numicon®

Online
Numicon 2 Sample

OXFORD
UNIVERSITY PRESS

numicon

Strand and Activity Group Number		Activity Group Title
Getting Started		Getting started with Number, Pattern and Calculating 2
Numbers and the Number System	1	Counting to 100 and beyond
Pattern and Algebra	1	Exploring different patterns
		NPC Milestone 1
Calculating	1	Adding and writing adding sentences
Calculating	2	Subtracting and writing subtracting sentences
Numbers and the Number System	2	2-digit numbers
		NPC Milestone 2
Calculating	3	Ordering adding and subtracting facts
Pattern and Algebra	2	Exploring the inverse relationship between adding and subtracting within 10
Numbers and the Number System	3	More 2-digit numbers
Numbers and the Number System	4	Comparing and ordering numbers to 100
[illegible]	3	Exploring equivalence – introducing empty box notation
		NPC Milestone 3
Measureme	1	Introducing centimetres
Calculating	4	Adding and subtracting whole tens
Geometry	1	Making and classifying polygons
Geometry	2	Identifying the faces, edges and vertices of solid 3D shapes
Calculating	5	Adding and subtracting 1 and 10
Geometry	3	Investigating symmetry
		GMS Milestone 1

Strand and Activity Group Number		Activity Group Title
Pattern and Algebra	4	Odd and even
Calculating	6	Partitioning into tens and units to answer adding and subtracting problems
Pattern and Algebra	5	Patterns and sequences of 2s, 3s, 5s and 10s
		NPC Milestone 4
Calculating	7	Adding and subtracting 1-digit numbers to and from 2-digit numbers
Measurement	2	Introducing the 20p,
Measurement	3	Introducing the £2 c
		GMS Milestone 2
Calculating	8	Introducing multiplying as repeated adding
Calculating	9	Learning times tables and about multiplying through arrays
Numbers and the Number System	5	Rounding
Calculating	10	Mental strategies for near doubles and adding and subtracting 9
		NPC Milestone 5
Calculating	11	Bridging through multiplies of 10
Geometry	4	Recognizing and naming prisms and cylinders
Calculating	12	Adding three or more 1-digit numbers
Calculating	13	Adding and subtracting 2-digit numbers to 100
Measurement	4	Introducing metres
		GMS Milestone 3
Calculating	14	Adding and subtracting to 20
		NPC Milestone 6
Calculating	15	Introducing dividing as 'How many … in … ?'
Pattern and Algebra	6	Logic
Calculating	16	Halves, quarters and thirds of wholes
Pattern and Algebra	7	Finding all possibilities
Numbers and the Number System	6	Introducing fractions as numbers
		NPC Milestone 7
Measurement	5	Introducing kilograms and grams
Measurement	6	Introducing litres and millilitres, and units of temperature
Measurement	7	Telling the time and adding and subtracting with units of time
Geometry	5	Investigating and describing rotation
		GMS Milestone 4

The money will be updated to $ and c in the NZ Version for 2025

Measurement 1: Introducing centimetres

Key mathematical ideas Length, Ordering, Standard units

Educational context

In this activity group, children begin to use centimetres, as initial 'standard' units of length, in a range of practical situations. The contexts are varied, but in each case the measurement task has a problem-solving purpose, whether showing how a caterpillar grows in a story, contributing to research into fish habitats or making hats.

Children begin by revisiting work from the *Geometry, Measurement and Statistics 1 Teaching Resource Handbook*, comparing and ordering lengths and using non-standard units. The importance of aligning to a common starting point is emphasized when children create a graph to show growth and compare pairs of lengths using <, > and = symbols.

Children are then introduced to centimetres, including the 'cm' abbreviation, and use the already familiar length of a 1-rod to begin estimating and making measurements in centimetres. Encourage them to recognize the usefulness of standard units for communicating – in Activity 3, for example, because they are making measurements in centimetres, they can be confident that the researcher they are sending their findings to will understand.

They are also introduced to centimetre rulers as measuring instruments. Children may take some time to appreciate the importance of 'starting from 0' when measuring with a ruler; allow for plenty of practice and discussion. Finally, children also address the problem of how to measure non-straight lengths, for example using ribbon or string.

Learning opportunities

- To compare two lengths using <, > and = symbols; and to compare and order more than two lengths.
- To understand how to use a ruler.
- To estimate lengths in centimetres.
- To construct a simple pictogram.
- To use a table to record data.

