They then use cubes to build a ground-level view of the building plan (from the front, side or back).

<table>
<thead>
<tr>
<th>Building site: level 2</th>
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</thead>
<tbody>
<tr>
<td>L1097 – Years 4–9</td>
</tr>
</tbody>
</table>

Students look down on some multi-storey buildings. They build a ground-level view of the building plans from a given perspective: front, side or back.

<table>
<thead>
<tr>
<th>Building site: level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1098 – Years 5–9</td>
</tr>
</tbody>
</table>

Students view multi-storey buildings from a corner angle. They create a 2D side view from each 3D plan. Students can rotate the 3D plan to assist with creating their views.

<table>
<thead>
<tr>
<th>Building site: level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1099 – Years 5–9</td>
</tr>
</tbody>
</table>

Students are shown two side views and a bird's eye view. They build a 3D multi-storey plan from the 2D plans. Students are able to rotate their 3D plan to gain different perspectives.
Building site
L654 – Years 4–9

This is an aggregated learning object combining the four other learning objects in a sequence.
Photo hunt series (Years 4–9)

Students visualise and match different perspectives of 2D representations of 3D solids such as cylinders, cones and cuboids.

Features include:
- a group of objects displayed from different perspectives
- visual cues about the shape of objects which can be used to construct a three-dimensional scene
- an opportunity for students to select from four levels of difficulty.

Students:
- interpret and visualise 2D representations of 3D objects by matching a 3D aerial view to a 2D profile view
- work through a random selection of six tasks of increasing complexity.

Photo hunt: level 1 [Flash Player version]
L6258 – Years 4–9

The original picture students must match is presented from the same (street level) perspective as the view students are working with. Students rotate their view in a horizontal plane to match the picture.

Photo hunt: level 2 [Flash Player version]
L6259 – Years 4–9

Students must take into account both vertical and horizontal planes when matching their view of the objects with the original picture.

Photo hunt: level 3 [Flash Player version]
L6260 – Years 5–9

Students view their objects from an elevated view however they must match the original picture, which is presented in a ‘street level’ view. Students must visualise the elevated view from the street view in order to successfully match the picture.

Photo hunt: level 4 [Flash Player version]
L6261 – Years 5–9

This is similar to level 3, however only two colours are used.
L6246 – Years 4–9

This is an aggregated learning object combining the four learning objects in the series.
**Viewfinder series (Years 4–9)**

Students interpret and visualise representations of 3D solids such as cylinders, cones and cuboids from different perspectives.

**Features include:**

- demonstrations to show that the perceived shape of objects depends on the observer's viewing point
- opportunities for repetition, with students working through random, increasingly complex selections of six tasks
- views of a group of objects from different perspectives
- visual cues about the shape of objects to construct a 3D scene
- four levels of difficulty for students to select from.

**Students:**

- interpret and visualise 2D representations of 3D objects
- place objects to make 3D models from plans and projections
- translate between 2D representations and 3D objects.

---

**Viewfinder: up front [Flash Player version]**

L6265 – Years 4–9

Students view both the reference picture and the base grid front-on.

---

**Viewfinder: flip side [Flash Player version]**

L6264 – Years 5–9

The camera view of the objects in the viewfinder is positioned at the side or diagonally across the grid, while the reference picture is shown with the camera directly in front if it.

---

**Viewfinder: backwards glance [Flash Player version]**

L6263 – Years 5–9

The camera view of the objects in the viewfinder is positioned directly behind, diagonally behind or to the side of the grid, while the reference picture is shown with the camera directly in front if it.

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**Viewfinder: all angles [Flash Player version]**

L6262 – Years 5–9

The camera is randomly positioned in any location around the grid.
Viewfinder [Flash player version]
L6245 – Years 4–9

This is an aggregated learning object combining the four learning objects in the 'Viewfinder' series.

Shape maker: assessment series (Years 5–7)
Students use transformations (rotations and translations) to change various selected 2D shapes into targeted 3D shapes.

Features include:
- a printable report of the student's performance
- a mechanism for the student and teacher to comment on the student's learning progress.

Students:
- interpret the characteristics of 3D shapes
- visualise the result of different transformations for given 2D shapes
- match the characteristics of given 3D shapes with transformed 2D shapes.

