# Mathematics – K-2 multi-age – Year A – Unit 3



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## Unit description and duration

This two-week unit introduces students to measurement using direct and indirect comparison. Students are provided opportunities to:

* compare, order and match using direct comparison and informal units
* estimate whether a measure is reasonable
* consider how selection of measuring unit affects accuracy
* explore conservation of length, area, volume, and mass.

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### Student prior learning

Before engaging in these teaching and learning activities, students would benefit from prior experience with:

* making direct comparisons with measurement, for example, hefting and superimposing
* using everyday language to compare, such as lighter-heavier, longer-shorter, wider-thinner, bigger-smaller, further-nearer
* using mathematical language of length, area, volume, and mass through play with informal units such as craft sticks, blocks, clay, water, and sand
* recognising and sorting everyday objects by length, area, mass, and volume
* exploring features of common shapes such as squares and rectangles through play.

## Lesson overview and resources

The table below outlines the sequence and approximate timing of lessons; syllabus focus areas and content groups; and resources.

|  |  |  |
| --- | --- | --- |
| Lesson | Syllabus focus area and content groups | Resources |
| [**Lesson 1: How can we measure length?**](#_Lesson_1:_How)  70 minutes  Direct and indirect comparison can be used to compare, order and match lengths. | **Representing whole numbers**  **Early Stage 1**   * **Use the counting sequence of ones flexibly**   **Stage 1 – Part A**   * Use counting sequences of ones with two-digit numbers and beyond * Continue and create number patterns   **Geometric measure**  **Early Stage 1**   * Use direct and indirect comparisons to decide which is longer   **Stage 1 – Part A**   * Measure the lengths of objects using uniform informal units * Compare lengths using uniform informal units | * 2 pieces of string of equal length * Informal units of measurement such as craft sticks, matchsticks, paperclips, blocks * Large paper * Roll of paper * Writing materials |
| [**Lesson 2: How long is that?**](#_Lesson_2:_How)  **70 minutes**  **Comparative language can be used to describe and order length.** | **Represent whole numbers**  **Early Stage 1**   * Instantly name the number of objects within small collections   **Stage 1 – Part A**   * **Represent the structure of groups of ten in whole numbers** * Represent numbers on a line   **Geometric measure**  **Early Stage 1**   * Use direct and indirect comparisons to describe which is longer   **Stage 1 – Part B**   * Compare and order lengths, using appropriate uniform informal units | * [Length riddles](https://www.learningtrajectories.org/math-activities/length-riddles-end-to-end-length-measurer) from [Learning Trajectories](https://www.learningtrajectories.org/early-math/birth-to-grade-3) * [Long creatures](https://education.nsw.gov.au/teaching-and-learning/curriculum/mathematics/mathematics-curriculum-resources-k-12/mathematics-k-6-resources/long-creatures) from [Early Stage 1 Thinking mathematically](https://education.nsw.gov.au/teaching-and-learning/curriculum/mathematics/mathematics-curriculum-resources-k-12/mathematics-k-6-resources.main-education--category---catalogue---stage---early-stage-1.nameAsc.1.grid#catalogue_auto) * 6-sided dice – at least 3 per Early Stage 1 student * Informal units of measurement such as craft sticks, matchsticks, interlocking cubes, string, blocks, paperclips * Large paper * Large quantity of coloured blocks * Number line * Thin strips of equal length card – 5 per Early Stage 1 student * Writing materials |
| [**Lesson 3: How can we measure area?**](#_Lesson_3:_How)  **75 minutes**  **Direct and indirect comparison can be used to compare, order and match areas.** | **Representing whole numbers**  **Early Stage 1**   * Use the counting sequence of ones flexibly   **Stage 1 – Part A**   * **Represent numbers on a line**   **Stage 1 – Part B**   * **Use counting sequences of ones and tens flexibly**   **Two-dimensional spatial structure**  **Early Stage 1**   * Identify and compare area   **Stage 1 – Part A**   * Indirectly compare area * Measure areas using uniform informal units | * [Resource 1: Number chart](#Resource_1_Number_chart) * [Resource 2: Shoeprints](#Resource_2_Shoeprints) * Large paper and card * Large quantities of coloured blocks * Number line * Pattern blocks * Small blocks, paperclips * Writing materials |
| [**Lesson 4: Rectangle detectives!**](#_Lesson_4:_Rectangle)  **75 minutes**  **Rectangles are closed shapes and come in different orientations and sizes.** | **Representing whole numbers**  **Early Stage 1**   * Instantly name the number of objects within small collections * Recognise number patterns   **Stage 1 – Part B**   * **Form, regroup and rename three-digit numbers**   **Forming groups**  **Stage 1 – Part B**   * Represent and explain multiplication as the combining of equal groups   **Two-dimensional spatial structure**  **Early Stage 1**   * Represent shapes   **Stage 1 – Part A**   * Recognise and classify shapes using obvious features * Indirectly compare area * Measure areas using uniform informal units   **Stage 1 – Part B**   * Compare rectangular areas using uniform square units of an appropriate size in rows and columns   **Data**  **Stage 1 – Part A**   * Represent data with objects and drawings and describe the displays | * [Different Sizes](https://nrich.maths.org/8117) from [NRICH](https://nrich.maths.org/) * [How many rectangles? – Stage 1](https://education.nsw.gov.au/teaching-and-learning/curriculum/mathematics/mathematics-curriculum-resources-k-12/mathematics-k-6-resources/how-many-rectangles-s1) from [Stage 1 Thinking mathematically](https://education.nsw.gov.au/teaching-and-learning/curriculum/mathematics/mathematics-curriculum-resources-k-12/mathematics-k-6-resources.main-education--category---catalogue---stage---stage-1.nameAsc.1.grid#catalogue_auto) * A5 paper * Different sizes of rectangular paper or sticky notes * Digital tablet * Large number of craft sticks, rubber bands * Pattern blocks, rectangular tiles, different kinds of triangles * Square tiles or pattern blocks * Small interlocking blocks or MAB blocks * Writing materials |
| [**Lesson 5: Let’s use our measuring skills!**](#_Lesson_5:_Let’s)  **70 minutes**  **Length and area can be used to compare measurements.** | **Representing whole numbers**  **Early Stage 1**   * Connect counting and numerals to quantities   **Stage 1 – Part A**   * Represent the structure of groups of ten in whole numbers   **Forming groups**  **Stage 1 – Part B**   * Represent and explain multiplication as the combining of equal groups   **Geometric measure**  **Early Stage 1**   * Use direct and indirect comparison to decide which is longer   **Stage 1 – Part A**   * Measure the length of objects using uniform informal units   **Stage 1 – Part B**   * Compare and order lengths, using appropriate informal units   **Two-dimensional spatial structure**  **Early Stage 1**   * Sort, describe and name familiar shapes * Represent shapes * Identify and compare area   **Stage 1 – Part B**   * Compare rectangular areas using uniform square units of an appropriate size in rows and columns   **Data**  **Early Stage 1**   * Organise objects into simple data displays and interpret the displays   **Stage 1 – Part A**   * Represent data with objects and drawings and describe the displays | * [About how many rectangles?](https://education.nsw.gov.au/teaching-and-learning/curriculum/mathematics/mathematics-curriculum-resources-k-12/mathematics-k-6-resources/about-how-many-rectangles) From [Early Stage 1 Thinking mathematically](https://education.nsw.gov.au/teaching-and-learning/curriculum/mathematics/mathematics-curriculum-resources-k-12/mathematics-k-6-resources.main-education--category---catalogue---stage---early-stage-1.nameAsc.1.grid#catalogue_auto) * 2 colours of chalk * Digital tablet * Grid paper * Large number of blocks * Large number of square tiles * String * Square tiles: 9 yellow,1 red for each Early Stage 1 student * Sticky notes * Student measure of 10 from lesson 2 * Writing materials |
| [**Lesson 6: Baby bear’s cup**](#_Lesson_6:_Baby_1)  **65 minutes**  **Objects can look different but still have the same internal volume.** | **Representing whole numbers**  **Early Stage 1**   * **Instantly name the number of objects within small collections** * **Recognise number patterns**   **Stage 1 – Part A**   * Use counting sequences of ones with two-digit numbers and beyond   **Stage 1 – Part B**   * Use counting sequence of ones and tens flexibly   **Three-dimensional spatial structure**  **Early Stage 1**   * **Compare internal volume by filling and packing** * **Compare volume by building**   **Stage 1 – Part A**   * **Measure and compare the internal volumes (capacities) of containers by filling** | * [Goldilocks and the three bears – Stage 1](https://education.nsw.gov.au/teaching-and-learning/curriculum/mathematics/mathematics-curriculum-resources-k-12/mathematics-k-6-resources/goldilocks-and-the-three-bears-s1) from [Stage 1 Thinking mathematically](https://education.nsw.gov.au/teaching-and-learning/curriculum/mathematics/mathematics-curriculum-resources-k-12/mathematics-k-6-resources.main-education--category---catalogue---stage---stage-1.nameAsc.1.grid#catalogue_auto) * [Goldilocks and the three bears – Early Stage 1](https://education.nsw.gov.au/teaching-and-learning/curriculum/mathematics/mathematics-curriculum-resources-k-12/mathematics-k-6-resources/goldilocks-and-the-three-bears-es1) from [Early Stage 1 Thinking mathematically](https://education.nsw.gov.au/teaching-and-learning/curriculum/mathematics/mathematics-curriculum-resources-k-12/mathematics-k-6-resources.main-education--category---catalogue---stage---early-stage-1.nameAsc.1.grid#catalogue_auto) * Cups, glasses, scoops of different sizes, variety of containers, trays * Large paper * Lentils, blocks, sand, rice * Mini whiteboards and markers * Ten-frames, double-sided counters, blocks, dice, dominoes, concrete materials * Writing materials |
| [**Lesson 7: Pack and stack!**](#_Lesson_7:_Pack)  **70 minutes**  **Container shape makes a difference to how efficiently units can be packed.** | **Representing whole numbers**  **Early Stage 1**   * **Use the counting sequence of ones flexibly**   **Stage 1 – Part A**   * **Represent the structure of groups of ten in whole numbers**   **Three-dimensional spatial structure**  **Early Stage 1**   * Explore familiar three-dimensional objects * **Compare internal volume by filling and packing** * **Compare volume by building**   **Stage 1 – Part B**   * **Compare containers based on internal volume (capacity) by filling and packing** | * [Two-digit Targets](https://nrich.maths.org/6343) adapted from [NRICH](https://nrich.maths.org/) * 20 blocks per student * 3D objects * Card for container, tape * Cubes and marbles * Paperclips, counters * Variety of containers * Writing materials |
| [**Lesson 8: Heavier, lighter or the same?**](#_Lesson_8:_Heavier,)  **50 minutes**  **We can compare, order and match objects by their mass.** | **Representing whole numbers**  **Early Stage 1**   * **Use the counting sequence of ones flexibly** * **Connect counting and numerals to quantities**   **Stage 1 – Part A**   * Represent numbers on a line   **Two-dimensional spatial structure**  **Early Stage 1**   * Represent shapes   **Three-dimensional spatial structure**   * Explore familiar three-dimensional objects   **Non-spatial measurement**  **Early Stage 1**   * **Identify and compare mass using weight**   **Stage 1 – Part B**   * Investigate mass using an equal-arm balance | * Balls, including large, light balls and small, heavy balls * Blocks, cubes, teddy bear counters * Equal-arm balances * Large paper * Large, small, heavy, and light objects * Modelling clay * Sticky notes with shapes drawn on them * Sticky notes labelled 1 to 10 and sticky notes labelled with two-digit numbers * Writing materials |

## Lesson 1: How can we measure length?

**Core concept:** Direct and indirect comparison can be used to compare, order and match lengths.

The table below contains suggested learning intentions and success criteria. These are best co-constructed with students.

|  |  |
| --- | --- |
| Learning intentions | Success criteria |
| All students are learning that:   * estimating and choice of measuring unit allows them to compare, order and match lengths * objects can appear to be different lengths depending on how they are orientated * numbers can be counted forwards and backwards by ones or in larger groups. | All students can:   * use words to describe length * estimate how long an object is and check by measuring.   In addition, students working towards Early Stage 1 outcomes can:   * use direct comparison to compare 2 or more objects * identify the number one less and one more for a given number.   In addition, students working towards Stage 1 outcomes can:   * identify a unit of measurement to compare lengths of objects * reason whether an object has been measured accurately by avoiding gaps, overlaps and measuring in a straight line * count forwards and backwards by ones from a given number * skip count forwards and backwards in twos from a given number. |

### Daily number sense: One more, one less – 10 minutes

1. Build student understanding of counting forwards and backwards and skip counting by measuring and exploring lengths.
2. Model measuring lengths of classroom objects such as pencil cases or books with blocks and ask:

* How many blocks long is this?
* If it was one block longer, how many blocks would that be?
* If it was one block shorter, how many blocks would that be?