Key Mathematical Ideas provide a summary of the important concepts covered this week

Terms for children to use

length, width, height, depth, longer, longest, shorter, shortest, deeper, deepest, thicker, thickest, thickness, distance, dimension, compare, align, same, different, mark, label, straight, direct, indirect, graph, centimetre (cm), bar chart, block graph

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively.
- Align lengths to measure and compare them accurately.
- Check accuracy by e.g. repeating or comparing measurements.
- Construct a basic table and use it to read and record data independently.
- Measure a length using a ruler, and record the length accurately in centimetres.
- Can construct and interpret a pictogram using a many-to-one correspondence.

GMS Milestone 1

- Compare and order lengths using <, > and = symbols (GMS 2:1a)
- Measure straight and curved lengths to the nearest cm, choosing suitable equipment, e.g. ruler, tape measure, cm cubes (GMS 2:1b)
- Record measurement data in a simple table and pictogram or block graph (GMS 2:1c)

Learning Opportunities are linked with the Assessment opportunities, detailing the range of Focus Activities for this week

Explorer Progress Book 2, pp. 2–3 and 30

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 6: Caterpillar Lengths

After completing work on Activity 2, give children Explore More Copymaster 6: Caterpillar Lengths to take home.

Focus activities

1. Comparing increasing lengths
2. Ordering lengths
3. Introducing centimeters
4. Presenting data in a pictogram
5. Measuring non-straight lengths
6. Investigating centimetre rulers

Assessment is supported by Explorer Progress activities at the end of the week or later. These are recorded along with the Milestones to provide a record of learning that is stored in the assessment Tracker

1: Comparing increasing lengths

Quit activity

Intro | Links | 1 | 2 | 3 | 4 | 5 | 6 | 7 | +

Learning opportunities:

- See all learning opportunities

Terms for children to use:

length, width, height, depth, longer, longest, shorter, shortest, deeper, deepest, thicker, thickest, thickness, distance, dimension, compare, align, same, different, mark, label, straight, direct, indirect, graph, centimetre (cm), bar chart, block graph

Have ready:

- interlocking cubes, large sheet of paper with horizontal line marked on it
- Words and Symbols for Measuring (<, > and = signs cut from photocopy master 44)
- Day Labels (cut from photocopy master 10), squared paper, coloured pencils

1: Comparing increasing lengths

Quit activity

Intro | Links | 1 | 2 | 3 | 4 | 5 | 6 | 7 | +

Links:

Full activity group overview
Starter image
Whole-class practice and discussion
Photocopy masters
Implementation guide
IWB Software
MyMaths

Next steps:

Explorer Progress Book 2, pp. 2–3 and p. 30
Explore More Copymaster 6: Caterpillar Lengths
Numicon 2 Milestone Assessment cards (GMS 2:Ia to GMS 2:Ic)
Numicon 2 Milestone Tracking chart

Practice and discussion: Whole-class

- Discuss with children how and when the mathematics they have been learning could help them in solving problems.
- Give children a number of different lengths of card or ribbon and ask them to put them in order from shortest to longest.
- Give children examples of simple block graphs marked in 1 cm intervals, and ask them to read the height of the bars in centimetres.
- Ask children to measure objects in the classroom using 1-rods, and check that they are correct using a ruler.

Implementation Guide

Length and Ordering

Technically, when we measure 'length' we measure what would perhaps be better called 'linear extension', and confusingly for children, in everyday life linear extension gets called different things in different contexts.

Height, width, depth, length, and distance are all different ways of referring to the same quality of linear extension, and so children need to connect references to their 'height' and how 'tall' they are, with the 'depth' of a swimming pool, the 'width' of their bedroom, the 'length' of a football pitch, and with how 'far' it is to the shops, as all measures of 'the same thing'. Much discussion is needed around this great variety of language use, and also around the wide variety of instruments used to measure different 'lengths' and 'distances' in different contexts.

Gradually, children will learn that there is also an important distinction between 'distance' and 'displacement' when measuring 'how far' it is from A to B. 'Distance' is simply an amount (a magnitude, e.g. how far you actually have to travel), whereas 'displacement' is both a magnitude and a direction (called a vector generally, and a 'translation' in geometry). In everyday life we describe the displacement between two places as the linear distance between them 'as the crow flies'; we assume crows fly along the shortest (straight) path between two points, whereas, e.g. the distance from our home to school will be further than 'the crow flies' because we won't be able to travel in a straight line. Because displacement is a straight-line path, we are able to specify it as movement in a constant direction. This distinction is obviously crucial in answering, 'How far is it from A to B?'.

