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Introduction
This catalogue contains details about the digital curriculum content for the Mathematics and numeracy strand Measurement available from The Le@rning Federation (TLF). The content has either been created by TLF or licensed from other sources and made available to all schools in Australia and New Zealand.

The Measurement digital content supports and enhances students’ understanding of key Mathematics concepts in a range of contexts for the P–12 years.

TLF-created content
Mathematics and numeracy digital materials 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
School day series (Years P–2)

Students read on-the-hour times on digital and analogue clocks and sequence familiar events in the correct time order.

Features include:
- clocks and labels showing the time in one hour intervals from 7 o’clock to 10 o’clock
- audio for all text to support reading and comprehension
- feedback and opportunity to self-correct sequences.

Students:
- associate events in a sequence with certain times
- sequence four images of a boy going to school
- sequence analogue or digital clocks and match them with labels that present times in words, e.g. seven o’clock
- are exposed to three different ways of expressing time: analogue clocks, digital clocks and words.

School day: analogue
L7789 – Years P–1

Students sequence four images that illustrate stages in going to school in the morning. Students then match analogue clocks with each image, and match the time, in words, to each clock.

School day: 12-hour digital
L7790 – Years P–1

Students put digital clocks showing on-the-hour times in order. Students match time words to the clocks, and then sequence four images that illustrate stages in going to school in the morning.

School day: 24-hour digital
L7797 – Year 2

Students sequence five images that illustrate stages in the school day. Students match analogue clocks with each image. Students then match the times with 24-hour digital clocks.

This series contains non-TLF content. See Acknowledgements in the learning objects.
**Area concept series (Years P–4)**

Students explore the concept of area as covering a surface, and to introduce the formula for calculating the area of a rectangle.

**Features include:**
- an animated multiplication table supports students who experience difficulty with calculating the product.

**Students:**
- estimate the area of the shape (square, rectangle or L shaped) using a reference square
- cover the shape with the square, first completing a row or a column and then copying the entire row or column to complete the shape
- calculate the area, using the dimensions of the shape to fill in the formula length $\times$ width.

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Time tools series (Years P–8)

Students explore 12-hour time, or 12-hour and 24-hour time, on both analogue and digital clocks. Students match 12-hour or 24-hour times to the minute, or half hour, on both analogue and digital clocks.

Features include:
- opportunities for students to manipulate times on 12-hour and 24-hour clocks
- information about 12-hour and 24-hour time
- adjustable time controls to 1-minute, half-hour and hour intervals.

Students:
- read and interpret times on digital and analogue clocks at 1-minute and half-hour intervals
- explore and manipulate times on 12-hour and 24-hour clocks
- identify matching times on digital and analogue clocks.

**Time tools: 24-hour to the minute**
L9642 – Years 5–8

Students explore the features of 12-hour and 24-hour clocks and the passing of time from am to pm, by viewing supporting animations. They match clock times to the time presented on a Master clock, and receive scaffolded feedback accordingly. Students play a game and find the matching time cards in the smallest number of possible tries.

**Time tools: 24-hour to the minute: time challenge**
L9646 – Years 5–8

Students match 12-hour and 24-hour clock times to the time presented on a Master clock, and receive scaffolded feedback accordingly.

**Time tools: 24-hour to the minute: time match**
L9647 – Years 5–8

Students find the matching time cards in the smallest number of possible tries. Times are displayed in analogue and digital form, in both 12-hour and 24-hour time.

**Time tools: 24-hour to the minute: practice time**
L9645 – Years 5–8

Students explore time by adjusting the controls to change and match times on analogue and digital clocks. They explore the features of 12-hour and 24-hour clocks and the passing of time from am to pm.
Time tools: 12-hour to the minute
L9643 – Years 3–4

Students explore the features of 12-hour clocks and the passing of time from am to pm, by viewing supporting animations. They match clock times to the time presented on a Master clock, and receive scaffolded feedback accordingly. Students play a game and find the matching time cards in the smallest number of possible tries.

Time tools: 12-hour to the minute: time challenge
L9649 – Years 3–4

Students match 12-hour clock times to the time presented on a Master clock, and receive scaffolded feedback accordingly.

Time tools: 12-hour to the minute: time match
L9650 – Years 3–4

Students find the matching time cards in the smallest number of possible tries. Times are displayed in analogue and digital form, in 12-hour times to the minute.

Time tools: 12-hour to the minute: practice time
L9648 – Years 3–4

Students explore time by adjusting the controls to change and match times on analogue and digital clocks. They explore the features of 12-hour clocks and the passing of time from am to pm.

Time tools: 12-hour to the half hour
L9644 – Years P–2

Students use the clock controls to change and match the times on analogue and digital clocks. They learn about the features of 12-hour clocks by viewing supporting animations. They change clock times to match the time presented on a Master clock, and receive scaffolded feedback accordingly. Provides audio to support on-screen text.