1. In pairs, Early Stage 1 students measure other objects with blocks, state the quantity of blocks needed and then one block more and one block less.
2. Stage 1 students measure other objects with blocks and use the number to:

* skip count forwards or backwards by twos
* count forwards by ones to at least 120.

The table below details assessment opportunities and differentiation ideas.

|  |  |  |
| --- | --- | --- |
| Assessment opportunities | Too hard? | Too easy? |
| What to look for:   * Can students identify the number one less and one more for a given number? **(MAE-RWN-01)** * Can students count forwards and backwards by ones from a given number? **(MA1-RWN-01)** * Can students skip count forwards and backwards in twos from a given number? **(MA1-RWN-01)**   What to collect:   * observations of students counting blocks to find numbers before and after a given number **(MAE-RWN-01, MA1-RWN-01)** | Students are unable to identify quantities one more and one less from a given quantity.   * Students start with 2 blocks and add or remove one block and state the new quantity. * Students then work with 3 blocks and so on. | Students can already skip count by 2.   * Students take a given number and skip count by fives and tens. * Students take a given number and skip count by numbers of choice. |

### Why do we measure things? – 5 minutes

1. Discuss different types of measurement by asking students what they have seen being measured and why things are measured. Answers could include to:

* get to school on time (measurement of time)
* buy the right amount of food (measurements of volume and mass)
* buy the right size shoes for our feet (measurement of length)
* buy furniture that fits in our house (measurements of area, length, and height)
* know what clothes to wear when we go out (measurement of temperature)
* know how much money to bring to school for a canteen treat (measurement of money)
* take the right amount of medicine (measurement of volume).

### Using my hand to measure! – 10 minutes

1. Tell students that they are going to think about how to measure length and complete the following two-minute challenges:

* What can you see that is smaller in length than your hand?
* Look at an object a little way from you, estimate how many hands long it is, and then check with your hand.
* What can you find in the classroom that is longer than 3 hands but shorter than 4 hands? Choose an object and check.
* What words do we use to describe how long something is? For example, short, long, shorter, longest.

### How do we measure? – 30 minutes

1. In groups on the floor, give students a pile of mixed informal units, for example, craft sticks, matchsticks, paperclips, or blocks. Students make as many different lines as possible in 5 minutes, using only one material in each line. Compare lines using vocabulary such as short, shorter than, shortest, long, longer than, longest, the same, almost as long, about twice as long, and so on. Look for examples where students have laid units end to end with no spaces and where there are no overlaps. Discuss how this improves accuracy of measurement.
2. Early Stage 1 students directly compare lengths of 2 pencils by placing them side by side and aligning the ends. Students state which is longer and which is shorter. Students choose another 2 objects, estimate which is longer and then check. Repeat. Encourage students to align objects by laying them down and standing them up on end and discuss whether that makes a difference to the lengths.
3. Stage 1 students choose a uniform informal unit and record the measurements of 2 objects. Support students to reflect by asking:

* What did you measure and how many units long were they?
* Which object was longest?
* Did you check your measurements by putting the objects side by side?
* Why did you choose that unit to measure with?
* Would you choose that unit to measure with again? Why? Why not?
* How did you record measurements that were not exactly whole units? For example, 3 and a bit, nearly 4, and so on.

1. With the whole class, choose a volunteer student. Tell the class that this person is going to be in the middle of a line of 5 students standing in height order. Decide which students would need to stand on each side and in what order. Use vocabulary of short, shorter, shortest, tall, taller, tallest.
2. Have students lie down and ask what words could be used to describe them now. For example, would students choose the same vocabulary, or would they use long, longer, longest? Ask students if they think they are taller, shorter or the same standing up or lying down. Ask students how they could check their ideas using informal units. Revise with students that height is a length.

**Note**: During this unit, measure the heights of students on a roll of paper for observations now, and comparisons later in the year.

1. To reinforce the conservation of length concept, show students 2 equal pieces of string, one lying straight and one curled in a spiral. Ask students what they think about the lengths of the pieces of string. Some may think the curled-up piece of string is shorter. Make both pieces of string straight to prove they are the same length.

The table below details assessment opportunities and differentiation ideas.

|  |  |  |
| --- | --- | --- |
| Assessment opportunities | Too hard? | Too easy? |
| What to look for:   * Can students use vocabulary to directly compare and order lengths? **(MAE-GM-02, MA1-GM-02)** * Do students select and use appropriate uniform informal units to indirectly measure lengths? **(MAO-WM-01, MA1-GM-02)** * Can students apply visual estimation to measurement of objects? **(MAO-WM-01, MAE-GM-02, MA1-GM-02)** * Do students align the ends of 2 objects to compare length? **(MAE-GM-02, MA1-GM-02)** * Can students place units end to end without gaps or overlaps? **(MA1-GM-02)** * Can students count informal units to measure lengths or distances and include leftover parts? **(MA1-GM-02)**   What to collect:   * observations of students measuring objects and comparing what they estimated to their final measurement **(MAO-WM-01, MAE-GM-02, MA1-GM-02)** | Students cannot align objects.   * Students stand objects up on the desk, so they are automatically aligned. * Students use the edge of the desk as a starting point for alignment.   Students do not understand that height is a length (distance).   * Show students 2 identical objects, placing one on its side and one upright and ask them which they think is longer. * Superimpose or measure both objects with interlocking cubes to prove they are the same. | Students can compare 2 objects using direct comparison.   * Students order and compare several objects. * Students use direct comparison to find 2 or more objects of the same length.   Students can already measure and compare using uniform informal units.   * Students investigate the length problem [Making Longer, Making Shorter](https://nrich.maths.org/5590) with blocks. * In this investigation, students work backwards to find shorter lengths and use repeated addition to make longer lengths. |

### Discuss and connect the mathematics – 15 minutes

This activity has been adapted from Sullivan and Lilburn (2004).

1. Tara measured a table and said it was 10 sticks long. Michael measured the same table and said it was 12 sticks long. Support students to think about how this might have happened by asking:

* Could there have been differences between the sticks?
* Did both students start measuring from the same place?
* What would happen if there were spaces between the sticks or the sticks overlapped?
* What could happen if the sticks were not in a straight line?

1. Make a poster with ideas from students about what is important to remember when measuring length.

## Lesson 2: How long is that?

**Core concept:** Comparative language can be used to describe and order length.

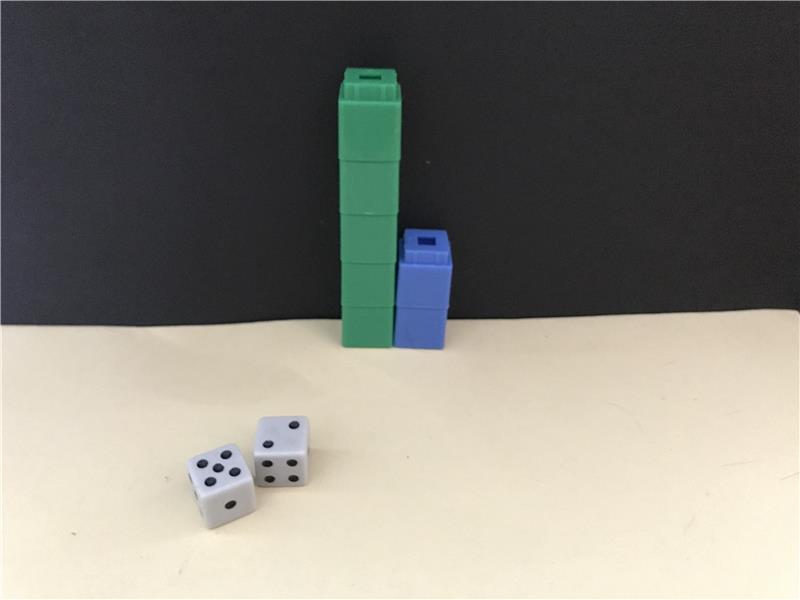
The table below contains suggested learning intentions and success criteria. These are best co-constructed with students.

|  |  |
| --- | --- |
| Learning intentions | Success criteria |
| All students are learning that:   * estimating and measuring allows them to compare, order and match lengths * length can be measured using different units * organising units can help us measure effectively. | All students can:   * visually estimate to predict measurements * check direct comparisons of length.   In addition, students working towards Early Stage 1 outcomes can:   * count by ones to make towers of different heights * compare, order, and match up to 5 items by length.   In addition, students working towards Stage 1 outcomes can:   * compare and order lengths using the same informal unit * make and use a tape measure calibrated with informal units to compare lengths of objects * use 10 as a reference to count quantities between 11 and 20. |

### Daily number sense: How many blocks? – 15 minutes

1. Build student understanding of number by organising coloured blocks to measure objects.
2. Early Stage 1 students will focus on identifying and comparing quantities. Students roll two 6-sided dice and make 2 block towers representing the 2 numbers rolled. Match the towers with the dice dots as in Figure 1.

Figure 1 – Make the tower!



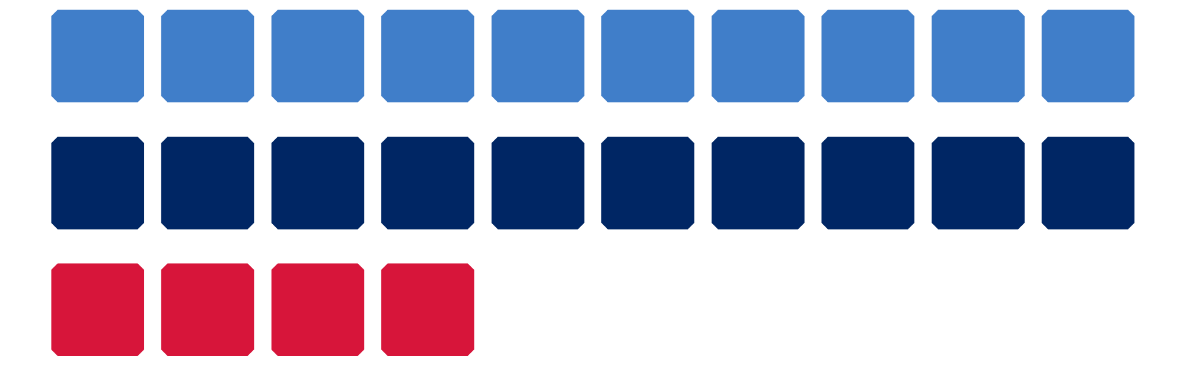
1. Align towers upright and verbally compare. For example, the second tower is 3 less than the first tower. Record towers by drawing blocks and writing corresponding numerals.
2. Stage 1 students will focus on using 10 as a reference number by organising coloured blocks to measure objects. Model the process by pre-selecting 2 classroom objects to measure that will give answers between 11 and 20 blocks in length. Prior to each measurement, ask students to estimate how many blocks long the object will be. Measure the first 10 blocks in one colour and the remainder in another colour. This will demonstrate using 10 as a reference number to make counting larger numbers easier. See example in Figure 2.

Figure 2 – Count 14 using 10 as a reference



1. Repeat this process with an object between 20 and 30 blocks long. Use one colour for the first 10 blocks, a second colour for the next 10, and another for remaining units.
2. Align groups of 10 blocks and then units vertically to demonstrate partitioning of numbers into tens and units. See example in Figure 3.

Figure 3 – Partitioning using vertical alignment



1. In pairs, students choose objects that will be over 11 blocks long and estimate how many blocks long they think the objects will be. Measure, using blocks in groups of 10 and then ones. Partition using 10 as modelled. Compare final measurements to estimates each time.

The table below details assessment opportunities and differentiation ideas.

|  |  |  |
| --- | --- | --- |
| Assessment opportunities | Too hard? | Too easy? |
| What to look for:   * Can students identify the number of dots on 2 dice, then represent and compare them using blocks? **(MAO-WM-01, MAE-RWN-01)** * Can students make reasonable estimates? **(MA1-GM-01)** * Can students use 10 as a reference number when counting quantities between 11 and 20? **(MA1-RWN-02)** * Can students partition two-digit numbers to show tens and units? **(MA1-RWN-02)**   What to collect:   * observations and images of students predicting and measuring objects with blocks, using 10 as a reference number **(MA1-RWN-02)** | Students cannot work with larger numbers of dice dots.   * Give students 3 cards with 1, 2 or 3 dots. Place cards facedown and choose 2 of the cards to turn over and count. * Students repeat the process but this time they compare the dots on each card. * Repeat the process with numbers 1 to 4.   Students cannot work with numbers between 11 and 20.   * Students measure objects between 5 and 9 blocks long and use 5 as a reference. * Students then build up to using 10 as a reference with 11 to 20 blocks. | Students can already work with given numbers of blocks.   * Students can throw 3 dice to make and compare 3 block towers. * Students work with big piles of blocks, thinking about how they will organise counting when they have 10 lots of 10 blocks, and some left over. |

### How long is my shoe? – 25 minutes

This activity has been adapted from [Length riddles](https://www.learningtrajectories.org/math-activities/length-riddles-end-to-end-length-measurer) at Learning Trajectories (2022).