The standard SI unit of linear extension in all contexts is the metre (m). Length is measured with ratio scales (metric or imperial), since 'zero length' is an absolute. Consequently, ratios of lengths to each other make good sense, and are used frequently in both everyday life and in science.

Lengths are compared and ordered initially in order to recap the work of Geometry, Measurement and Statistics 1, and then centimetres are introduced in the context of growing animals, and metres in the context of heights. Rulers and metre sticks are introduced as standardized instruments. The varied vocabulary of linear extension is further developed by using terms such as 'width' and 'height' and so on.

Standard units

The key aspect of work on measurement at this stage is the introduction of standard units and their different notations. Within various contexts, children are introduced to metres (m) and centimetres (cm), kilograms (kg) and grams (g), litres (ℓ) and millilitres (ml).

Focus activities

1. Comparing increasing lengths
2. Ordering lengths
3. Introducing centimeters
4. Presenting data in a pictogram
5. Measuring non-straight lengths
6. Investigating centimetre rulers

Step 1

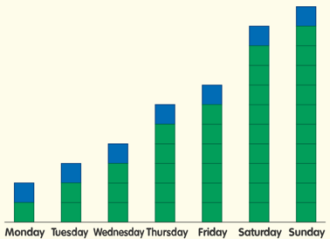
Set the scene: tell children a story about, e.g. a caterpillar growing longer, day by day. As you tell the story, make a model using interlocking cubes, starting with two cubes of different colours, one for the head and another for the body, and adding further 'body' cubes for each day.

Match the number of cubes grown to the number of items eaten, so that, e.g. the caterpillar grows by 1 cube for each leaf he eats through.

1: Comparing increasing lengths
Quit activity
Intro | Links | 1 | 2 | 3 | 4 | 5 | 6 | 7 | +

Step 2

Provide labels for the days in your story cut from Day Labels (photocopy master 10) and a sheet with a horizontal line to use as an axis. Explain that children are going to make a kind of picture – a graph – to show what happens in the story. Retell the story for children to make a model for each day, and place it with the correct label on the sheet, aligned to the axis, using a different colour block for the caterpillar's head (see image).



10 Day labels

Name ..... Date ...../...../.....

Monday	Monday	Monday	Monday
Tuesday	Tuesday	Tuesday	Tuesday
Wednesday	Wednesday	Wednesday	Wednesday
Thursday	Thursday	Thursday	Thursday
Friday	Friday	Friday	Friday
Saturday	Saturday	Saturday	Saturday
Sunday	Sunday	Sunday	Sunday

1: Comparing increasing lengths
Quit activity
Intro | Links | 1 | 2 | 3 | 4 | 5 | 6 | 7 | +

Step 3

Discuss with children what the graph shows.

Encourage them to describe for themselves how the caterpillar changes during the story. Listen for their use of language about size and length, e.g. 'tiny', 'longer', 'big'.

Next, ask questions for children to compare lengths on different days, e.g. 'Was the caterpillar on Tuesday longer or shorter than he was on Thursday?'

Encourage children to make their answers as precise as they can, asking e.g. 'How much longer/shorter?' Look and listen for children realizing they can answer in numbers of cubes.

1: Comparing increasing lengths
Quit activity
Intro | Links | 1 | 2 | 3 | 4 | 5 | 6 | 7 | +

Step 4

Place two 'caterpillar' models side by side and invite children to compare the length of the first with the length of the second.

Look and listen for children answering, e.g., 'It is two cubes longer.'

1: Comparing increasing lengths
Quit activity
Intro | Links | 1 | 2 | 3 | 4 | 5 | 6 | 7 | +

Step 5

Explain to children that we can use symbols to compare lengths. Show and read > as 'greater than', < as 'less than' and = as 'equal to'. Establish that, e.g., the > symbol goes between the two models from Step 4. Place a card showing the correct symbol cut from Words and Symbols for Measuring 2 (photocopy master 44) between the models and read the sentence created as, e.g., 'The length of 5 cubes is greater than the length of 3 cubes' (see image).