Time tools: 12-hour to the half hour: time challenge
L9652 – Years P–2
Students match 12-hour clock times to the half hour times presented on a Master clock, and receive scaffolded feedback accordingly.

**Time tools: 12-hour to the half hour: time match**  
L9653 – Years P–2  
Students find the matching time cards in the smallest number of possible tries. Times are displayed in analogue and digital form, in 12-hour times to the half hour.

**Time tools: 12-hour to the half hour: practice time**  
L9651 – Years P–2  
Students explore time by adjusting the controls to change and match times on analogue and digital clocks to the half hour. They explore the features of 12-hour clocks and the passing of time from am to pm.
Wake up, Pup series (Years 1–2)

Students help Mia and Jack take Pup for a walk by putting pictures of Pup’s morning in the correct sequence and clocks showing on-the-half-hour times in the correct order.

Features include:
- feedback and opportunity to self-correct sequences
- times presented in different ways
- audio to support reading and comprehension.

Students:
- put familiar events represented by pictures in the correct order
- read on-the-half-hour times on clocks, and put them in the correct order
- read words expressing o’clock and half-past times.

Wake up, Pup: analogue
L7791 – Years 1–2

Students are introduced to times presented in three different ways: pictorially, on analogue clocks and expressed in words.

Wake up, Pup: analogue and digital
L7792– Years 1–2

Students are introduced to times presented in four different ways: pictorially, on analogue clocks, on digital clocks and expressed in words.

This series contains non-TLF content. See Acknowledgements in the learning objects.
Rice paper rolls series (Year 2)

Help Tom and Liz make rice paper rolls. Put pictures of how they prepare the rolls in the correct sequence and place the clocks showing on-the-quarter-hour times in order.

Features include:
- feedback and opportunity to self-correct sequences
- audio to support reading and comprehension
- times presented in different ways.

Students:
- associate events in a sequence with certain times
- place the clocks showing on-the-quarter-hour times in order and match them to the pictures
- match the time words to the clocks
- watch Tom and Liz prepare rice paper rolls as time passes.

Rice paper rolls: analogue
L7793 – Year 2

Students read on-the-quarter-hour times on analogue clocks, and put them in the correct order.

Rice paper rolls: analogue and digital
L7794– Year 2

Students read on-the-quarter-hour times on analogue and digital clocks, and put them in the correct order.
**After school series (Year 2)**

Students help Neo get home from school by sequencing analogue clocks and a series of images. Students match word labels and digital clocks to the analogue clocks showing on-the-quarter-hour times.

**Features include:**
- audio for all text is included to support reading and comprehension
- three different ways of expressing time: analogue clocks, digital clocks and words.

**Students:**
- sequence five images and five analogue clocks then match word labels and/or digital clocks to the analogue clocks
- associate events in a sequence with certain times
- watch an animation of the event.

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**After school: analogue**

L7795 – Year 2

Students sequence five analogue clocks and match labels to the clocks. Students then match illustrations of a boy’s progress from leaving school to arriving home with the clocks and labels.

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**After school: analogue and digital**

L7796 – Year 2

Students sequence five analogue clocks. Students match digital clocks with each clock face and then match labels to the clocks. Students match illustrations of a boy’s trip home from school with the correct clocks.

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This series contains non-TLF content. See Acknowledgements in the learning objects.
Cubirocks (Years 2–4)

Using robot creatures with three different-sized measuring cubes, students estimate the volume of different cubic shaped ‘cubirocks’.

Features include:
- eight medium cubes and 27 small cubes fill one large cube so students can use these ratios to estimate the volume of solids
- different measuring cubes for each character: small, medium-sized or large.

Students:
- help cuboid characters to estimate the volume of solids made from a number of large cubes.

Cubirocks galore
L161 – Year 2–4

Students help two characters using medium-sized or large blocks, so ratios are 1:1 and 1:8. Volumes range from one unit up to 48 units (2x2x2x6). Students complete a data table which can be used to explore relationships between unit size and volume.

Cubirocks are measured
L162 – Year 2–4

Students help three characters using small, medium-sized or large blocks so ratios are 1:1, 1:8 and 1:27. Volumes range from one unit up to 162 units (3x3x3x6). Students complete a data table which can be used to explore relationships between unit size and volume.

Cubirocks go!
L160 – Year 2–4

Students help three characters, so ratios are 1:1, 1:8 and 1:27. Volumes range from one unit up to 162 units (3x3x3x6).
**Timetable series (Years 3–8)**

Students solve complex timetabling problems by calculating times and durations using a range of clock types and time notations.

**Features include:**
- A context for solving a complex problem involving several aspects of time measurement
- A time calculation tool with digital and analogue clock displays, for calculation strategy support
- Scaffolded feedback for correct and incorrect answers.