1. All students take off a shoe and look at the bottom. Play [Length riddles](https://www.learningtrajectories.org/math-activities/length-riddles-end-to-end-length-measurer). Ask if students can see anything in the classroom that is about the same length. Place shoes side by side next to objects to check and use comparative language to describe lengths. For example, my shoe is longer than this book, my shoe is way shorter than the table. Ask students What am I? questions. For example, I have bristles on the end and I am about one shoe long, what am I? Support correct alignment of objects. Early Stage 1 students continue to play this game.
2. Stage 1 students then find objects about 2 of their shoes long, 5 of their shoes long, less than one shoe length and so on. Ask if everyone's results will be the same and prompt students to think about why or why not. Emphasise that as everyone's shoes are different lengths, all their measurements will be different too.
3. Explain that students will measure and compare shoe lengths.
4. Early Stage 1 students work in pairs to find who has the longest shoe. Trace around each shoe, cut out and superimpose to compare lengths. Alternatively, cut a piece of string or tear a strip of paper that matches the distance from the heel to the end of the shoe. Join up with another pair and compare the lengths of 4 strings or papers.
5. With Stage 1 students, discuss how to get accurate measurements that can be compared. This means agreeing on a sensible, consistent unit of informal measurement, for example, small blocks or paperclips. Estimate how long your shoe is and model placing units next to it, using the same starting and finishing points and making sure there are no gaps or overlaps.
6. As students estimate and find their shoe length, record on a number line with student names and ask students what they notice. This could include thinking about who has the shortest or longest shoe and what is the most common shoe length.

This table details assessment opportunities and differentiation ideas.

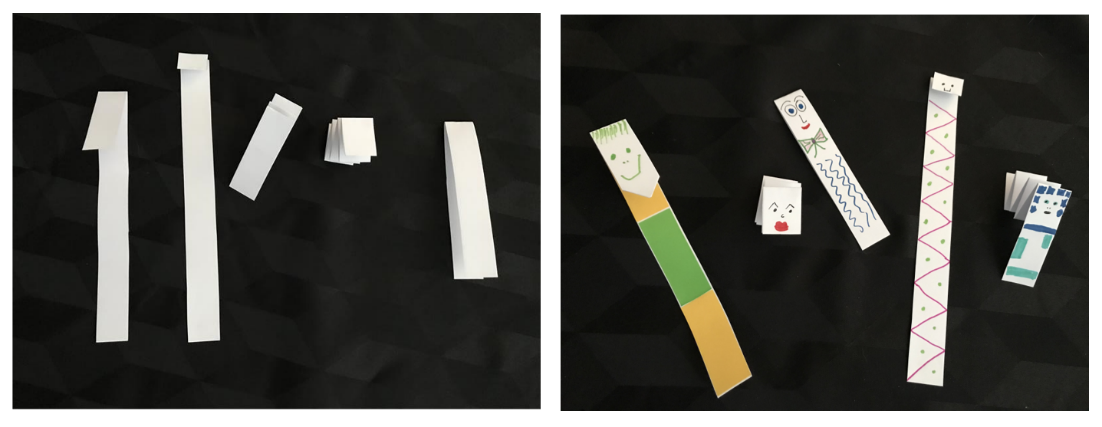
|  |  |  |
| --- | --- | --- |
| Assessment opportunities | Too hard? | Too easy? |
| What to look for:   * Can students use tracings or string to compare shoe lengths? **(MAO-WM-01, MAE-GM-02)** * Can students make reasonable estimates? **(MA1-GM-01)** * Can students use informal units of measurement to record, compare and order shoe lengths? **(MA1-RWN-01, MA1-GM-01)**   What to collect:   * observations of verbal comparisons of length (**MAO-WM-01, MAE-GM-02)** * samples of estimates and measurements (**MA1-GM-01)** * observations of comparing shoe lengths using a number line **(MA1-RWN-01, MA1-GM-01)** | Students do not have spatial skills to make reasonable estimates.   * Students work with small objects, 5 or less blocks long to build visual estimation skills. * Build up to estimating length of longer objects, using 5 or 10 connected blocks as a visual reference.   Students are not using uniform informal units accurately when measuring shoe.   * Measure at least the first half of the shoe with the student, modelling no overlaps, no spaces and measuring in a straight line. * Student continues to place units independently to the end of the shoe and then counts units. | Students predict and accurately measure lengths of several different-sized objects.   * Students estimate length and height of an object and measure. * Students then compare the length with the height, making observations, such as the length is more than twice the height. |

### How long is my creature? Early Stage 1 – 20 minutes

This activity has been adapted from [Long creatures](https://education.nsw.gov.au/teaching-and-learning/curriculum/mathematics/mathematics-curriculum-resources-k-12/mathematics-k-6-resources/long-creatures) from [Early Stage 1 Thinking mathematically](https://education.nsw.gov.au/teaching-and-learning/curriculum/mathematics/mathematics-curriculum-resources-k-12/mathematics-k-6-resources.main-education--category---catalogue---stage---early-stage-1.nameAsc.1.grid#catalogue_auto).

1. Give students 5 thin strips of card of equal length. Students fold strips into different lengths and decorate them as creatures. See Figure 4.

Figure 4 – Card creatures!



1. Order creatures from shortest to tallest. Ask students if there are any other ways to order them.

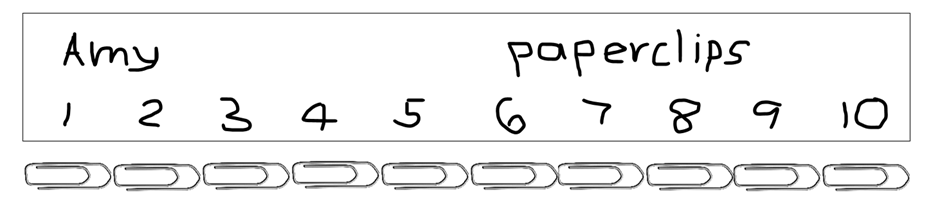
The table below details assessment opportunities and differentiation ideas.

|  |  |  |
| --- | --- | --- |
| Assessment opportunities | Too hard? | Too easy? |
| What to look for:   * Can students directly compare lengths by placing objects side by side and aligning ends? **(MAE-GM-02)** * Can students use comparative language to describe length? **(MAE-GM-02)** * Can students think of different ways to order creatures? **(MAO-WM-01, MAE-GM-02)**   What to collect:   * observations of students ordering creatures by length in different ways **(MAO-WM-01, MAE-GM-02)** | Students cannot order 5 creatures.   * Students work with 3 pieces of card. * Students then add another creature to work with 4 lengths. | Students quickly make and order creatures.   * Students choose their shortest creature and compare it to the longest creature. * Students work out how many short creatures are needed to make the longest creature. |

### What else can we measure with? Stage 1 – 20 minutes

1. Ask Stage 1 students if they can see any objects that cannot be measured with squares or blocks, such as large, tall, and curved objects. Discuss what other ways students could measure objects apart from using single units. Students might suggest solutions such as a card that measures 5 blocks at a time, a tape measure, or a ruler. Tell students they are going to make their own measure of 10 from a material of choice (for example, card or string) and a chosen unit of measurement such as blocks, craft sticks, paperclips and so on. Label and name the measure. See Figure 5.

Figure 5 – Measure of 10



1. Once students have a measure of 10 calibrated with an informal unit of measurement, they can record estimates and measure objects in the classroom that cannot be moved. Students use ‘[Talk moves](https://education.nsw.gov.au/teaching-and-learning/curriculum/literacy-and-numeracy/teaching-and-learning-resources/numeracy/talk-moves)’ in pairs to discuss which estimates were most accurate, which units of measurement were most useful, and whether they would choose a different unit to measure an object if they did it again.
2. Ask students if anyone can compare their measurements. The answer should be yes for students who chose the same unit of measure and no for others. For example, 3 students who used matchsticks to make their measure of 10 can compare their measurements but only one student used paperclips so they cannot compare measurements with anyone else. Discuss why.

**Note:** Collect named measures of 10 and keep for [Lesson 5 number sense](#_Daily_number_sense:) activity.

The table below details assessment opportunities and differentiation ideas.

|  |  |  |
| --- | --- | --- |
| Assessment opportunities | Too hard? | Too easy? |
| What to look for:   * Can students make and use a tape measure calibrated with informal units? **(MAO-WM-01, MA1-GM-02)**   What to collect:   * calibrated, labelled tape measures **(MAO-WM-01, MA1-GM-02)** | Students cannot work with 10 units to calibrate their ruler.   * Students work with teacher to label the first 5 units. * Students label 5 more units independently. | Students quickly make and accurately use measures of 10.   * Students find a unit that is exactly twice as long, then 3 times as long and so on to make longer rulers of 10. * Students discuss where each ruler would be most useful for measuring. |

### Discussing and connecting the mathematics – 10 minutes

1. As a class, clarify and add to the length poster from [Lesson 1](#_Lesson_1:_How). Revisit what is important when measuring and comparing lengths. This will be compared to future posters on area, volume, and mass. The posters should be used to build connections about what is important when measuring anything, and how length, area, volume, and mass are connected.

## Lesson 3: How can we measure area?

**Core concept:** Direct and indirect comparison can be used to compare, order and match areas.

The table below contains suggested learning intentions and success criteria. These are best co-constructed with students.

|  |  |
| --- | --- |
| Learning intentions | Success criteria |
| All students are learning that:   * estimating and measuring allows them to compare, order and match areas * choice of measuring unit affects accuracy when measuring area * counting by ones and tens develops understanding of place value. | All students can:   * compare areas of 2 surfaces * estimate which of 2 similar shapes has the larger area.   In addition, students working towards Early Stage 1 outcomes can:   * count forwards by ones from a given number * count backwards by ones from a given number.   In addition, students working towards Stage 1 outcomes can:   * choose an informal unit to accurately measure area and check final measurements of estimates * organise measurements on a number line to make comparisons * estimate and check by counting in groups of 10 and adding leftover parts * count forwards and backwards in tens from a given number. |

### Daily number sense: How many are there? – 15 minutes

1. Build student understanding of place value by counting large numbers of blocks.
2. Groups of Early Stage 1 students are given several piles of between 10 and 20 blocks. For each pile, count by ones to find the total number of blocks and then count backwards from the answer, taking away one block at a time.
3. Show Stage 1 students a pile of 30-50 blocks. In advance, ensure the answer is off the decade. Have students estimate how many blocks there are and then check by counting into groups of 10 and adding on leftover blocks.
4. From the answer, count forwards by tens into three-digit numbers and then backwards by tens.
5. Return to the original answer and ask students to find the next multiple of 10. Count forwards and backwards on the decade from the answer.
6. Repeat in small groups with a different number of blocks between 30 and 50.

The table below details assessment opportunities and differentiation ideas.

|  |  |  |
| --- | --- | --- |
| Assessment opportunities | Too hard? | Too easy? |
| What to look for:   * Can students count by ones forwards and backwards? **(MAE-RWN-01)** * Can students find a quantity by counting blocks in groups of 10 and adding on leftover blocks? **(MA1-RWN-01)** * Do students refer to estimates to decide if their answer is reasonable? **(MA1-RWN-01)** * Can students count forwards and backwards by tens on and off the decade? **(MA1-RWN-01)**   What to collect:   * observations of students counting forwards and backwards with corresponding numbers of blocks **(MAE-RWN-01)** * observations of students using groups of 10 to find answers and counting forwards and backwards off the decade **(MA1-RWN-01)** | Students cannot work with 10 to 20 blocks to count forwards and backwards.   * Students work with between 3 and 5 blocks. * Students then work with between 5 and 10 blocks and so on.   Students cannot work with 30 to 50 blocks independently.   * Model estimating and grouping a second pile of blocks between 30 and 50. * Student works with between 10 and 20 blocks as in the previous number sense activity ([Lesson 2](#_Lesson_2:_How)).   Students cannot count forwards or backwards by 10 off the decade.   * Students use a number chart to find the next number. * See [Resource 1: Number chart](#Resource_1_Number_chart). | Students already understand counting forwards and backwards.   * Students order the block piles, stating which is biggest and smallest. * Students then make piles which are 2 and 5 blocks bigger and 2 and 5 blocks smaller.   Students can already count by tens on and off the decade.   * Students take an answer and count forwards and backwards by twos, threes, and fives. * Students count forwards and backwards from an answer by numbers of their choice. |

### Predicting and covering – 10 minutes

1. Tell students that they are going to think about how to measure area. Explain that area is the surface an object takes up.