To help children choose the correct symbol, you could compare the > and < symbols to the open beak of a hungry bird, explaining that the bird will always choose to 'eat' the larger of the two caterpillars; the = symbol is a closed beak, showing that the bird is having trouble deciding which to eat.

Step 6

Swap the two models around and ask children to choose which symbol to place between them. Agree and place the < card. Look and listen for children reading the resulting sentence correctly.

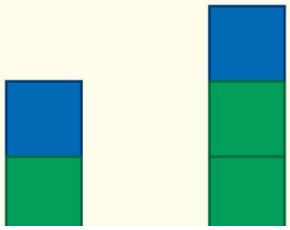
Repeat for two equal-length caterpillars, for children to choose the = symbol.

Step 7

Repeat Steps 4 and 5 for other pairs of caterpillars, including some which are the same length.

Once children are choosing the correct symbols and reading the resulting sentences confidently, position the next two models so that they are at different starting points (see image). You could present this as an error for children to correct, saying that the caterpillar on the right is one cube longer than the one on the left.

Agree that it is easier to compare the lengths, and see by exactly how many cubes one caterpillar is longer or shorter, if they are at the same starting point.



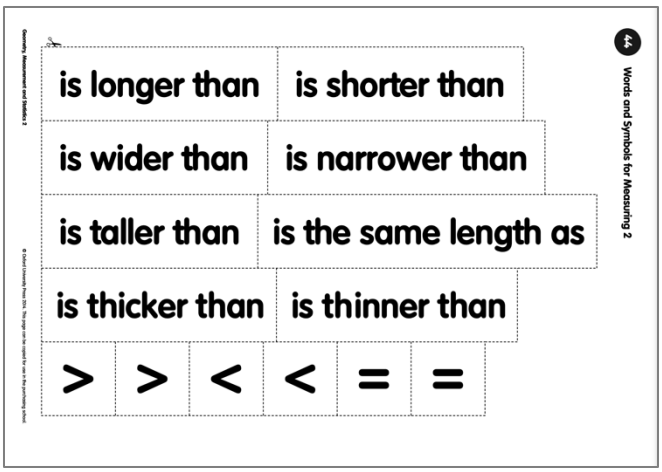
Paired or individual work

Have ready: interlocking cubes, Words and Symbols for Measuring 2 (cut from photocopy master 44), squared paper, coloured pencils

Provide a set of models of caterpillars (using the interlocking cubes) for children to arrange into pairs and place a <, > or = symbol between, as appropriate.

Encourage them to use the word cards to arrange and say a 'sentence' for each pair, e.g. 'The 4-cube caterpillar is shorter than the 7-cube caterpillar.'

Extend the practice by asking children to record their caterpillars and symbols on squared paper and write down their sentences.

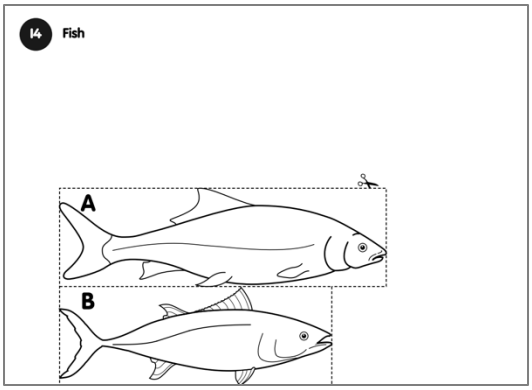


Step 1

Give children copies of fish A and B (cut from photocopy master 14). Set the scene: explain that a scientist wants to find out which of two lakes makes a better home for fish. However, she is based some distance away and can't visit often (adjust the story to suit, e.g. she might be carrying out another part of the research in a remote area).

You are interested in the work and have been helping her, keeping in touch by phone.

A few months ago you released some newly hatched fish into both lakes, and now you have gone back to catch some of them to see how they have changed. Fish A comes from lake A, and fish B from lake B.



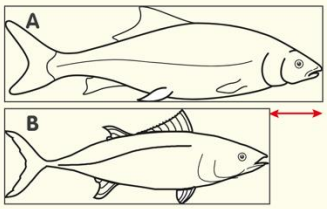
Step 2

Ask children which lake they think may make a better home for fish, and why. Look and listen for children choosing lake A because the fish from there is bigger, or longer.

Ask children how they can use their fish to show this.

Look and listen for children aligning their fish to the same starting point and keeping them parallel, and for those who describe and can point out the difference in length (see image).