**Students:**
- Sequence events
- Interpret calendars, digital and analogue clocks, timetables and timelines
- Calculate times and durations by adding or subtracting 30-minute or 1-hour intervals, often across midday or across different time zones.

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**Timetable: talent quest**
L7896 – Years 3–4

Students work out a program for a talent quest. They find the date for the show by marking off dates on a calendar. They then check the travel plans for each act and work out their earliest arrival times. Students place each act into a timetable slot and create the final program for the talent quest.

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**Timetable: music festival challenge: run sheet**
L7899 – Years 7–8

Students create a daily timetable by scheduling events. They place each event into a timetable slot and allocate a time. The timetable can be printed, upon completion.

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**Timetable: music festival challenge**
L7840 – Years 7–8

Students work out a program for an Auckland music festival. They find the flight times and other travel details for acts coming from different parts of Australia, New Zealand and Norfolk Island. They check for extra information, like changes in time zones, connecting flights, or stage bookings. They then place each act into a timetable slot that allows for their set-up time, act length and any special needs.

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**Timetable: music festival**
L7841 – Years 7–8

Students work out a program for a Sydney music festival. They find the flight times and other travel details for acts coming from different parts of Australia and New Zealand. They then calculate the earliest and latest times acts can perform. They check for extra information, like changes in time zones, or connecting flights, then create the final program for the festival.
### Timetable: extreme talent quest
L7842 – Years 5–6

Students work out a program for an extreme talent quest. They check the travel plans for each act and work out their earliest arrival times, noting if the act travels via another destination first. They place each act into a timetable and create the final program.

### Timetable: extreme talent quest: travel
L7900 – Years 5–6

Students help plan an extreme talent quest by checking the travel plans for each act and working out their earliest arrival times, noting if the act travels via another destination first.

### Timetable: talent quest: travel
L9892 – Years 3–4

Students help plan a talent quest by checking the travel plans for each act and working out their earliest arrival times.

This series contains non-TLF Content. See Acknowledgements in the learning objects.
Inside cubes series (Years 5–9)

Students use a tool to ‘cut’ compound shapes into triangles and rectangles and then select the appropriate formula to calculate the area of each piece and, finally, the area of the total compound shape.

Features include:
- visual feedback via an animated counter
- an enlargement tool allowing students to examine results in detail, and a rotation tool so they can view the object from various aspects.

Students:
- explore the concept of volume by estimating the size of various cubes.

How big is a cubic metre?
L163 – Years 6–9

Students are asked to estimate how many cubic centimetres are contained in a cubic metre. They are shown how their estimate fits within a transparent cubic metre. Students are offered three opportunities before being given the chance to find out. Students are then asked to estimate the number of cubic centimetres in the length and width of the cubic metre. The concept of volume is further enhanced by students estimating the number of cubic centimetres in each layer of the cubic metre and the idea that the volume of a cuboid can be calculated by multiplying the area of the base by the height.

Inside a cubic metre
L164 – Years 6–9

Students are asked to enter their estimates of the length and width, and then how many cubic centimetres are in parts of a cubic metre. Once they get the estimate correct, assisted by the animation and the counter, the decimal fraction value is displayed. There are several levels of difficulty, each culminating in the presentation of a table on which students are asked to complete blank cells, including the decimal fraction.

What’s in a cube?: level 1
L165 – Years 6–9

Students are presented with a variety of cuboid or cuboid-like objects inside a cubic metre grid and asked to estimate the volume of the objects. They are encouraged to compare the object with the cubic metre – that is, ‘I think the DVD player is about one-tenth of the cubic metre’. The interactive approach is enhanced by students being able to override the feedback animation and enter an improved estimation.
What's in a cube?: level 2
L166 – Years 6–9

Students estimate the volumes of objects that are less regular. Students are encouraged to imagine the object broken up into a number of cuboids to estimate the volume of each cuboid piece and then to add their estimates to get their answers. If their first estimate is incorrect the object is broken up into the component cuboids, which are arranged to assist in their estimation.

Working it out!
L167 – Years 6–9

Students work out the volume of a number of real-life cuboid-shaped objects using the formula: volume = area of base x height. The dimensions are given in centimetres. The student is led step by step through the calculation process, first working out the area of the base of the cuboid, and then the volume. Visual feedback is provided. At the end of the learning object the student is asked to complete a table with a column for working out the equivalence in cubic metres.
Area of triangles series (Years 6–9)

Students explore the relationship between the area of a rectangle and the area of a triangle.

Features include:
- an animation tool to help students to find the base and height measurements of triangles
- opportunities for students to apply the formula for calculating area to nine different types of triangles
- scaffolding to reinforce the idea that the area of a triangle is calculated as half the base times the height
- a mechanism for the student and teacher to comment on the student’s learning progress
- a printable report of the student’s answers alongside the correct values.