**Area:** The amount of surface inside a closed flat (2D) shape.

1. Ask students to predict which classroom objects their hand will completely cover. Test predictions. Repeat for classroom objects their hands will not completely cover.
2. Ask students to choose 2 similar objects to measure by covering with hands, predict which will be bigger and then check.
3. Give each student a piece of A4 paper. Students predict which objects they could completely cover with the paper and then test their predictions. In pairs, students find things they could completely cover with 2 pieces of paper. Students make a list or take photos of objects that can be covered with one and 2 pieces of paper.
4. Ask a few students to describe objects they measured using language of area, for example, this picture is bigger than 2 pieces of paper, that pencil case was much smaller than one piece of paper.
5. Make a list of words that can be used to describe area, for example, big, narrow, wide, small, larger, smallest, and so on.

### Shoeprints – 35 minutes

This activity has been adapted from [Teaching Measurement Early Stage One: Shoeprints [DOC 765KB]](https://schoolsnsw.sharepoint.com/:w:/r/sites/A43LZFM2/_layouts/15/Doc.aspx?sourcedoc=%7BB15C70B9-38C9-410F-96CE-CDEE9AC1241F%7D&file=Shoe%20prints-%20Exploring%20area%20through%20superimposing.docx&action=default&mobileredirect=true&cid=ecfdeb13-9b05-453e-a41a-95980f7ca1f8&wdLOR=cE9762679-F39C-4DF4-BE5C-FDFD4B778823).

1. To stimulate recollection of previous learning, ask students for their ideas on what area is. Revise that it is the measurement of surface inside a two-dimensional shape. Display [Resource 2: Shoeprints](#Resource_2_Shoeprints) and discuss with students what they notice, what they wonder and what mathematics they see.
2. In pairs, students take off one shoe each, directly compare the sole of their shoe with their partner’s shoe (shoeprint) and discuss which has the largest area.
3. Early Stage 1 students trace around their shoe. Check that the tracing is a closed shape by starting and finishing at the same point. Using pattern blocks (or other small squares), students see how many squares they can fit into their shoe shape. Encourage turning shapes to make them fit inside. Record and compare answers with a partner. Repeat for triangles and circles. Ask students which shape fitted inside the shoe area the best and why.
4. Stage 1 students suggest a unit of measurement they could use to compare everyone's shoeprints. Spend a few minutes discussing advantages and disadvantages of suggestions. Select a unit that everyone will use, for example, small blocks or paperclips. Ask students what they will need to remember when they are measuring and comparing area of shoeprints. Discuss how measuring area is the same and different to measuring length.
5. Trace around the shoe on paper. Model estimating how many units of measurement will be needed by making one line of units in the middle of the tracing, discussing how many units are in one row and how many there might be altogether. Model measuring part of the area by placing informal units over the shoe with no overlaps or spaces and thinking about leftover parts. For example, this looks like about a half and a half so they can count as one; here is almost a full unit and here is a tiny bit of unit so they could make one.
6. Students independently estimate, trace, measure and record the area of their shoeprint.
7. In groups, students discuss how they could organise results to make comparisons. They could choose to use a number line as in [Lesson 2](#_Lesson_2:_How), or make a list from smallest to largest, and so on. Students organise data and make observations about their shoe area compared to others, largest area, smallest area, matching areas and so on.
8. As a class, revisit the shoe lengths found in [Lesson 2](#_Lesson_2:_How). Did the student who had the longest shoe have the largest shoeprint area? Did the student who had the shortest shoe have the smallest shoeprint area?

The table below details assessment opportunities and differentiation ideas.

|  |  |  |
| --- | --- | --- |
| Assessment opportunities | Too hard? | Too easy? |
| What to look for:   * Can students trace around their shoe and use it to compare with another shoe’s area? **(MAE-2DS-02)** * Can students predict which of 2 similar shapes has the larger area and check using an informal unit of measurement? **(MAE-2DS-02, MA1-2DS-02)** * Can students use an informal unit to measure the bottom of their shoe, and include leftover parts of units in their answer? **(MA1-2DS-02)** * Can students organise measurements of shoe areas to make comparisons? **(MA1-RWN-01)**   What to collect:   * observations of students using comparative language measuring with hands and showing tracings **(MAE-2DS-02)** * observations and images of students measuring and organising shoe areas using informal units and including leftover parts in their answer **(MAO-WM-01, MA1-2DS-02, MA1-DATA-01, MA1-DATA-02)** | Students cannot write the number of shapes they used inside their shoeprint.   * Make 3 piles of shapes. * Count and discuss numbers of circles, squares and triangles used.   Students cannot work out how to include leftover parts in final measurements.   * Model part-part-whole with concrete materials. * Model language of part-part-whole. | Students can find the area of their shoeprint.   * Students take the measurement of their shoe as a unit. Estimate areas of large objects in the classroom in shoes. * Then students work out how to measure the objects and compare answers to estimates. |

### Discuss and connect the mathematics – 15 minutes

1. Ask students:

* What were they measuring today?
* What is area?
* Are there other objects that they could use the tracing method for to compare areas?
* Are there objects they cannot use tracing to measure the area of? What are they and why?

1. Ask students if there is anything the same about how they measure length and area. Students then think about whether there is anything different. Make an area poster with student responses and display it next to the length poster.

## Lesson 4: Rectangle detectives!

**Core concept:** Closed shapes can be different orientations and sizes.

The table below contains suggested learning intentions and success criteria. These are best co-constructed with students.

|  |  |
| --- | --- |
| Learning intentions | Success criteria |
| All students are learning that:   * estimating and measuring allows them to compare, order and match areas * choice of measuring unit affects accuracy when covering an area * groups of units can be organised to find a measurement. | All students can compare, order and match areas of objects.  In addition, students working towards Early Stage 1 outcomes can estimate how big an object is and justify by comparing to other objects.  In addition, students working towards Stage 1 outcomes can:   * use uniform informal units to estimate, measure and record area * explain why different rectangles can have the same area * understand that the size of unit used makes a difference to the number of units needed * form arrays of equal rows and equal columns to create rectangles * systematically group in tens and hundreds to count three-digit numbers. |

### Daily number sense Early Stage 1: Counting shapes – 10 minutes

1. Early Stage 1 students create a picture on A5 paper by tracing around a selection of shapes. The picture must include a rectangle. No shapes can go over the edge of the paper. Students tell a partner how many of each shape they used and work out the total number of shapes. Repeat but this time the picture must include 2 rectangles and so on.

### Daily number sense Stage 1: Counting big numbers! – 10 minutes

1. Build understanding of counting and representing large sets of objects by systematically grouping in tens and hundreds.
2. Show students a big pile of craft sticks (between 200 and 300 so that you can represent 100 twice). Tell students there are more than 100 sticks and ask them to estimate approximately how many hundreds there are. Ask if they have a way to count them. Guide student discussion to recall that the previous number sense activity used grouping in tens. When 10 or more groups of 10 are reached, count them 10 by 10. When 100 is reached, ask students if there is a new way they could group the sticks they have counted so far. Bundle 10 groups of 10 in one group of 100. Keep counting until another hundred is counted. When it looks like there are less than 100 sticks left, count by tens and ones to find the answer.
3. Ask students how many hundreds, tens, and ones there are.
4. Ask students if the answer is closer to 300 or 400 and to explain how they can tell.

### How many rectangles? Early Stage 1 – 25 minutes

1. While Stage 1 are watching the video, [How many rectangles? (2:45)](https://education.nsw.gov.au/teaching-and-learning/curriculum/mathematics/mathematics-curriculum-resources-k-12/mathematics-k-6-resources/how-many-rectangles-s1), explain to Early Stage 1 students they are going to be rectangle detectives. In pairs, students find 5 different rectangles around the classroom, estimate which will be biggest and smallest, take photos and order them. Justify how they have ordered the rectangles. When students have found 5 rectangles they need to join up with another pair and discuss which rectangles were biggest, smallest, or the same size. Students work out how many different rectangles they found between them.

The table below details assessment opportunities and differentiation ideas.

|  |  |  |
| --- | --- | --- |
| Assessment opportunities | Too hard? | Too easy? |
| What to look for:   * Can students recognise rectangles in different sizes and orientations? **(MAE-2DS-01)** * Do students use comparative language to compare areas? **(MAE-2DS-02)**   What to collect:   * observations of students identifying and comparing rectangles **(MAE-2DS-01, MAE-2DS-02)** | Students cannot recognise rectangles in different orientations.   * Students use a rectangular tile and rotate it against a real-life object to see if it is a rectangle. * Students superimpose a tile with rectangular faces on objects to check. | Students can already identify rectangles in different orientations.   * Students are given a variety of triangle pattern blocks, for example, equilateral and isosceles. They look for different kinds of triangles in the classroom. * Students take photographs of different types of triangles and label them. |

How many rectangles? Stage 1 – 25 minutes

1. Stage 1 students watch the video, [How many rectangles? – Stage 1 (2:45)](https://education.nsw.gov.au/teaching-and-learning/curriculum/mathematics/mathematics-curriculum-resources-k-12/mathematics-k-6-resources/how-many-rectangles-s1) at [Stage1 Thinking mathematically resource](https://education.nsw.gov.au/teaching-and-learning/curriculum/mathematics/mathematics-curriculum-resources-k-12/mathematics-k-6-resources.main-education--category---catalogue---stage---stage-1.nameAsc.1.grid#catalogue_auto).
2. Make the 2 rectangles from the video with tiles and ask if there is another rectangle that can be made using 12 squares. This rectangle will be 12 squares long and one square high. Students describe the rectangle and explain how it is the same and different to the first 2 rectangles.
3. Challenge students to make as many different rectangles as they can using 12 squares of the same colour. Use grid paper or tiles to record rectangles. Ask students how they will know if they have found all the rectangles. If students make rectangles with the same dimensions but in different orientations, it may be difficult to decide whether they are different. Paper rectangles can be cut, rotated, and superimposed to check. Tile models can be built on top of each other to check.
4. Explain that shapes, like rectangles, can look different but have the same area. Ask students how they can describe different rectangles.

The table below outlines stimulus prompts to generate conversation, along with anticipated responses from students.

|  |  |
| --- | --- |
| Prompts | Anticipated student responses |
| * What is the same? * What is different? * What are you wondering? | * All the rectangles have 12 squares. * Some are long and some are wide. * This rectangle has 2 layers of 6 and I know that 2 lots of 6 makes 12. * That one is the longest and it only has one row of tiles. * I wonder if the rectangle that has 3 groups of 4 columns is the same as the rectangle that has 4 groups of 3 columns. * I wonder how many of the layers have the same number of squares as dots on dice. |

The table below details assessment opportunities and differentiation ideas.

|  |  |  |
| --- | --- | --- |
| Assessment opportunities | Too hard? | Too easy? |
| What to look for:   * Do students recognise arrays when they are making rectangles? **(MA1-FG-01, MA1-2DS-01)** * Can students use understanding of area to explain why rectangles in different orientations are the same? **(MA1-2DS-02)**   What to collect:   * observations of students making, manipulating and describing rectangles **(MA1-FG-01, MA1-2DS-01)** | Students cannot recognise arrays.   * Teacher models separating a rectangle of 12 squares into 2 rows of 6. Students mirror teacher example. * Students use interlocking cubes in blocks of colour to show one row and then how rows are added. | Students understand arrays and can prove they have made all possible rectangles with 12 squares.   * Give students the activity [Different Sizes](https://nrich.maths.org/8117) from [NRICH](https://nrich.maths.org/) to investigate different areas of rectangles exploring criteria such as sides, area, doubling and halving. * Students make or draw irregular shapes with 12 squares to further their understanding of conservation of area. |

### Measuring area with informal units – 25 minutes!

1. Give pairs of Early Stage 1 students pieces of rectangular paper or sticky notes in different sizes to order and describe. For each sized sticky note, students find 3 objects that have a larger area, a smaller area, or the same area. Record findings with drawings or photos. Repeat with different sizes of paper shapes, for example, circles, squares, and triangles.
2. Stage 1 students select a rectangular classroom object such as the top of a desk or a book cover and discuss how to use square tiles to measure the area. Students estimate, measure, and record the area of the object, ensuring there are no gaps or overlaps. Discuss measurement methods and compare results by asking:

* Did you encounter any challenges and if so, how did you overcome them? For example, counting leftover parts of tiles.
* Did anyone use arrays to find an area?
* Were everybody’s results the same?
* What are some possible reasons for differences in results?

1. Using the same object, introduce using a second informal square unit such as small interlocking blocks or MAB blocks. Ask students if they think the area will be bigger, smaller or the same and why. Estimate and measure using the second informal unit with no gaps or overlaps. Decide how to measure parts of squares at the edges. Ask students to describe the difference between their 2 measurements and how this relates to the 2 units of measurement used. Support students to recognise that a smaller unit of measure will result in a bigger answer.