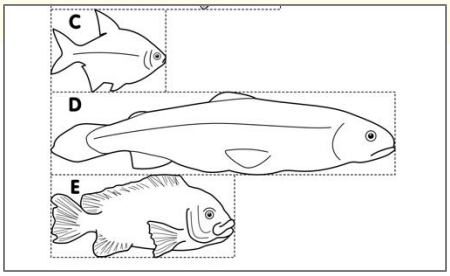
Invite children to suggest possible reasons why a fish might grow bigger in one lake. Discuss their ideas.



Step 3

Give children copies of fish C–E (cut from photocopy master 14). Set the scene again: explain that the scientist asked you to repeat the experiment in three more local lakes. Agree that children now have fish from five different lakes.

Ask children to use their fish to show how the lakes compare as homes for fish. Allow time for discussion, and prompt children, as needed, to arrange their fish in order of length, e.g. smallest to largest, aligned to the same starting point.

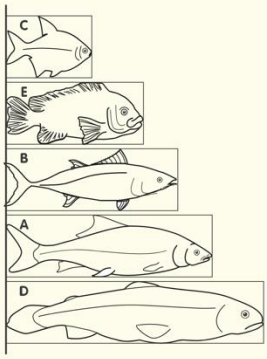


Step 4

Once children have arranged their fish in order, ask questions such as 'Which fish is the shortest?', 'Which has grown the most?' Invite children to make comparisons between the lengths.

Look and listen for children suggesting that, e.g., fish B is about twice as long as C, and fish D is about twice as long as E.

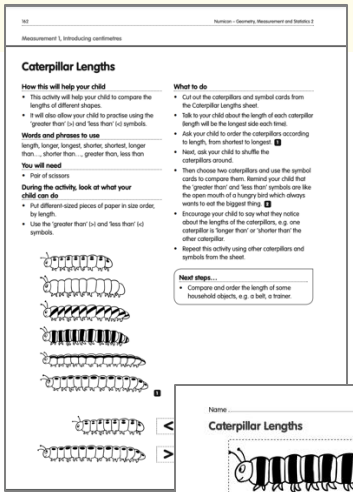
Encourage them to record their findings by sticking the fish down in order, using the same baseline to make a chart (see image).



Step 5

Talk with children about how you should report their findings back to the scientist. Agree that the lakes can be listed in the order C, E, B, A, D, with D being the best and C the poorest. Ensure children's work is kept for use in Activity 3.

After completing work on this activity, give children the opportunity to take home and complete Explore More Copymaster 6: Caterpillar Lengths. This will help children practise using the 'greater than' (>) and 'less than' (<) symbols.



Measurement 1, Introducing centimetres

Caterpillar Lengths

How this will help your child
- This activity will help your child to compare the lengths of different shapes.
- It will also allow your child to practise using the 'greater than' (>) and 'less than' (<) symbols.

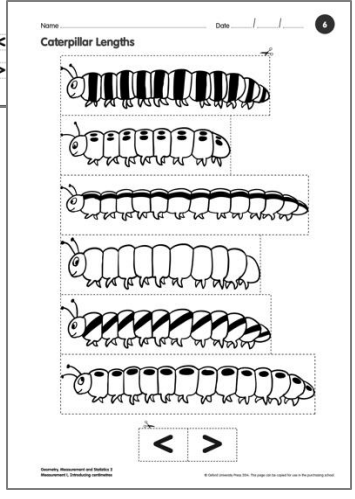
Words and phrases to use
length, longer, longest, shorter, shortest, longer than ..., shorter than ..., greater than, less than

You will need
- Pair of scissors

During the activity, look at what your child can do
- Put different-sized pieces of paper in size order, by length.
- Use the 'greater than' (>) and 'less than' (<) symbols.

What to do
- Cut out the caterpillars and symbol cards from the Caterpillar Lengths sheet.
- Talk to your child about the length of each caterpillar (length will be the longest side each time).
- Ask your child to order the caterpillars according to length, from shortest to longest.
- Next, ask your child to shuffle the caterpillars around.
- Then choose two caterpillars and use the symbol cards to compare them. Remind your child that the 'greater than' and 'less than' symbols are like the open mouth of a hungry bird which always wants to eat the biggest thing.
- Encourage your child to say what they notice about the lengths of the caterpillars, e.g. one caterpillar is 'longer than' or 'shorter than' the other caterpillar.
- Repeat this activity using other caterpillars and symbols from the sheet.