Students:
- predict the area of triangles
- identify the base and height of triangles
- choose an edge of the triangle as the base then slide a ‘height line’ to the correct position to identify the height
- enter the dimensions of the triangle into the formula to calculating its area. Where the dimensions are difficult to determine from the underlying grid, they are provided. Students will require a calculator for some of the calculations
- substitute the base and height measurements into the formula for calculating the area of a triangle
- practise applying the formula directly to a range of triangles
- compare the actual area of the triangle with their original prediction.

Area of triangles: triangles with a right angle
L354 – Years 6–9

Students work with triangles with a horizontal or vertical edge. When students select the base, they are prompted that horizontal and vertical sides are easier to use for the base.

Area of triangles: height intersects with the base inside the triangle
L355 – Years 6–9

Students work with triangles where the height line falls within the base of the triangle and that have either a vertical or horizontal side.

Area of triangles: height intersects with the base outside the triangle
L356 – Years 6–9

Students work with triangles with a vertical or horizontal side, where the height line may fall outside the base of the triangle. Students fit the two triangles into the rectangle then they must fit in the part of the original triangle that falls outside the rectangle.
Area of triangles: triangles without vertical or horizontal sides
L357 – Years 6–9

Students work with triangles where none of the sides are vertical or horizontal.

Area of triangles
L145 – Years 6–9

This is an aggregate of the other learning objects except for triangles with a right angle. Students can select the type of triangle they work with.

Area of triangles: assessment
L8273 – Years 6–8

Students calculate the area of nine triangles using the area formula.
Area of compound shapes series (Years 6–9)

Students use a tool to ‘cut’ compound shapes into triangles and rectangles and then select the appropriate formula to calculate the area of each piece and, finally, the area of the total compound shape.

Features include:
- shapes presented range in size and complexity

Students:
- are encouraged to be efficient in their ‘cutting’ so that their compound shape is cut into a small number of pieces
- apply formulas for the area of rectangles and triangles to calculate the area of compound polygons
- cut compound polygons into triangles and rectangles in a number of different ways.
- estimate the area of compound polygons
- identify rectangles and triangles that comprise compound polygons.

### Compound shapes: small shapes
L150 – Years 6–9

Students estimate the area of a simple polygon. They cut the shape into rectangles and triangles and use a formula to calculate the exact area for each of the simple shapes. Then find the total area for the original polygon.

### Compound shapes: medium-sized shapes
L151 – Years 6–9

Students estimate the area of a complex polygon. They cut the shape into rectangles and triangles and use a formula to calculate the exact area for each of the simple shapes. Then find the total area for the original polygon.

### Compound shapes: large shapes
L152 – Years 6–9

Students estimate the area of a highly complex polygon. They cut the shape into rectangles and triangles and use a formula to calculate the exact area for each of the simple shapes. Then find the total area for the original polygon. Try dividing the shape again into fewer pieces.

### Compound shapes
L153 – Years 6–9 🔄

This is a combination of the three ‘Compound shapes’ learning objects.
Measures series (Years 7–9)

Students investigate the spatial properties of similar plane shapes and solids.

Features include:

- illustrations of the meaning of similarity in solids and plane shapes
- a range of scalable plane shapes and solids with side lengths displayed in whole numbers
- opportunities to use multiplication facts in ratio and scale situations
- tables to help students record the relationship between side length and area in similar plane shapes and solids.

Students:

- distinguish between similar and non-similar shapes and objects and use ratio to quantify and describe the relationships between their measurable attributes (length, area, volume).

Measures: similar shapes
L2309 – Years 7–9

Students work through examples that demonstrate that similar shapes are shapes that have the same angles and where the corresponding side-lengths are in proportion. The shapes used are rectangles, squares, right angle triangles, isosceles triangles and equilateral triangles. Students receive a score after ten attempts.

Measures: scaling up
L2310 – Years 7–9

Students scale up shapes to create similar plane shapes. Students are presented with simple shapes, asked to choose an enlargement scale factor and record their observations in a table. They must predict the area scales factor in the table before the larger shape is drawn.

Measures: scaling down
L2311 – Years 7–9

Students explore the relationships between side-length scale factor and area scale factor when reducing the size of a given shape.

Measures: similar solids
L2312 – Years 7–9

Students explore similar solids using cubes, triangular prisms, cylinders, cones and irregular shapes.
Measures: scaling up solids  
L2313 – Years 7–9  
Students scale up solids to create similar solids.

Measures: scaling down solids  
L2314 – Years 7–9  
Students scale down solids to create similar solids.

Measures: scaling surface area  
L2315 – Years 7–9  
Students identify the relationship between the side length scale factor and the surface area when scaling solids. They use this relationship to complete scaling tasks.