Shape maker: simple shapes: assessment
L9931 – Years 5–6
Students demonstrate their knowledge of how the transformations rotating and translating – or spinning and extruding, as used in this assessment object – can change some of the most basic 2D shapes (such as squares, triangles and circles) into various 3D shapes (such as cylinders, cones and different prisms).

Shape maker: complex shapes: assessment
L9932 – Years 6–7
Students are assessed on their understanding of how the transformations of spinning and extruding can change some less basic 2D shapes (such as a pentagon, cross, crescent and trapezium) into specific atypical 3D shapes.
**Contours series (Years 5–9)**

Students are introduced to the idea of contour lines representing the shape of artificial landforms, in this case geometrical solids.

**Features include:**
- illustrations of how contour lines represent the shape of landforms and geometrical solids
- opportunities to construct a landscape of geometrical objects to match a contour map
- opportunities to construct a contour map representing a landscape of geometrical objects.

**Students:**
- explore the concepts of angles, contour maps, geometric perspective, grids, prisms, shapes, symmetry, transformations, 2D and 3D environments and visual perception
- match 'landforms' and their contour representations then position them correctly to create a corresponding map
- match different views (2D representations) of 3D objects with the 3D objects themselves
- translate between 2D representations and 3D objects.

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**Contours: about contours [Flash Player version]**
L7553 – Years 5–9

Students are introduced to the concept of contour lines. Students select different landscape shapes to view contours from a top or side view.

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**Contours: mystery shapes [Flash Player version]**
L7554 – Years 5–9

Students create a contour map by interpreting a given landscape scene of 3D objects. They interpret this scene and create a corresponding contour map by selecting from a number of given contours and placing them in the correct locations on their map. Students are able to rotate the scene to better view the objects.

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**Contours: loony landscapes [Flash Player version]**
L7555 – Years 5–9

Students create a 3D landscape by interpreting a given contour map. Students view a random scene of contour outlines on a plane then create a 3D view by selecting from a number of objects and locating them so they are consistent with the contour map.

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**Contours [Flash Player version]**
L7552 – Years 5–9

This is an aggregated learning object combining the three other learning objects.
**Journey planner series (Years 6–9)**

Students make decisions about transport alternatives based on information presented in train and bus timetables.

**Features include:**
- a progressive increase in difficulty as the numbers of options and alternatives grow.

**Students:**
- are presented with public transport challenges and are required to consider bus and train alternatives (sometimes combinations of the two) in order to reach destinations with the earliest possible time of arrival
- develop skills in reading timetables and in considering alternative modes of transport and alternative routes.

### Journey planner: quickest route 1
**L764 – Years 6–9**

Students compare the relative speeds between train and bus travel over three different short routes to select the quickest trip.

### Journey planner: quickest route 2
**L765 – Years 6–9**

Students compare the relative speeds between train and bus travel over six different short routes to select the quickest trip. The trips require changing trains at a particular node.

### Journey planner: quickest route 3
**L1111 – Years 6–9**

Students select the quickest route for the same trip at three different times of the day. Students learn that quickest route may vary for the same destination because of waiting times caused by timetables.
Content from other sources

Space manipulatives series (Years P–9)

Students use manipulatives to explore and practise a range of concepts and operations relating to space.

Features include:
- a template format presentation with a description and instructions.

Students:
- explore geometric concepts and apply them through a range of practice activities.

Attribute blocks
L3511 – Years P–3

Students identify what the blocks inside the oval have in common, such as the same colour, shape or size. Sort blocks by moving all blocks with that attribute inside the oval.

Ladybird mazes
L3535 – Years P–4

Students manoeuvre a ladybird through a maze using forward and backward arrows and rotations of 90 and 45 degrees. They plan and select the moves for the ladybird and then watch it execute their plan. They can map the moves in stages or map the entire journey in one go.

Pentominoes
L3540 – Years P–9

Students name a pentomino after the alphabetical letter that it resembles. They then arrange 12 different pentominoes to make patterns and pictures (for example, by making a staircase with five steps using only the letters L, W and I).

Tessellations
L3547 – Years P–9

Students build tessellations with triangles, squares, hexagons, octagons and dodecahedrons. They notice that some shapes form regular tessellations and others do not and clone patterns of tessellations to create larger patterns. They zoom in to check whether two edges are the same length, then zoom out to view and create larger patterns. They can also change the colour of any tile or group of tiles.