Next steps ...
- Compare and order the length of some household objects, e.g. a belt, a trainer.



Name ..... Date ..... / ..... / .....

6

Caterpillar Lengths

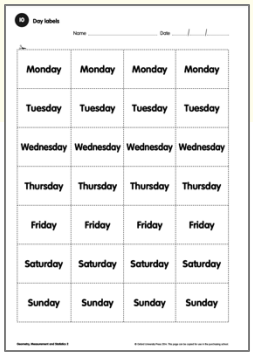
Small group or paired work

Have ready: interlocking cubes, large sheet of paper with horizontal line marked on it, labels cut from Day Labels (photocopy master 10), squared paper, coloured pencils, audio or video recording or podcasting equipment (optional)

Provide a set of models of another caterpillar (use different colours from those used for the caterpillar in Activity 2, if possible), along with a block graph axis and day labels, for children to arrange in order and make up their own 'growing' story.

You could challenge some children by including two caterpillars of the same length (to be used to represent a day on which the caterpillar did not eat).

Extend the practice by asking children to record their block graph on squared paper, and to write down or record their story. You could display or record children's stories.



10 Day labels

Name ..... Date ..... / ..... / .....

Monday	Monday	Monday	Monday
Tuesday	Tuesday	Tuesday	Tuesday
Wednesday	Wednesday	Wednesday	Wednesday
Thursday	Thursday	Thursday	Thursday
Friday	Friday	Friday	Friday
Saturday	Saturday	Saturday	Saturday
Sunday	Sunday	Sunday	Sunday

Caterpillar Lengths

How this will help your child

- This activity will help your child to compare the lengths of different shapes.
- It will also allow your child to practise using the 'greater than' (>) and 'less than' (<) symbols.

Words and phrases to use

length, longer, longest, shorter, shortest, longer than…, shorter than…, greater than, less than

You will need

- Pair of scissors

During the activity, look at what your child can do

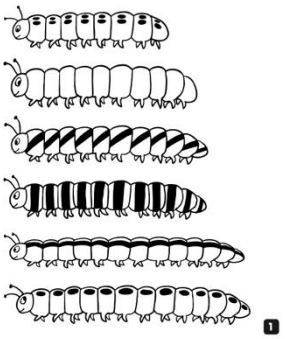
- Put different-sized pieces of paper in size order, by length.
- Use the 'greater than' (>) and 'less than' (<) symbols.

What to do

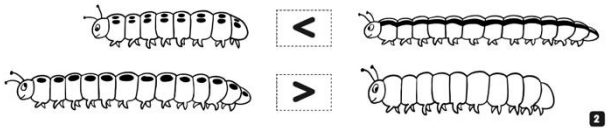
- Cut out the caterpillars and symbol cards from the Caterpillar Lengths sheet.
- Talk to your child about the length of each caterpillar (length will be the longest side each time).
- Ask your child to order the caterpillars according to length, from shortest to longest. 1
- Next, ask your child to shuffle the caterpillars around.
- Then choose two caterpillars and use the symbol cards to compare them. Remind your child that the 'greater than' and 'less than' symbols are like the open mouth of a hungry bird which always wants to eat the biggest thing. 2
- Encourage your child to say what they notice about the lengths of the caterpillars, e.g. one caterpillar is 'longer than' or 'shorter than' the other caterpillar.
- Repeat this activity using other caterpillars and symbols from the sheet.

Next steps…

- Compare and order the length of some household objects, e.g. a belt, a trainer.