Measures: volume  
L2316 – Years 7–9  
Students identify and describe the relationship between side lengths and volume when scaling up prisms. They use this relationship to complete scaling tasks.
Trigonometry series (Years 7–9)

Students explore how the angles and side length properties of similar right-angled triangles may be applied in measurement situations to calculate unknown side lengths and angles.

Features include:
- scaffolding and informative feedback
- a range of equations including an unknown variable that can be solved by using multiplicative facts and strategies
- a visual tool to determine the magnitude of angles from 0–90 degrees from trigonometric values
- a range of equations including an unknown variable that can be solved by using multiplicative facts and strategies
- modelling of measurement situations involving equivalent ratios.

Students:
- establish similarity, identify corresponding sides, establish equivalent ratios and find unknown lengths
- use multiplicative and ratio strategies to solve measurement problems
- explore the unit circle definition of trigonometric ratios
- use a unit circle model to determine values of trigonometric ratios.

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### Trigonometry: measuring with triangles
L2326 – Years 7–9

Students see how the early Greeks and Egyptians used the properties of similar right-angle triangles to solve measurement problems. They then identify and record the relevant ratios in two similar right-angle triangles to find the unknown height of one of them (represented as the height of a column). Students then use ratio in three pairs of similar isosceles right-angle triangles to find the unknown value on one triangle.

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### Trigonometry: similar triangles
L2327 – Years 7–9

Students manipulate and identify the properties of similar right-angle triangles.

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### Trigonometry: sine
L2329 – Years 7–9

Students use a ‘unit circle’ tool to complete a table of values concerning sine.
Trigonometry: cosine  
L2328 – Years 7–9  
Students use a ‘unit circle’ tool to complete a table of values concerning cosine.

Trigonometry: tangent  
L2330 – Years 7–9  
Students use a ‘unit circle’ tool to complete a table of values concerning tan.

Trigonometry: using sine  
L2332 – Years 7–9  
Students use sine and the properties of the right-angle triangles to solve measurement problems.

Trigonometry: using cosine  
L2333 – Years 7–9  
Students use cosine and the properties of the right-angle triangles to solve measurement problems.

Trigonometry: using tan  
L2331 – Years 7–9  
Students use tan and the properties of the right-angle triangles to solve measurement problems.
Trigonometry: finding the hypotenuse
L2334 – Years 7–9

Students use sine to find the hypotenuse.

Trigonometry: finding the angles
L2335 – Years 7–9

Students use tri ratios to find missing angles.

The Metrix series (Years 7–10)

Students practise conversions between metric units of measurement, with particular attention given to place value relationships using whole numbers and decimal fractions.

Features include:

- metric tables that show the relationships between units, and highlight place value
- opportunities for students to practise converting units of measurement for length, volume, and area
- feedback that supports the development of strategies for conversion between units.

Students:

- convert measurements by applying knowledge of metric relationships in length, volume, and area
- interpret terminology for length, volume, and area measurement, to solve problems.

The Metrix: new planet
L8146 – Years 7–8

Students captain the Metrix spacecraft on a mission to a new planet. They use the metric measurement tables for length, volume, and area to help make decisions about the spacecraft’s launch, flight and landing.

The Metrix: asteroid
L8147 – Years 8–10

Students captain the Metrix spacecraft on a mission to save Earth from an asteroid collision. They use the metric measurement tables for mass, length, and volume to make unit conversion involving rates, such as speed and frequency.
The Metrix: comet
L8145 – Years 6–8

Students captain the Metrix spacecraft on a mission to collect valuable minerals from the dust of a comet’s tail. They use the metric measurement tables for mass, length and capacity to make unit conversions. For example, to ensure a successful launch, select the millilitre equivalent of 50 cm³ of rocket fuel additive.

The Metrix: comet: decimals
L8148 – Years 7–8

Students captain the Metrix spacecraft on a mission to collect valuable minerals from the dust of a comet’s tail. They use the metric measurement tables for mass, length and capacity to make unit conversions involving decimal numbers.

The Metrix: asteroid: decimals
L8150 – Years 8–10

Students captain the Metrix spacecraft on its mission to save Earth from an asteroid collision. They use the metric measurement tables for mass, length and volume to make metric unit conversions involving decimal numbers involving rates, such as speed and frequency.

The Metrix: new planet: decimals
L8149 – Years 7–8

Students captain the Metrix spacecraft on its mission to a new planet. They use the metric measurement tables for length, area and volume, plus prior knowledge of decimal numbers, to make decisions about the spacecraft’s launch, flight and landing.

The Metrix: mass
L10869 – Years 6–8

Students measure the mass of a drinking water container required to fit into the Metrix spacecraft.

The Metrix: metric table
L10870 – Years 6–8

Students complete the missing information in the metric measurement table for units of length.
The Metrix: length 1  
L10871 – Years 6–8  
Students measure the lengths of cable required to repair a broken tile on the Metrix spacecraft.