Pattern blocks
Students create regular or semi-regular tessellations using pattern blocks. They investigate relationships between the areas of blocks, list and compare the perimeters of each block, and compare perimeters of block combinations.

**Geoboard**

L3528 – Years 3–9

Students use rubber bands to create polygons such as a triangle, square, octagon and parallelogram on a virtual geoboard. They start by building a shape that touches six pegs, then make a five-peg triangle. They explore patterns created by dividing shapes and find out the perimeter and area of their shapes.

**Geoboard: coordinate [Windows version]**

L3529 – Years 5–9

Students use rubber bands to create polygons such as a triangle, a square, an octagon and a parallelogram on a virtual geoboard. They explore patterns created by making shapes, colour the shapes and then play the game 'Battleship' with another student on a different computer.

**Geoboard: isometric [Windows version]**

L3530 – Years 5–9

Students use rubber bands to create 3D polyhedrons such as a cube, prism and pyramid on a virtual geoboard. They colour the shapes and explore the properties of polyhedral shapes.

**Congruent triangles**

L3517 – Years 4–9

Students find out about congruent and non-congruent triangles. They use line segments and angles to build two congruent triangles for three different combinations of sides and angles. They explore the SSS case (side, side, side), the SAS case (two sides and the included angle) and the ASA case (two angles and the included side) by forming two triangles and then using the rotation function to test them for congruency.

**Platonic solids**

L3542 – Years 4–9

Students investigate the five Platonic solids by displaying, rotating and resizing them. They select
vertices, edges, and faces to show that the number of vertices minus the number of edges plus the number of faces is equal to two (Euler's formula).

### Polyominoes
L3543 – Years 4–9

Students construct polyominoes like triominoes, tetrominoes and pentominoes, and rotate and drag them to see if they are the same. They find complete sets of particular polyominoes and use the rotate and translate features to see if different-looking polyominoes are, in fact, congruent.

### Turtle geometry
L3505 – Years 6–9

Students use translations and rotations to make a turtle move and turn. For example, they select different options in sequence to walk the turtle through a maze, around obstacles, or in pre-set patterns. Students also investigate the properties of polygons.

### Golden rectangle
L3533 – Years 6–9

Students watch the plotting of a golden rectangle. The rectangle is divided into a square and another rectangle. The second rectangle has the same proportions, but is a smaller size than the original rectangle. The second rectangle can be divided again into a square and another rectangle. Notice the spiral pattern that is formed from the golden rectangles.

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**Toby jigsaw puzzle: assessment (Years 5–6)**

Students demonstrate their visualisation skills to complete a 2D jigsaw puzzle of a puppy.

**Features include:**
- a mechanism for students and teachers to comment on the student's learning progress
- a printed report showing the student's completed puzzle, as well as a performance summary and the student's reflection on improvement strategies.

**Students:**
- use transformation skills to move pieces to the correct position, rotating them where necessary
- use visualisation and spatial awareness skills.

**Treasure hunt: assessment (Years 5–6)**

Students' map-reading skills are assessed as they read directions and then decide the correct route around a treasure map.

**Features include:**
- a printable report with a mechanism for teachers to comment on the student's performance
- a map showing students' choices along the journey
- feedback to students on their choice of route and ability to follow directions.

**Students:**
- apply their knowledge of compass point directions and their understanding of left and right
- use map-reading skills in a practical situation.
**Lion trainer: assessment (Years 6–8)**

Students estimate distances and directions on maps to direct a lion to a cave.

**Features include:**
- feedback on the student's performance
- a printable report.

**Students:**
- create a series of programming commands to achieve a goal.

**Exploring space series (Years 6–9)**

Students use short digital activities to explore and practise a range of concepts and operations relating to space.

**Features include:**
- two or more separate activities or games per object
- short videos to provide everyday examples of the mathematical principles featured in the learning object
- a template format with a description and instructions.

**Students:**
- explore geometric concepts relating to space.

**Exploring relationships of angles**

L6554 – Years 6–9

Students explore angles formed by a transversal line intersecting parallel lines and look at illustrations showing pairs of angles: vertically opposite, corresponding and alternate angles. They name pairs of angles to score points and help a monkey drive to the supermarket to buy food.