The table below details assessment opportunities and differentiation ideas.

|  |  |  |
| --- | --- | --- |
| Assessment opportunities | Too hard? | Too easy? |
| What to look for:   * Can students identify familiar shapes and use them to describe areas using comparative language? **(MAO-WM-01, MAE-2DS-01, MAE-2DS-02)** * Can students estimate, accurately measure and record area using uniform informal units in rows and columns? **(MA1-FG-01, MA1-2DS-02)** * Can students identify leftover parts of units when measuring area and include them in a final measurement? **(MAO-WM-01, MA1-2DS-02)** * Do students understand that the size of unit used makes a difference to the number of units needed? **(MA1-2DS-02)**   What to collect:   * observations of students using comparative language to describe area **(MAO-WM-01, MAE-2DS-01, MAE-2DS-02)** * samples of recordings of rectangles **(MA1-2DS-02)** * observations of discussions of methods and units used **(MAO-WM-01, MA1-2DS-02)** | Students cannot compare and order rectangles by area because they are only considering length.   * Students superimpose 2 identical rectangular shapes to consider area. * Students superimpose rectangular faces of identical real-life objects to compare area. * Students cannot work out how to include leftover parts in final measurements. * Model part-part-whole with concrete materials. * Model language of part-part-whole. | Students find objects bigger than, smaller than and the same area as common shapes.   * Students repeat the activity using different-sized squares. * Students repeat the activity using equilateral, right-angled and isosceles triangles.   Students understand all concepts and skills taught.   * Students close their eyes and throw 2 counters on a number chart to get 2 numbers, for example, 43 and 69. * Students apply skills and concepts of area to find as many objects as they can that have an area of between 43 and 69 units in 10 minutes. |

### Consolidation and meaningful practice: What unit of measure should I use? – 15 minutes

1. Ask students if square tiles or pattern blocks would be an appropriate unit for measuring a larger area, such as a rug or desktop. Students should decide that this unit of measurement is too small and choose a more appropriate consistent unit, such as newspaper or coloured paper squares. Measure some larger areas in small groups, compare results and explain differences.
2. Return to the area poster, clarify and add new ideas.

## Lesson 5: Let’s use our measuring skills!

**Core concept:** Length and area can be used to compare measurements.

The table below contains suggested learning intentions and success criteria. These are best co-constructed with students.

|  |  |
| --- | --- |
| Learning intentions | Success criteria |
| All students are learning that:   * grouping of units allows them to estimate, compare, order and match lengths and areas * choice of measuring unit affects accuracy when measuring length and area * measurements can be used to find patterns and make connections. | All students can:   * use estimation to decide if an answer is reasonable * compare lengths of straight and irregular routes * use equal-sized squares to investigate rectangles.   In addition, students working towards Early Stage 1 outcomes can:   * identify and make closed shapes * compare areas using language such as biggest, smallest and the same as.   In addition, students working towards Stage 1 outcomes can:   * use a calibrated measure of 10 * investigate length and area comparisons using drawings, numerals, and words, and refer to the unit of measurement selected. |

### Daily number sense: Shorter or more fun? – 25 minutes

1. Build understanding of large numbers by measuring straight and curved lines using a measure of 10 units.
2. Go outside to play the measuring game, ‘Shorter or more fun?’ Using chalk, students mark one spot as home and another spot as school and then draw the shortest straight route between them. Early Stage 1 students use a single length of string and cut it to the exact length of the route. Then they will find out how many blocks can fit along the string, counting one by one to reach a total number. Stage 1 students take their measure of 10 from [Lesson 2](#_What_else_can) and use it iteratively to find the length of the route.

**Iteratively:** Repeatedly.

1. Discuss with students that sometimes they don't come straight to school. They might have to drive around a roundabout or get a hot chocolate on the way. Explain that this means the route might have corners, curves, or a circle in it. Students have fun drawing an irregular route that includes curves and a circle between the same 2 points as before but in a different colour. They predict whether this route will be shorter or longer than the first route.
2. Early Stage 1 students find a second single length of string to match their irregular route and compare it to the string from the straight route. Ask students if their prediction was correct. Remind students to start exactly at the home or starting point and finish exactly at the school or end point. Students work out how many blocks can fit along the string, counting one by one to reach a total number. Compare this number of blocks to blocks in the straight line.
3. Stage 1 students estimate and measure their irregular route. At this point, some students will realise that, if they made a straight, inflexible measure in [Lesson 2](#Lesson_2), it won’t work for a curved route. They will need to quickly choose a flexible material such as string and make a new calibrated measure of 10. Students can choose how to record their measurements as they work, for example, skip counting by tens and adding the remainder at the end; or using tally marks to record how many tens and how many left over. Many measurements will be over 100 units. Where this happens, support students to systematically put 10 measures together to make 100 as in [Lesson 4](#_Daily_number_sense): Daily number sense.
4. Compare the 2 routes, for example the fun route is more than twice as long as the straight route.

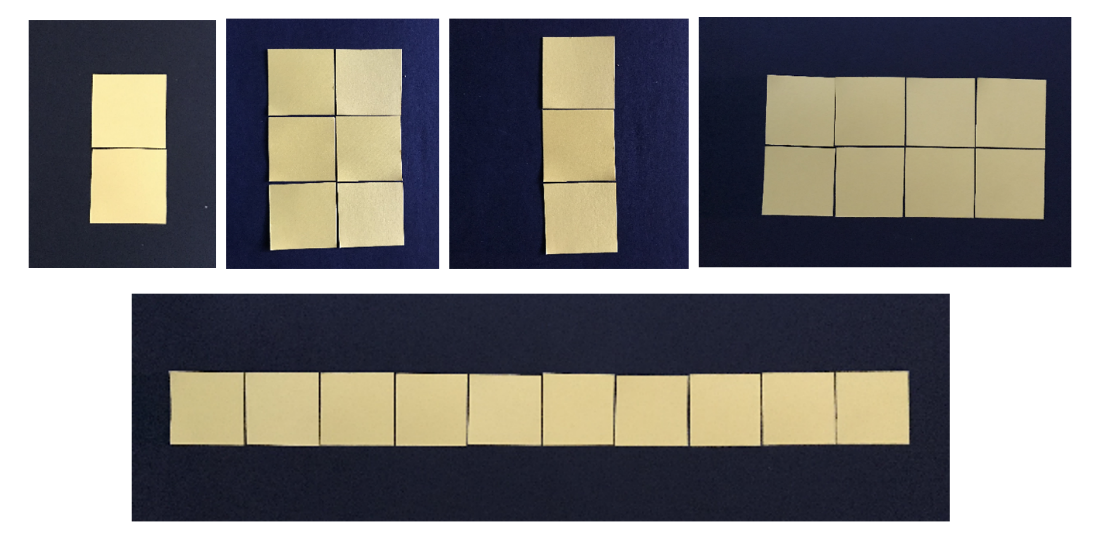
The table below details assessment opportunities and differentiation ideas.

|  |  |  |
| --- | --- | --- |
| Assessment opportunities | Too hard? | Too easy? |
| What to look for.   * Can students use string for indirect comparison? **(MAE-GM-02)** * Can students count by ones to find how many blocks fit along the string? **(MAE-RWN-01)** * Can students use a calibrated measure of 10 iteratively to measure routes? **(MA1-GM-02)** * Do students remember to add the leftover part to reach an accurate final measurement? **(MA1-GM-02)** * Do students use estimation to consider whether a final measurement is reasonable? **(MAO-WM-01, MA1-GM-02)**   What to collect:   * observations of students estimating and measuring **(MAO-WM-01, MAE-RWN-01, MAE-GM-02, MA1-GM-02)** | Students are unable to use string accurately.   * Support students to begin at the starting point and stop at the end point. * Students use putty or tape to fix string as needed along the route.   Students cannot count forwards to the number of blocks in a string.   * Model placing blocks along the string with no spaces or overlaps. * Model counting by ones to find the total number.   Students are unable to use their measure of 10 accurately.   * Model the first section of each path with no overlaps or spaces. * Student completes the measurement. | Students find and compare measurements of both paths quickly.   * Students predict whether a calibrated measure of 20 units will make measuring a path easier or harder and test their prediction. * Students compare the measurements and look for patterns, for example, halving. * Students make up number questions about their routes. For example, if the short route takes 5 minutes and the fun route is 3 times longer, how long will the fun route take? |

### How many rectangles: Same and different? – 35 minutes

1. Early Stage 1 students watch the video [About how many rectangles? (2:58)](https://education.nsw.gov.au/teaching-and-learning/curriculum/mathematics/mathematics-curriculum-resources-k-12/mathematics-k-6-resources/about-how-many-rectangles) From [Early Stage 1 Thinking mathematically](https://education.nsw.gov.au/teaching-and-learning/curriculum/mathematics/mathematics-curriculum-resources-k-12/mathematics-k-6-resources.main-education--category---catalogue---stage---early-stage-1.nameAsc.1.grid#catalogue_auto). In pairs, students investigate how many different rectangles they can make with 10 squares (9 yellow and 1 red), by placing the red tile in a different position. Students record by tracing, drawing, or taking photos.
2. In pairs, Early Stage 1 students make as many different rectangles as they can, using up to 10 squares. For example, 2 by 1, 3 by 1, 5 by 1, 2 by 3, 2 by 4. For more examples, see Figure 6.

Figure – Rectangles from squares!



1. Students identify the biggest and smallest rectangles by thinking about the number of squares used. They then record and organise data to justify they have found all solutions. Encourage students to make rectangles in different orientations, for example, 3 by 2 and 2 by 3, and discuss how they are the same and different.
2. Explain to Stage 1 students that they are going to investigate rectangles again, but this time using 24 squares. Students are going to be measurement detectives and investigate the lengths and areas of the rectangles they find. In small groups, students make or draw rectangles using square tiles or grid paper. Students choose how to organise their rectangles in order to investigate them. Ask questions to support investigations:

* How many rectangles can you find?
* How do you know you have found all the rectangles?
* How can you order your rectangles so you can compare them?
* How are your rectangles the same?
* How are your rectangles different?
* How can you use arrays to make your rectangles?
* What different arrays can you see in your rectangles?
* Which rectangle has the shortest and longest sides? Why?
* Can you see any patterns between the sides of the rectangles and the areas of the rectangles?

The table below details assessment opportunities and differentiation ideas.

|  |  |  |
| --- | --- | --- |
| Assessment opportunities | Too hard? | Too easy? |
| What to look for:   * Can students make and organise different-sized rectangles and identify area as an attribute by counting squares? **(MAO-WM-01, MAE-2DS-02, MAE-DATA-01)** * Do students use arrays to create rectangles? **(MA1-FG-01, MA1-2DS-02)** * Can students choose how to record area and length of rectangles? **(MAO-WM-01, MA1-GM-01, MA1-2DS-01)** * Are students using data to look for patterns and make connections about area and length? **(MAO-WM-01, MA1-DATA-02)**   What to collect:   * observations of students using data to discuss connections and patterns **(MAO-WM-01, MAE-2DS-02, MAE-DATA-01,** **MA1-FG-01, MA1-GM-01, MA1-2DS-02, MA1-DATA-02)** | Students cannot make rectangles.   * Work with students to make small rectangles, for example, 2 by 1, 3 by 1, or 3 by 2. Model language of arrays. * Increase array numbers until the student is working with 10 or 24 squares. | Students find all yellow and red rectangles.   * Students are given 6 or 10 tiles of one colour to see how many different rectangles they can find. * Count the total of rectangles found.   Students find answers to all questions.   * Students work with random odd numbers of squares to investigate if they can make them into rectangles with no squares left over. **Note:** Odd numbers will work if there are 2 or more squares left over. * Students investigate different-sized squares, beginning with a one-by-one square. Look for patterns in the number of tiles used as squares increase in size. Look for connections with rectangle lengths and areas. |

### Discuss and connect the mathematics: Length and area – 10 minutes

1. Return to area and length posters. Think about connections between length and area.

## 

## Lesson 6: Baby bear’s cup!

**Core concept:** Objects can look different but still have the same internal volume.

The table below contains suggested learning intentions and success criteria. These are best co-constructed with students.

|  |  |
| --- | --- |
| Learning intentions | Success criteria |
| All students are learning that:   * estimating, measuring and choice of measuring unit allows them to compare, order and match volumes * volume can be the same even if containers are different shapes * a number can be explored in many ways. | All students can explain why different shaped containers can have the same volume.  In addition, students working towards Early Stage 1 outcomes can:   * recognise and represent the number 4 in different ways * compare volumes of 2 containers by filling one and pouring into the other.   In addition, students working towards Stage 1 outcomes can:   * estimate and measure how much a container will hold by repeatedly using a scoop to fill with a chosen unit * identify the number before and after a given two-digit number * identify the next multiple of 10 for a given two-digit number. |

### Daily number sense Early Stage 1: Number of the day – 15 minutes

1. Provide a selection of concrete materials and equipment and ask students how many ways they can show the number 4. For example, 0 and 4, 3 and 1, 2 and 2 with fingers, ten-frames, double-sided counters, blocks, dice, dominoes and so on. Ask students if they can see any examples of 4 in the classroom.