The Metrix: length 2  
L10872 – Years 6–8  
Students replace a reflective tile of the required thickness on the Metrix spacecraft.

The Metrix: capacity 1  
L10873 – Years 6–8  
Students fill the cargo hold of the Metrix spacecraft with the required volume of cargo.

The Metrix: capacity 2  
L10874 – Years 6–8  
Students add the amount of explosive powder required to ignite the Metrix spacecraft, to its fuel tank.

The Metrix: decimals: mass 1  
L10878 – Years 7–8  
Students use decimal numbers to measure the mass of a drinking water container required to fit into the Metrix spacecraft.
<table>
<thead>
<tr>
<th>Learning Object</th>
<th>Code</th>
<th>Year Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Metrix: decimals: length 1</td>
<td>L10879</td>
<td>7–8</td>
</tr>
<tr>
<td>Students use decimal numbers to measure the docking port required to dock the Metrix spacecraft with the space station.</td>
<td></td>
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</tr>
<tr>
<td>The Metrix: decimals: capacity</td>
<td>L10880</td>
<td>7–8</td>
</tr>
<tr>
<td>Students select the appropriate air tank for a spacewalk, by converting units expressed as decimals, so they can repair a damaged tile on the Metrix spacecraft.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Metrix: decimals: length 2</td>
<td>L10881</td>
<td>7–8</td>
</tr>
<tr>
<td>Students use decimal numbers to calculate the required thickness of a reflective tile that needs to be replaced on the Metrix spacecraft.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Metrix: decimals: area 1</td>
<td>L10882</td>
<td>7–8</td>
</tr>
<tr>
<td>Students use decimal numbers to measure the required size of a solar panel to replace a damaged one on the Metrix spacecraft.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Metrix: decimals: volume</td>
<td>L10883</td>
<td>7–8</td>
</tr>
<tr>
<td>Students use decimal numbers to measure the volume of a drinking water container needed for the Metrix spacecraft.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Metrix: decimals: area 2  
L10887 – Years 7–8  
Students stake their claim on a newly discovered planet’s most appropriate area of landmass, by converting units expressed as decimals.

The Metrix: decimals: mass 2  
L10888 – Years 7–8  
Students convert units expressed as decimals to choose the required space collector to obtain some valuable particles from a comet’s tail.

The Metrix: power  
L10875 – Years 8–10  
Students charge the Metrix spacecraft’s laser gun with the required power rating.

The Metrix: frequency  
L10876 – Years 8–10  
Students replace the Metrix computer’s failed CPU with the required frequency component.

The Metrix: volume  
L10877 – Years 8–10  
Students calculate the required volume of antibiotic to fight an alien virus threatening the Metrix spacecraft.
The Metrix: decimals: rate 1
L10884 – Years 8–10

Students use decimal numbers to measure the rate of speed required for the Metrix spacecraft to escape the Earth’s orbit.

The Metrix: decimals: rate 2
L10885 – Years 8–10

Students measure the air pressure required to destroy an alien attacking the Metrix spacecraft, by converting between units of volume and time expressed as decimals.

The Metrix: decimals: rate 3
L10886 – Years 8–10

Students match the speed of the Metrix spacecraft to an asteroid’s speed by converting between units of length and rates of time expressed as decimals.
Trigonometry: assessment (Years 10–12)
Students demonstrate their understanding of angles and their sine, cosine and tangent values.

Features include:
- an interactive unit circle tool, enabling student to answer questions
- a printable report of the student’s performance.

Students:
- use the unit circle tool to find the value of sine, cosine or tangent of a specified angle
- use the unit circle tool to find the value of an angle given sine, cosine or tangent for that angle
- identify the key values and relationship between the value of an angle and the unit circle ratio for angles between 0° and 360°.

Trig degrees (Years 11–12)
Students use an interactive unit circle tool to explore sine, cosine and tangent values and to observe symmetry and patterns in the values.

Features include:
- introductory animations that provide step-by-step explanations for each of the function definitions
- an interactive unit circle to ensure students work with general definitions of the functions for sine, cosine and tangent (connected to right-angled triangle definitions)
- challenges that highlight the symmetry and patterns in each of the functions of sine, cosine and tangent
- associations with real-world periodic phenomena that are modelled with trigonometric functions.

Students:
- apply the unit circle definitions of the trigonometric functions for sine, cosine and tangent
- interpret graphs (from 0° to 360°) of the trigonometric functions for sine, cosine and tangent
- identify patterns and symmetry of the trigonometric functions for sine, cosine and tangent.
Trig degrees: cosine tool  
L9114 – Years 11–12  
Students use a unit circle tool to explore cosine values. They observe the graph being drawn as each cosine value is plotted.

Trig degrees: tangent tool  
L9115 – Years 11–12  
Students use a unit circle tool to explore tangent values. They use the information to predict what the graph of tan Ø will look like.