**Exploring angles**

L6555 – Years 6–9

Students resize a triangle by moving its vertices and note that the sum of the three interior angles is always 180 degrees. They watch a video showing how angles are used in designing and riding bicycles.
L6556 – Years 6–9

Students explore the constant value of ‘$\pi$’ by investigating the relationship between circumference and diameter. They unroll the circumference of a circle to form a straight line, see how many times the diameter can be placed beside it, and note that the relationship between the circumference and diameter applies no matter what size the circle is.

Exploring quadrilaterals
L6562 – Years 6–9

Students examine the sides and angles of a four-sided shape and identify its geometric properties, such as the number of sides of equal length. They classify the shape as a parallelogram, rhombus, square, rectangle, kite or trapezium, noting that some quadrilaterals can be classified in multiple ways.

Exploring transformations
L6565 – Years 6–9

Students explore transformations of shapes such as rotation, translation or reflection. They identify which transformations have been applied to circles and polygons to produce new images (e.g., the original image may have been rotated 90 degrees around the point (0,0)) and note how the coordinates of the transformed image are related to the original image.

Exploring dilations
L6566 – Years 6–9

Students explore dilations by transforming shapes such as triangles and rectangles. They choose a scale factor and position a shape and dilation centre. They note how the coordinates of the dilation image are related to the original image; look at how scale factors enlarge or reduce the size of a shape; identify a scale factor that has been used to dilate an image; and position a dilation image according to a given scale factor and dilation centre.
HOTmaths: using a centre of enlargement (Years 7–8)

Students investigate the effect of changing the scale factor on the enlargement of a quadrilateral and notice the effect on corresponding sides of a quadrilateral.

Features include:
- opportunities to investigate the impact of a scale factor on an image
- opportunities to investigate how, in a dilation, the ratio of corresponding sides in a figure and its image is a constant and equal to the scale factor.

Students:
- understand that the ratio of corresponding sides of similar figures is equal to the scale factor
- understand that the ratio of corresponding sides of similar figures is constant
- understand that a scale factor greater than one results in an enlargement and a scale factor of less than one results in a reduction.

HOTmaths: using a centre of enlargement
L11103 – Years 7–8

Students discover that, in a dilation, the ratio of corresponding sides in a figure and its image is a constant and is equal to the scale factor.

HOTmaths: using a centre of enlargement: solution sheet
R11184

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HOTmaths: exploring bearings (Years 7–10)

Students use a map of New South Wales and a virtual compass to calculate the bearing of one town to another.

Features include:
- a virtual protractor to measure bearings.

Students:
- understand that bearings are always calculated as the clockwise angle from north.

HOTmaths: exploring bearings
L10814 – Years 7–10

Students investigate the relationship between the bearing of Town A from B and Town B from A.

HOTmaths: exploring bearings: solution sheet
R11188

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Interacting with Mathematics (IWM) (Years 11–12)

These digital curriculum resources, developed by the Department of Education and Children's Services (DECS), South Australia, provide mathematical learning experiences for students in years 11 and 12 that incorporate constructivist pedagogy and ICT technologies combined with a positive purpose for mathematical learning. A range of everyday 'real world' problems and challenges are posed, requiring students to solve them using mathematics.

Features include:
- a series of interactives (simulations) to visualise events and generate data
- prompts, helpful hints and explanations of concepts and techniques using interactive in-built tools to aid student calculation and skill development
- assessment by a three-level check of concept reinforcement, skill refinement and application of knowledge of the concepts.

Students:
- attempt a Stenduser activity to promote interest and enthusiasm for the topic
- undertake the new learning tasks through a learning journey
- demonstrate their understanding of new concepts
- apply their new skills in simple situations
- apply their new knowledge to solve problems
- undertake a project or challenge to apply their new-found mathematical knowledge by exploring a problem(s) with little or no teacher direction.

IWM: deductive geometry

L10363 – Years 11–12

Students develop knowledge and understanding of deductive geometry and the nature of proof to solve real-world problems. They undertake a learning journey to connect three locations by the shortest possible route. They identify the patterns and properties associated with Steiner points, circumcentres and cyclic quadrilaterals and make conjectures in geometric settings. They prove the conjectures true or false using the theorems of Euclidean geometry and mathematical modelling. They explore the geometric properties of points, lines and circles using interactive technologies.