**Note**: Double-sided counters are, for example, red on one side and yellow on the other. Four counters can be thrown and will land in different combinations making 4.

### Daily number sense Stage 1: Number of the day – 15 minutes

1. Build student understanding of place value by thinking about a two-digit number in multiple ways.
2. Show students the number 77. Students answer questions verbally or on mini whiteboards:

* What number comes before?
* What number comes after?
* What is 10 more? Can you keep counting forwards in tens?
* What is 10 less? Can you keep counting backwards in tens?
* How many more to the next multiple of 10? What is 10 less and 10 more than that?
* How many tens and how many ones are there in 77?

1. In pairs, students randomly choose a two-digit number and ask each other the same questions.

The table below details assessment opportunities and differentiation ideas.

|  |  |  |
| --- | --- | --- |
| Assessment opportunities | Too hard? | Too easy? |
| What to look for:   * Can students subitise collections of 4 in different arrangements? **(MAE-RWN-01)** * Can students identify the number before and after a given two-digit number? **(MA1-RWN-01)** * Can students count forwards and backwards by tens on and off the decade from a given two-digit number? **(MA1-RWN-01)** * Can students identify the next multiple of 10 from a given two-digit number? **(MA1-RWN-01)**   What to collect:   * observations of student responses **(MAE-RWN-01, MA1-RWN-01)** | Student cannot subitise and move back into one-to-one correspondence.   * Students work with a smaller number, for example 3, with dice and then dominoes. * Students match dice and dominoes with the same number of dots to develop subitising skills. | Students already work with two-digit numbers.   * Students work with random three-digit numbers. * Students find the appropriate column on a 1000 number chart to check answers. |

### Baby bear’s cup – 40 minutes

This lesson has been adapted from ‘Goldilocks and the three bears’ from [Early Stage 1 Thinking Mathematically](https://education.nsw.gov.au/teaching-and-learning/curriculum/mathematics/mathematics-curriculum-resources-k-12/mathematics-k-6-resources.main-education--category---catalogue---stage---early-stage-1.nameAsc.1.grid#catalogue_auto) and [Stage 1 Thinking Mathematically](https://education.nsw.gov.au/teaching-and-learning/curriculum/mathematics/mathematics-curriculum-resources-k-12/mathematics-k-6-resources.main-education--category---catalogue---stage---early-stage-1.nameAsc.1.grid#catalogue_auto).

1. Ask students if they can remember what kinds of measurements they have learned about so far – area and length. Explain they are going to explore how to measure internal volume (capacity). Internal volume (capacity) is the space inside something. Students point to objects that have a small space inside and then a large space inside using vocabulary such as big, small, full, almost empty. Discuss how it might be possible to measure these spaces or internal volumes (capacities). Ask what units might be suitable to measure capacity with and why.
2. Ask if students can remember any stories where there were different-sized containers such as bowls. Revise that, in Goldilocks and the Three Bears, the bears had different-sized bowls for their porridge. Discuss how it might be possible to measure these spaces or internal volumes. Ask what units might be suitable to measure capacity with and why.
3. Early Stage 1 students watch [Goldilocks and the three bears – Early Stage 1 (5:48)](https://education.nsw.gov.au/teaching-and-learning/curriculum/mathematics/mathematics-curriculum-resources-k-12/mathematics-k-6-resources/goldilocks-and-the-three-bears-es1) from [Early Stage 1 Thinking mathematically](https://education.nsw.gov.au/teaching-and-learning/curriculum/mathematics/mathematics-curriculum-resources-k-12/mathematics-k-6-resources.main-education--category---catalogue---stage---early-stage-1.nameAsc.1.grid#catalogue_auto) video.
4. Stage 1 students watch [Goldilocks and the three bears – Stage 1 (8:04)](https://education.nsw.gov.au/teaching-and-learning/curriculum/mathematics/mathematics-curriculum-resources-k-12/mathematics-k-6-resources/goldilocks-and-the-three-bears-s1) from [Stage 1 Thinking mathematically](https://education.nsw.gov.au/teaching-and-learning/curriculum/mathematics/mathematics-curriculum-resources-k-12/mathematics-k-6-resources.main-education--category---catalogue---stage---early-stage-1.nameAsc.1.grid#catalogue_auto) video.
5. As a class, discuss the important things the mathematicians in the video did to get an accurate measurement. Ask students why they think this activity uses lentils for measurement and what would change if blocks had been used. Think about spaces between units and how this would affect a measurement. Model measuring scoops of lentils and then scoops of blocks if students need concrete materials to visualise this. Ask students if the mathematicians filled containers right to the top or left space and how this affects accuracy of measurement. See if students noticed the mathematicians checking how lentils were level with the top of the cup.
6. In groups, Early Stage 1 students work with cups of different sizes, trays, and lentils. They choose one cup to be Baby bear’s cup and have 10 minutes to find another cup that holds the same amount of lentils. For each cup investigated, students predict whether it will contain more than, less than or the same as Baby bear’s cup. After the measurement, students refer to their prediction to develop estimation skills.
7. Provide groups of Stage 1 students with cups of different sizes, small scoops, and choices of measuring units, for example, sand, rice, blocks. Groups choose one cup to be Baby bear’s cup, and then have 10 minutes to select a measuring unit and scoop and find another cup that can hold the same amount. For each cup investigated, students estimate, record a measurement, and see how close their estimate was. Students compare and order measurements once they have investigated 2 or more cups.
8. Come back together as a class. Ask:

* What unit of measure did you choose to work with? Why? How well did it work?
* Did any groups find an exact match to Baby bear’s cup?
* If you didn’t find an exact match, which cup was closest in volume and how could you tell?

The table below details assessment opportunities and differentiation ideas.

|  |  |  |
| --- | --- | --- |
| Assessment opportunities | Too hard? | Too easy? |
| What to look for:   * Can students estimate and measure how much a container will hold by iteratively filling with a smaller container? **(MAO-WM-01, MA1-3DS-02)** * Do students understand that spaces between units will lead to an inaccurate measurement? **(MA1-3DS-02)** * Can students compare internal volumes (capacities) of 2 or more containers? **(MAO-WM-01, MAE-3DS-02, MA1-3DS-02)** * Can students recognise and explain why containers of different shapes can have the same internal volume? **(MAO-WM-01, MA1-3DS-02)**   What to collect.   * observations of student investigations demonstrating understanding of internal volume (capacity) **(MAO-WM-01, MAE-3DS-02, MA1-3DS-02)** | Students cannot measure accurately.   * Model filling scoop and container to the top and levelling off. * Work with smaller containers. | Students complete activity quickly.   * Students select a variety of containers and label the point at which they estimate each container would be half full. They cannot use a ruler. * Students use a unit of measurement and a scoop to check answers. |

### Consolidation and meaningful practice: Sandy’s container – 10 minutes

1. Show students a cup of rice and explain that Sandy filled a container or space somewhere in the classroom using 5 cups of rice. Ask students what containers Sandy could have filled.
2. Discuss the important things to remember when measuring volume and record ideas on a volume poster. Compare to length and area posters.

## Lesson 7: Pack and stack!

**Core concept:** Container shape makes a difference to how efficiently units can be packed.

The table below contains suggested learning intentions and success criteria. These are best co-constructed with students.

|  |  |
| --- | --- |
| Learning intentions | Success criteria |
| All students are learning that:   * estimating, measuring and choice of measuring unit allows them to compare, order and match volumes * volume can be the same even if containers are different shapes.   In addition, students in Stage 1 are learning that two-digit numbers can be partitioned to make different quantities. | All students can recognise that different shaped boxes or models can hold the same amount.  In addition, students working towards Early Stage 1 outcomes can:   * identify how much a container can hold using concrete materials * use volume words, for example, bigger than, smaller than, the same as.   In addition, students working towards Stage 1 outcomes can:   * make and use a container to hold a given number of objects * estimate how many of a unit will be needed to fill a container by comparing it to other units of measure * understand that using smaller units of measure will mean that more units are needed * manipulate two-digit numbers to make smaller or larger quantities. |

### Daily number sense Early Stage 1: How many blocks? – 15 minutes

1. Students draw a picture on A4 paper by tracing around a selection of faces from 3D objects; for example, drawing a circle by using the bottom of a cylinder. The first picture must include a circle. No shapes can go over the edge of the paper. Students tell a partner how many sides of shapes they can see in their picture and how many there would be with one more side and one less side. Repeat but this time the picture must include a triangle and so on.

### Daily number sense Stage 1: Two-digit targets! – 15 minutes

1. Build student understanding of place value and properties of numbers by completing [Two-digit Targets](https://nrich.maths.org/6343) adapted from NRICH.
2. Give small groups a set of digit cards from 0-9. Each time, students can arrange any of their cards to make the following two-digit numbers:

* the largest even number (98)
* the largest, odd number (97)
* the smallest, odd number (13)
* the largest multiple of 5 (95)
* the number closest to 50 (49 or 51 – ask students why both answers are correct).

1. Students repeat the activity but this time they can only use each digit once. One possible set of solutions is:

* the largest even number (92)
* the largest, odd number (75)
* the smallest, odd number (13)
* the largest multiple of 5 (60)
* the number closest to 50 (48).

1. Discuss different solutions, decide which is closest and justify why.

### Volume warm-up – 15 minutes

1. Revise that in the previous lesson ([Lesson 6](#_Lesson_6:_Baby_1)), students investigated volume by filling the space inside containers. Explain that in this lesson, students will investigate volume by making and packing containers.
2. Two-minute challenge: find something that will hold 6 cubes so they don't move around too much. Compare different objects chosen.

### Early Stage 1: Stack and pack! – 30 minutes

1. In pairs or small groups, students predict and investigate containers that hold exactly 30 blocks. Encourage students to check for spaces around the sides and tops. Ask students how close they were to their prediction. Label containers as too big, too small, or just right. Place ‘just right’ containers together and discuss how they are the same (volume) and different (shape).
2. Independently, students make a model using between 10 and 20 blocks. Once each student has a model, organise students into pairs. Partner A takes their blocks apart and uses them to make a copy of Partner B’s model. Discuss whether Model B used the same number of blocks, more blocks or less blocks and how they could tell. Repeat but using different numbers of blocks and swapping roles.

### Stage 1: Keep those marbles safe! – 30 minutes

1. Explain that students will be given 30 marbles which need to be stored in a container, so they don’t roll around all over the place. In small groups, students make a container out of card and tape that will hold exactly 30 marbles with as little space left over as possible. This container could be a box, but there are many other possibilities.
2. As a class, compare containers and talk about how they are the same (volume) but different (shape).
3. Provide students with a variety of informal units of measure, for example, paperclips, counters and so on. Then use the empty marble container to investigate packing other informal units of measure. For each, estimate and then record a measurement. Encourage students to compare each new informal unit with a marble to help predict how many more or less of the new unit of measure they will need. For example, 5 of these counters are about the same as one marble, so there should be about 5 times more counters than marbles. This block is twice the size of the marbles so my box might fit 15 blocks instead of 30 marbles. Fill the marble container with the new unit of measure and check predictions.

The table below details assessment opportunities and differentiation ideas.

|  |  |  |
| --- | --- | --- |
| Assessment opportunities | Too hard? | Too easy? |
| What to look for:   * Can students compare volumes of 2 models made from blocks by using the blocks from one model to make the other? **(MAO-WM-01, MAE-3DS-02)** * Can students make and use a container to hold a given number of informal units? **(MAO-WM-01, MA1-3DS-02)** * Can students estimate internal volume (capacity) by referring to number and type of uniform informal unit used? **(MAO-WM-01, MA1-3DS-02)** * Can students identify different shaped boxes holding 30 units? **(MAE-3DS-01)** **(MA1-3DS-02)** * Do students understand that the size of the unit used makes a difference to the number of units needed? **(MAO-WM-01, MA1-3DS-02)**   What to collect:   * observations of students demonstrating working mathematically with volume skills **(MAO-WM-01, MAE-3DS-02, MA1-3DS-02)** | Students cannot work with more than 10 blocks.   * Students work with smaller containers and pack 10 blocks. * Students make models with 5 to 10 blocks to rebuild.   Students have poor fine motor skills and cannot make a container.   * Provide students with a variety of containers to investigate and find one that holds 30 marbles. * If they cannot find a container that holds exactly 30 marbles, ask how they can work out which container is closest. | Students complete all activities quickly and accurately.   * Students explore packing marbles and blocks in different shaped containers and discuss findings. * Students use their thirty-marble containers to work out dimensions for containers that will hold 60 marbles and 90 marbles. |

### Connect and discuss the mathematics: Volume, length, and area – 10 minutes

1. Add to or clarify the class volume poster. Discuss what is the same and different about measuring volume compared to measuring length and area.