Trig degrees: sine to 360  
L7844 – Years 11–12  
Students determine the sin Ø values for angles. They observe the symmetry and patterns of the functions to predict sine values in different quadrants.

Trig degrees: cosine to 360  
L7845 – Years 11–12  
Students determine the cos Ø values for angles. They observe the symmetry and patterns of the functions to predict cosine values in different quadrants.

Trig degrees: tangent to 360  
L7846 – Years 11–12  
Students determine the tan Ø values for angles. They observe the symmetry and patterns of the functions to predict tangent values in different quadrants.
Trig degrees: sine to 360: demo
L9116 – Years 11–12

Students watch a demonstration showing how sine is defined in the unit circle. Students view the connection between the unit circle definition of sine and the right-angled triangle definition of sine.

Trig degrees: cosine to 360: demo
L9117 – Years 11–12

Students watch a demonstration showing how cosine is defined in the unit circle. Students view the connection between the unit circle definition of cosine and the right-angled triangle definition of cosine.

Trig degrees: tangent to 360: demo
L9118 – Years 11–12

Students watch a demonstration showing how tangent is defined in the unit circle. Students view the connection between the unit circle definition of tangent and the right-angled triangle definition of tangent.

Trig degrees
L7843 – Years 11–12 🤗

This is an aggregated learning object combining three learning objects in the series. Students work with sine, cosine and tangent.
Time manipulatives series (Years P–6)

Students use manipulatives to explore and practise a range of concepts and operations relating to the measurement of time.

Features include:
- both digital and analogue clocks to represent time
- a template format with a description and instructions.

Students:
- perform number operations involving analogue and digital time.

**Time: analogue and digital clocks**
L3548 – Years P–6

Look at the same time displayed on a digital and a face (analogue) clock. Move the hour, minute or second hand on the face clock and observe the change in the digital clock. Increase or decrease the hours, minutes or seconds on the digital clock and watch the corresponding hands on the face clock move. Show or hide seconds on each clock.

**Time: match clocks**
L3549 – Years P–6

Increase or decrease the hours and minutes on a digital clock to match the time displayed on a face (analogue) clock. Or move the hands on a face (analogue) clock to match the time displayed on a digital clock.

**Time: what time will it be?**
L3550 – Years P–6

Calculate what time it will be later. Increase the hours or minutes on a digital or analogue clock to show the later time. For example, increase the minutes by 15 to show what time it will be 15 minutes after 2.35 am.
How high? (Years 4–9)
Students use manipulatives to explore the concept of conservation of volume.

Features include:
- a template format with a description and instructions
- illustrations of how ratio is related to volume.

Students:
- explore properties of ratios.
- investigate properties of conservation of volume.

How high?
L3534 – Years 4–9

Observe what happens when the liquid in one container is poured into another. Move a slider to predict the level of the liquid in the second container. Then check your prediction. Notice that the liquid level is related to the width of the container.

EagleCat: spin graph (Years 5–12)
Students investigate loci involving a rolling circle.

Features include:
- a platform in which students can explore mathematical relationships such as the ratio of radii, using numerical information on laps, spins and angles.
- further pathways for development and extension of core concepts through an ‘Ideas’ panel
- the option to print some parts of the learning object.

Students:
- describe the path of a moving point
- describe the relationship between a family of curves and the radii of two circles.

EagleCat: spin graph
L10092 – Years 5–12

Students investigate the beautiful patterns that can emerge from the locus of a point on one circle rolling around another circle. They investigate families of curves that can be produced by: (a) changing the size of the rolling circle only, (b) changing the size of the fixed circle only or (c) changing the position of the point only.

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EagleCat: rotasym (Years 6–9)

Students explore rotational symmetry.

Features include:
- a tool that enables students to visualise a variety of shapes rotated through 360°
- ideas for further development and extension of core concepts
- an option to print individual parts of the learning object.

Students:
- rotate shapes through 360° and determine each shape's order of symmetry
- identify order of symmetry as factors of 360°.
**Exploring measurement series** *(Years 6–10)*

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

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

**Students:**
- investigate theories and concepts related to measurement.

<table>
<thead>
<tr>
<th>Exploring ratios and proportions</th>
<th>L6546 – Years 6–9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students explore ratios by comparing the dimensions of two rectangles. They choose a scale to enlarge the smaller shape and identify whether its sides are proportional to those of the larger rectangle.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exploring area and perimeter</th>
<th>L6557 – Years 6–9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students build a compound shape on a grid from shapes such as rectangles, semicircles and squares. They notice that the total area of the compound shape equals the sum of the areas of all of the component shapes then build a rectangle to produce a given area and perimeter. They identify shapes used to form a compound shape and calculate the area of each component shape and the compound shape.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exploring triangles</th>
<th>L6558 – Years 6–9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students find an active triangle in a photograph and work out its angles by applying principles of opposite angles, complementary angles, supplementary angles and the sum of interior angles.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exploring square roots</th>
<th>L6547 – Years 7–9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students build a square on a grid to cover a given number of units. They notice that each side of the square equals the square root of the area and calculate the area of each square and work out the square root.</td>
<td></td>
</tr>
</tbody>
</table>
Exploring the Pythagorean theorem  
L6559 – Years 7–9

Students adjust the dimensions of a right-angled triangle then calculate the area of squares bordering each side of the triangle. They notice that the area of the square bordering the hypotenuse is equal to the sum of the areas of the squares bordering the other two sides.