## 

## Lesson 8: Heavier, lighter or the same?

**Core concept:** Objects can be compared, ordered, and matched by their mass.

The table below contains suggested learning intentions and success criteria. These are best co-constructed with students.

|  |  |
| --- | --- |
| Learning intentions | Success criteria |
| All students are learning that:   * estimating, measuring and choice of measuring unit allows them to compare, order and match mass * mass remains the same even if the object changes shape * shapes and numbers can be identified by features. | All students can:   * use hefting to compare objects with words such as heavier than, lighter, the same as * ask logical questions about a secret shape or number to work out what it is.   In addition, students working towards Early Stage 1 outcomes can predict whether an object will be the same as, heavier, or lighter than another object.  In addition, students working towards Stage 1 outcomes can:   * use an equal-arm balance to compare the mass of 2 objects * use a consistent unit to measure, compare and order mass * explain why a ball of clay can be made into 2 different shapes but still have the same mass. |

### Daily number sense: Celebrity shapes and numbers – 10 minutes

1. Build student understanding of the features of two-dimensional shapes and numbers by asking questions in a logical sequence to discover a mystery shape or number.
2. With the whole class, model how to play Celebrity shapes. Have sticky notes with shapes drawn on them. Take one out without looking and stick to your forehead. Ask the students questions that only have yes or no answers until there are enough clues to guess what the shape is. For example:

* Do I have less than 4 sides? Yes. I could be a triangle or a circle.
* Do I look like the bottom of this cylinder? Yes. I am a circle.

1. Early Stage 1 students play Celebrity shapes in small groups.
2. With Stage 1 students, model how to play Celebrity numbers. Have mixed-up sticky notes labelled 1 to 10. Take one out without looking and stick to your forehead. Ask the students questions that only have yes or no answers until there are enough clues to guess what the number is. For each answer, indicate on a number line which numbers the answer could still be. For example:

* Am I bigger than 5? No. Look at the number line. The answer could be 1, 2, 3 or 4.
* Am I an even number? Yes. Look at the number line. The answer could only be 2 or 4 now.
* Am I 4? No. Look at the number line. There is only one possibility left now.
* Am I 2? Yes.

1. Some students will need to keep playing a modelled version to apply logical thinking with properties. Others who demonstrate understanding could make their own sticky notes with two-digit numbers to play with. They can add questions that give clues to larger numbers, for example:

* Am I bigger than 50 but less than 75?
* Can you skip count by 5 to get exactly to me?
* Can you skip count by 10 to get exactly to me?

### Two-minute mass challenges – 10 minutes

1. Explain that students will explore mass as a measurement. Students have 2 to 3 minutes to complete each challenge to recall previous understanding and vocabulary of mass:

* Challenge 1: What can you find that is bigger and lighter than a rubber ball? Encourage hefting.
* Challenge 2: Lin carried a big, full bucket quite easily. Ask what might have been in it.

1. Make a list of words used to talk about mass, for example, heavier, heaviest, lighter, lightest. Ask students if any of their words have connections to words used to describe area, length, and volume.

**Hefting**: Testing the weight of an object by lifting and/or balancing it.

### Heavy or light Early Stage 1 – 15 minutes

1. Provide small groups of students with a collection of natural and built objects to investigate mass. The collection should include large, light objects and small, heavy objects as well as objects that are the same size but different masses. Students predict whether each object is heavy, light, or in-between, then heft and compare to their prediction. Order objects from lightest to heaviest.

### Measuring with an equal-arm balance demonstration Stage 1 – 15 minutes

1. Show students an equal-arm balance. Discuss:

* How can an equal-arm balance help us to measure?
* What does it measure?
* How does it work?

1. Clarify that an equal-arm balance shows if objects weigh the same or if one object is heavier or lighter. Put objects of the same weight on each side of the balance and ask students what they see.
2. Show students 2 different-sized balls of modelling clay. Ask students if they think they are the same or if one ball is heavier than the other. Demonstrate hefting and record which ball seems heavier.
3. Ask students to predict what will happen to the equal-arm balance when the balls are placed on either side. Place the balls on each side and discuss what happens.
4. Discuss how to make the equal-arm balance even. Students may suggest taking some clay off the heavier side and adding it to the other or adding new clay to the lighter ball. Try suggestions, getting closer each time until the equal-arm balance is even.
5. Change the shape of the clay on one side and then put it back on the scale. Ask if the scale is still balanced. Prompt students to explain their thinking. Repeat with the clay on the other side. Talk about how mass remains the same even if an object changes shape.

The table below outlines stimulus prompts to generate conversation about the topic, along with anticipated responses from students.

|  |  |
| --- | --- |
| Prompts | Anticipated student responses |
| * What do you notice? * Are the 2 sides of the balance even? * What do you think has happened when one side of the balance goes down? * What will happen if we make one ball of clay a different shape? | * The balance has stayed level so my objects must be the same mass. * One side is higher so that ball of clay must be lighter. * That side went down so it might be heavier. * The ball is thinner now so it won't weigh as much, and one side of the scale will go down. * The scale stayed balanced even when we changed the shape of a ball so it must still weigh the same. |

### How can we compare? – 15 minutes

1. Provide Early Stage 1 students with a wide selection of balls of different sizes and mass. Ensure that there is a large, light ball and a small, heavy ball. Individually, students choose one ball and then predict whether a second ball will be heavier than, lighter than or about the same weight as the first. Use hefting to check predictions and repeat several times with different balls. Repeat with a selection of toys.
2. Give groups of Stage 1 students different-sized balls of clay and ask the class how they can measure their balls so that they can compare and order mass. If they do not suggest using a consistent unit of measurement for the other side of their scale, revise how they measured length of shoes in [Lesson 2](#_Lesson_2:_How) and volume of containers in [Lesson 6](#_Lesson_6:_Baby_1). Decide on a consistent unit of measure. Place the ball on one side and the selected unit, for example, blocks, one by one on the other side until the balance is level. Record the number of blocks needed.
3. As a class, discuss results. Ask if any ball of clay did not equal an exact number of the measuring unit and what they did if this happened. Order quantities to identify the lightest and heaviest clay balls.

The table below details assessment opportunities and differentiation ideas.

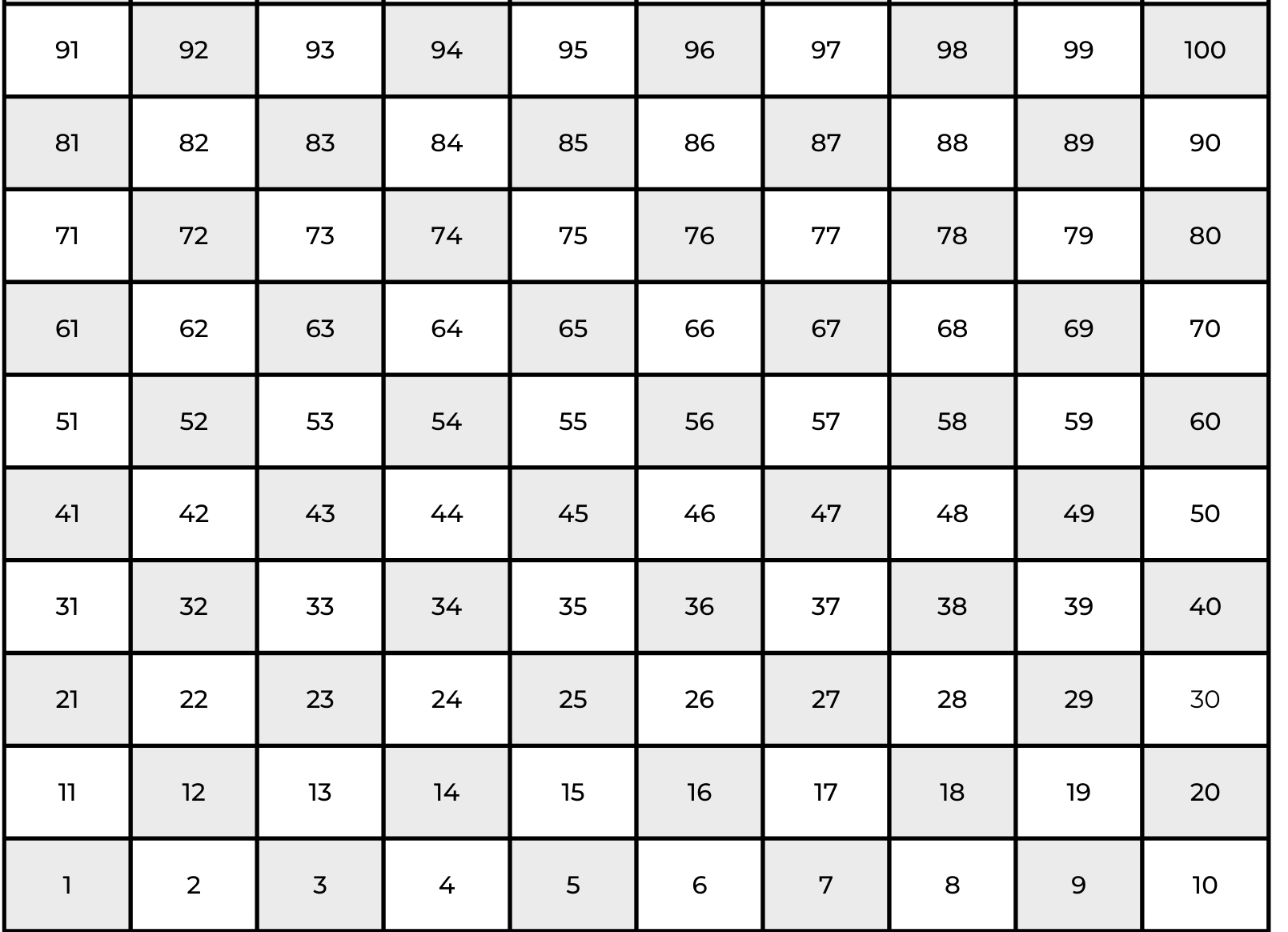
|  |  |  |
| --- | --- | --- |
| Assessment opportunities | Too hard? | Too easy? |
| What to look for:   * Can students use hefting to describe objects with vocabulary such as heavier than, lighter, the same as? **(MAO-WM-01, MAE-NSM-01, MA1-NSM-01)** * Can students use an equal-arm balance to compare masses of 2 objects? **(MA1-NSM-01)** * Do students understand that mass remains the same even if the object changes shape? **(MA1-NSM-01)** * Can students use a consistent unit to measure mass to compare and order objects? **(MAO-WM-01, MA1-NSM-01)**   What to collect:   * observations of students using an equal arm balance correctly to compare and order masses **(MAO-WM-01, MAE-NSM-01, MA1-NSM-01)** | Students do not understand vocabulary of mass.   * Students are given clear examples of light and heavy objects and place them on cards labelled heavy and light. * Add an in-between mass for students to consider. Include heavier than and lighter than hefting opportunities.   Students do not understand conservation of mass.   * Students are given 2 balls of clay with equal mass and prove they are equal by placing on the equal-arm balance. * Students remove one ball and make it into a sausage shape. Place back on the scale to prove the 2 masses are still the same.   Students cannot use a consistent unit to measure.   * Students put big blocks and little blocks together and discuss why they cannot be used in the same measurement. * Students use the equal-arm balance to prove different-sized blocks are not the same mass. | Students accurately heft balls and toys.   * Students heft a variety of building bricks which are different sizes and lengths but have very similar mass. * Students choose another resource of interest, for example, pattern blocks and repeat activity.   Students find equivalence using clay and units. These activities have been adapted from Sullivan and Lilburn (2004).   * Students place a book on one side of a balance and find 2 objects for the other side so the arm balance is level. Ask what the 2 objects might be. * Students place five 20 cent pieces on one side of the balance and find out what money amounts could be placed on the other side to make both sides equivalent. Students think about how to prove they have found all possible answers. |

Discuss and connect the mathematics: How do we measure? – 10 minutes

1. As a class, make a poster detailing the important things to remember when measuring mass. Compare this poster to the area, volume, and length posters. Ask students:

* What are the most important things to remember when measuring quantities of anything?
* What do students have to do so that they can compare, order and match quantities?

## Resource 1: Number chart



## Resource 2: Shoeprints



## Syllabus outcomes and content

The table below outlines the [syllabus outcomes](https://curriculum.nsw.edu.au/learning-areas/mathematics/mathematics-k-10) and range of relevant syllabus content covered in this unit. Content is linked to [National Numeracy Learning Progression](https://www.australiancurriculum.edu.au/resources/national-literacy-and-numeracy-learning-progressions/version-3-of-national-literacy-and-numeracy-learning-progressions/) version (3).

|  |  |  |
| --- | --- | --- |
| Focus area and outcomes | Content groups and content points | Lessons |
| **Representing whole numbers**  **MAO-WM-01**  **MAE-RWN-01, MA1-RWN-01**  **MAE-RWN-02, MA1-RWN-02** | **Early Stage 1**  **Instantly name the number of objects within small collections**   * Instantly recognise (subitise) the number of items in small groups of up to four items without counting (NPV1, CPr1) * Identify the number of items in different arrangements (CPr2) | **2, 4 and 6** |
| **Representing whole numbers (cont)** | **Early Stage 1**  **Use the counting sequence of ones flexibly**   * Count forwards to at least 30 and state the number after or before a given number, without needing to count from one (CPr4) * Count backwards from a given number 20 or less (CPr5) * Identify the number before as one less and the number after as one more than a given number | **1, 3, 5, 7 and 8** |
| **Representing whole numbers (cont)** | **Early Stage 1**  **Recognise number patterns**   * Recognise dice and domino dot patterns (NPA1, NPV2, CPr2) * Recognise different finger patterns for the same number (NPA2) | **4 and 6** |
| **Representing whole numbers (cont)** | **Early Stage 1**  **Connect counting and numerals to quantities**   * Count one-to-one correspondence recognising that the last number name represents the total number in the collection (CPr3, CPr5) * Make correspondences between collections | **5 and 8** |
| **Representing whole numbers A (cont)** | **Stage 1**  **Use counting sequences of ones with two-digit numbers and beyond**   * Identify the number before and after a given two-digit number (CPr5) | **1 and 6** |
| **Representing whole numbers A (cont)** | **Stage 1**  **Continue and create number patterns**   * Count forwards and backwards by twos from any starting point (CPr6-CPr7, MuS2) | **1** |
| **Representing whole numbers A (cont)** | **Stage 1**  **Represent numbers on a line**   * Sequence numbers and arrange them on a line by considering the order and size of those numbers (CPr5) | **2, 3 and 8** |
| **Representing whole numbers A (cont)** | **Stage 1**  **Represent the structure of groups of ten in whole numbers**   * Use 10 as a reference in forming numbers from 11-20 (CPr7) * Count large sets of objects by systematically counting in tens (CPr7) * Partition two-digit numbers to show quantity values (NPV4) * Estimate, to the nearest ten, the number of objects in a collection and check by counting in groups of ten (CPr7, NPV6) | **2, 5 and 7** |
| **Representing whole numbers B (cont)** | **Stage 1**  **Use counting sequences of ones and tens flexibly**   * Count forwards and backwards by tens, on and off the decade, with two- and three-digit numbers (CPr7) | **3 and 6** |
| **Representing whole numbers B (cont)** | **Stage 1**  **Form, regroup and rename three-digit numbers**   * Count and represent large sets of objects by systematically grouping in tens and hundreds (CPr7, NPV5) * Identify the nearest hundred to a number | **4** |
| **Forming groups B**  **MAO-WM-01**  **MA1-FG-01**  **NOTE – there is only one forming groups outcome for Stage 1.** | **Stage 1**  **Represent and explain multiplication as the combining of equal groups**   * Form arrays of equal rows and equal columns (MuS5) | **4 and 5** |
| **Geometric measure**  **MAO-WM-01**  **MAE-GM-01, MA1-GM-01**  **MAE-GM-02, MA1-GM-02** | **Early Stage 1**  **Length: Use direct and indirect comparisons to decide which is longer**   * Identify the attribute of ‘length’ as the measure of an object from end to end * Use comparative language to describe length (UuM2) * Compare lengths directly by placing objects side by side and aligning the ends (UuM2) * Explain why the length of a piece of string remains unchanged whether placed in a straight line or a curve * Compare lengths indirectly by copying a length) (UuM3) | **1, 2 and 5** |
| **Geometric measure A (cont)** | **Stage 1**  **Length: Measure the lengths of objects using uniform informal units**   * Use uniform informal units to measure lengths and distances by placing the units end to end without gaps or overlaps (UuM2) * Select appropriate uniform informal units to measure lengths and distances (UuM3) * Recognise and explain the relationship between the size of a unit and the number of units needed * Count informal units to measures lengths or distances and describe the part left over (UuM4) * Record lengths and distances by referring to the number and type of unit used (UuM4) * Use a single informal unit repeatedly (iteratively) to measure length (UuM4) | **1, 2 and 5** |
| **Geometric measure A (cont)** | **Stage 1**  **Length: Compare lengths using uniform informal units**   * Compare the lengths of two or more objects using appropriate uniform informal units and check by placing the objects side by side and aligning the ends (UuM2-UuM3) * Explain why the length of an object remains constant when rearranged * Estimate lengths, indicating the number and type of unit used and check by measuring (UuM3) | **1** |
| **Geometric measure B (cont)** | **Stage 1**  **Length: Compare and order lengths, using appropriate uniform informal units**   * Make and use a tape measure calibrated in uniform informal units (UuM4) * Compare and order two or more shapes according to their lengths using an appropriate uniform informal unit * Compare the lengths of two or more objects that cannot be moved or aligned * Record length comparisons using drawings, numerals and words, and by referring to the uniform informal unit used | **2 and 5** |
| **Two-dimensional spatial structure**  **MAO-WM-01**  **MAE-2DS-01, MA1-2DS-01**  **MAE-2DS-02, MA1-2DS-02** | **Early Stage 1**  **2D shapes: Sort, describe and name familiar shapes**   * Identify familiar shapes in a range of contexts * Sort shapes according to features such as size and shape (UGP1-UGP2) * Describe shapes, including circles, squares, triangles and rectangles (UGP1-UGP2) * Ask and respond to questions that help identify and name a particular shape | **5 and 8** |
| **Two-dimensional spatial structure (cont)** | **Early Stage 1**  **2D shapes: Represent shapes**   * Turn shapes to fit into or match a given space * Make pictures and designs using a selection of shapes * Make two-dimensional shapes by tracing around the faces of three-dimensional objects (UGP3) * Identify and draw lines and curves | **4, 5 and 8** |
| **Two-dimensional spatial structure (cont)** | **Early Stage 1**  **Area: Identify and compare area**   * Make closed shapes and identify the attribute of area as the measure of the amount of surface * Use comparative language to describe areas (UuM2) * Predict which of two surfaces will have the larger area and justify the answer * Compare areas of two similar shapes directly by drawing, retracing, or cutting and pasting (UuM3-UuM4) | **3 and 5** |
| **Two-dimensional spatial structure A (cont)** | **Stage 1**  **2D shapes: Recognise and classify shapes using obvious features**   * Identify shapes presented in different orientations (UGP2) | **4** |
| **Two-dimensional spatial structure A (cont)** | **Stage 1**  **Area: Indirectly compare area**   * Predict which of two similar shapes has the larger area and check by covering (UuM4) | **3 and 4** |
| **Two-dimensional spatial structure A (cont)** | **Stage 1**  **Area: Measure areas using uniform informal units**   * Explore area using uniform informal units to cover the surface in rows or columns without gaps or overlaps (UuM5) * Measure area by selecting and using appropriate uniform informal units * Explain the relationship between the size of a unit and the number of units needed to measure an area * Explain why the area remains constant when units are rearranged * Record areas by referring to the number and type of uniform informal units used * Identify any parts of units left over when counting uniform informal units to measure area * Estimate areas by referring to the number and type of uniform informal unit used and check by measuring (UuM3) | **3 and 4** |
| **Two-dimensional spatial structure B (cont)** | **Stage 1**  **Area: Compare rectangular areas using uniform square units of an appropriate size in rows and columns**   * Cover rectangular surfaces by creating repeated rows of square tiles (UuM5) * Use the structure of repeated units to find the area of a rectangle (UuM5) * Explain how the grid structure of rows and columns helps to find the area * Record comparisons of area using drawings, numerals and words, and by referring to the uniform informal unit used | **4 and 5** |
| **Three-dimensional spatial structure**  **MAO-WM-01**  **MAE-3DS-01, MA1-3DS-01**  **MAE-3DS-02, MA1-3DS-02** | **Early Stage 1**  **3D objects: Explore familiar three-dimensional objects**   * Describe the features of familiar objects (UGP1) * Predict the stacking capabilities of various three-dimensional objects | **7 and 8** |
| **Three-dimensional spatial structure (cont)** | **Early Stage 1**  **Volume: Compare internal volume by filling and packing**   * Fill and empty containers using materials such as water or sand * Compare the internal volumes (capacities) of two containers directly by filling one and pouring into the other (UuM2) * Establish that containers of different shapes may hold the same amount * Stack and pack blocks into defined spaces (UuM5) | **6** |
| **Three-dimensional spatial structure (cont)** | **Early Stage 1**  **Volume: Compare volume by building**   * Identify the attribute of volume as the amount of space an object or substance occupies * Compare the volumes of two objects made from blocks or connecting cubes directly by deconstructing one object and using its parts to construct a copy of the other object * Use comparative language to describe volume (UuM2) | **6 and 7** |
| **Three-dimensional spatial structure A (cont)** | **Stage 1**  **Volume: Measure and compare the internal volumes (capacities) of containers by filling**   * Use uniform informal units to measure how much a container will hold by counting the number of times a smaller container can be filled and emptied into the container being measured (UuM3)   **Volume: Measure the internal volume (capacity) of containers by packing**   * Explain that if there are gaps when packing and stacking, this will affect the accuracy of measuring the internal volume | **6** |
| **Three-dimensional spatial structure B (cont)** | **Stage 1**  **Volume: Compare containers based on internal volume (capacity) by filling and packing**   * Make and use a device for measuring internal volume (capacity) calibrated in uniform informal units (UuM3-UuM4) * Compare, order and record the internal volumes (capacities) of two or more containers by measuring each container in uniform informal units (UuM3-UuM4) * Estimate internal volume (capacity) by referring to the number and type of uniform informal unit used (UuM3) | **7** |
| **Non-spatial measure**  **MAO-WM-01**  **MAE-NSM-01, MA1-NSM-01**  **MAE-NSM-02, MA1-NSM-02** | **Early Stage 1**  **Mass: Identify and compare mass using weight**   * Identify that objects can be heavy or light (UuM2) * Compare two masses directly by hefting (UuM3) * Predict which object would be heavier than, lighter than, or have about the same weight as another object and explain reasons for this prediction | **8** |
| **Non-spatial measure A (cont)** | **Stage 1**  **Mass: Investigate mass using an equal arm-balance**   * Place objects on either side of an equal-arm balance to obtain a level balance * Use an equal-arm balance to compare the masses of two objects and record, which is heavier or lighter (UuM2) * Predict the action of an equal-arm balance before placing objects in each pan * Compare and order the masses of two or more objects by hefting, and check using an equal-arm balance (UuM2) | **8** |
| **Data**  **MAO-WM-01**  **MAE-DATA-01, MA1-DATA-01**  **MA1-DATA-02**  **NOTE – there is only one data outcome for Early Stage 1.** | **Early Stage 1**  **Organise objects into simple data displays and interpret the displays**   * Group objects according to characteristics (IRD1) | **5** |
| **Data A (cont)** | **Stage 1**  **Represent data with objects and drawings and describe the displays**   * Use concrete materials or pictures of objects such as symbols to create data displays where one object or picture represents one data value (IRD2) * Describe information presented in one-to-one data displays (IRD2) | **3–5** |

## References

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Clements D H and Sarama J (2017/2019) [*Length Riddles [End to End Length Measurer]*](https://www.learningtrajectories.org/math-activities/length-riddles-end-to-end-length-measurer), Learning & Teaching with Learning Trajectories website, accessed 19 September 2022.

Sullivan P and Lilburn P (2004) *Open-Ended Maths Activities*, 2nd ed. Oxford University Press ANZ, Great Britain.

University of Cambridge (Faculty of Mathematics) (2022) [*Different Sizes*](https://nrich.maths.org/8117), NRICH website accessed 19 September 2022.

University of Cambridge (Faculty of Mathematics) (2022) [*NRICH*](https://nrich.maths.org/)[website]*,* accessed 19 September 2022.

University of Cambridge (Faculty of Mathematics) (2022) [*Making Longer, Making Shorter*](https://nrich.maths.org/5590), NRICH website accessed 19 September 2022.

University of Cambridge (Faculty of Mathematics) (2022) [*Two-digit Targets*](https://nrich.maths.org/6343), NRICH website accessed 19 September 2022.