Exploring trigonometry  
L6561 – Years 8–10

Students label the three sides of a right-angled triangle as hypotenuse, adjacent and opposite sides and identify which sides form a trigonometric ratio such as cosine or tangent.

EagleCat: bearings  
L10094 – Year 7

Students explore the differences between true bearings and compass bearings.

Features include:
- a tool for the direct comparison of true bearings and compass bearings
- familiarisation about the way directions can be described
- further pathways for development and extension of core concepts through an ‘Ideas’ panel
- the option to print some parts of the learning object.

Students:
- distinguish between true bearings and compass bearings
- convert true bearings to compass bearings and vice versa
- estimate true bearings and compass bearings
- use the eight main cardinal points on a compass rose to describe direction
- use a compass tool to determine the direction from landmarks on an island.
HOTmaths: using a beam balance (Years 7–8)

Students estimate the mass of an everyday object and then check using a beam balance.

**Features include:**
- opportunity to improve estimation skills of the mass of everyday objects
- a virtual beam balance which can be used as an introduction to equation-solving
- real-life objects to estimate mass.

**Students:**
- Students estimate the mass of everyday objects
- use a beam balance to measure the mass of everyday objects
- understand that masses on either side of a beam balance are equal when the beam is horizontal
- understand that an iterative approach can be used to measure the mass of an object using a beam balance.

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HOTmaths: exploring areas of rectangles and squares (Years 7–8)

Students explore the relationship between the area and perimeter as the length and width are altered. They can follow an investigation path using the HOTsheet.

**Features include:**
- exposure to the notion that there are many rectangles with the same area and that each of these has a different perimeter
- option for students to plan an investigation that can be used as a springboard for developing hypotheses
- option of a guided investigation or an open ended investigation.

**Students:**
- investigate the link between the length and width of rectangles and the area and perimeter
- explore relationships between the area and perimeter of rectangles
- understand that the closer a rectangle of a particular area is to a square, the shorter the perimeter.
HOTmaths: exploring kites (Years 7–10)

Students explore properties of kites including angles, side lengths and lengths of diagonals.

Features include:
- opportunity to investigate angles and side lengths of kites
- opportunity to explore relationships between kites and other quadrilaterals.

Students:
- identify properties of kites
- understand relationships between kites and other quadrilaterals
- understand that diagonals of kites always intersect at right angles.

EagleCat: scale it (Years 7–10)

Students explore the relationship between changes in area and volume with changes in scale factor.

Features include:
- results for whole number scale factors, allowing the pattern for change to be deduced
- opportunity for students to interact with the concept using drag-and-drop functionality
- further pathways for development and extension of core concepts through an ‘Ideas’ panel
- the option to print some parts of the learning object.

Students:
- describe how changing the scale of 2D shapes creates a change in area
- identify how changing the scale of 3D objects creates a change in volume
- identify a pattern after analysing data.
EagleCat: motion graphs (Year 10)

Students investigate distance–time and velocity–time graphs by changing position, speed and acceleration.

Features include:
- a demonstration of the relationship between initial settings and vertical axis intercept
- a kinaesthetic opportunity for motion when velocity is related to mouse movement
- pathways for development and extension of core concepts through an ‘Ideas’ panel
- simulations of many travel scenarios
- the option to print some parts of the learning object.

Students:
- distinguish between velocity–time and distance–time graphs
- describe how changes in graphs correspond with the manipulation of initial conditions such as position and velocity
- determine the rate of change of distance and velocity with respect to time
- associate positive and negative gradients with direction of motion in distance–time graphs
- associate positive and negative gradients with acceleration and deceleration in velocity–time graphs.

EagleCat: trig-G (Year 12)

Students relate changes in trigonometric equations to changes in their graphs.

Features include:
- demonstrations of key functional transformations, including dilations, reflections and translations for trigonometric functions
- a simple copy function to track transformations
- ideas for further development and extension of core concepts
- an option to print individual parts of the learning object.

Students:
- alter trigonometric equations and interpret changes to the graph
- manipulate functions and relate amplitude, period, horizontal and vertical position to the values of constants in trigonometric equations
- identify the relationship between horizontal dilation and period
- identify the relationship between vertical dilation and amplitude.