1



2

Explore More
– for class and home

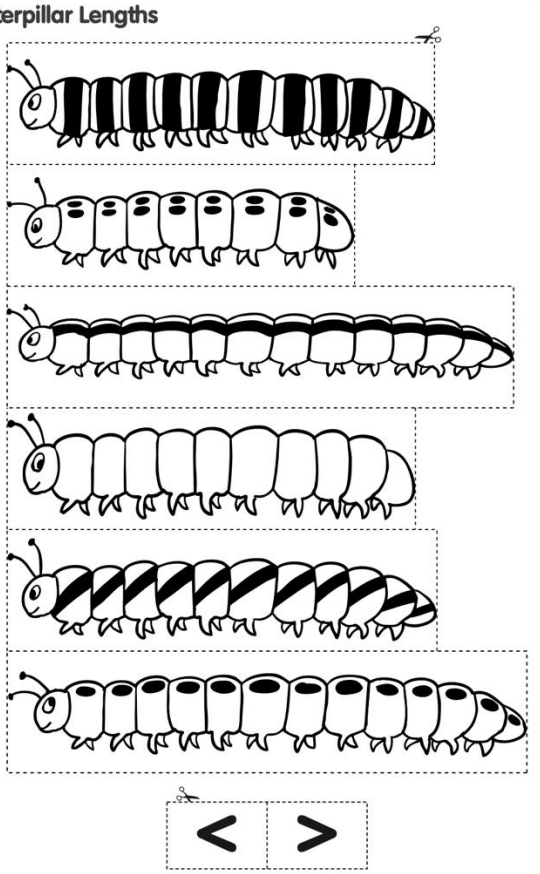
Activities for class and home offer further opportunities for children to explore maths in an engaging way.

A clear guide and suggestions on how to extend the activity

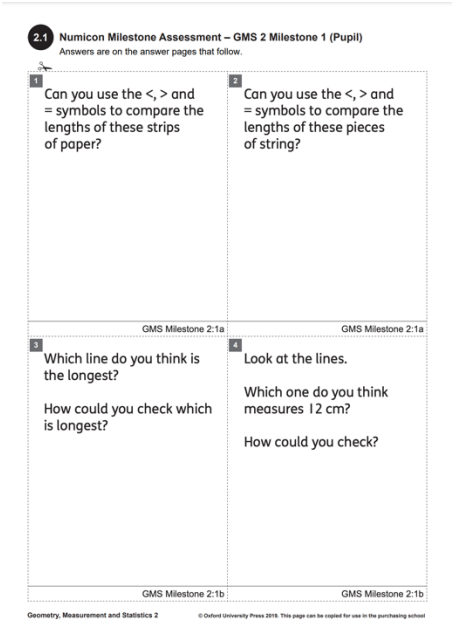
Practical real-life contexts help children think about how maths can be used and applied

Name ..... Date ...../...../..... 6

Caterpillar Lengths



Milestone
ASSESSMENT CARDS



2.1 **Numicon Milestone Assessment – GMS 2 Milestone 1 (Pupil)**
Answers are on the answer pages that follow.

1 Can you use the <, > and = symbols to compare the lengths of these strips of paper?

GMS Milestone 2:1a

2 Can you use the <, > and = symbols to compare the lengths of these pieces of string?

GMS Milestone 2:1a

3 Which line do you think is the longest?

How could you check which is longest?

GMS Milestone 2:1b

4 Look at the lines.

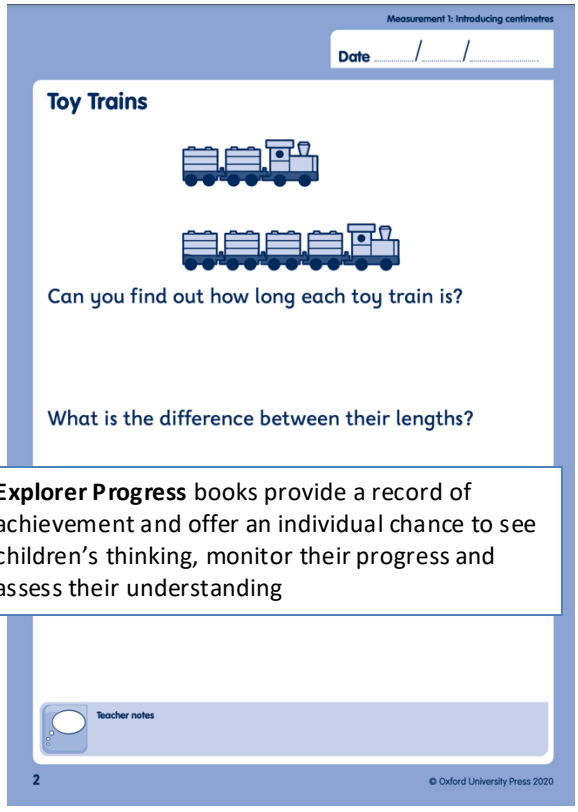
Which one do you think measures 12 cm?

How could you check?

GMS Milestone 2:1b

Geometry, Measurement and Statistics 2 © Oxford University Press 2019. This page can be copied for use in the purchasing school

Explorer Progress
– weekly assessment tool



Measurement 1: Introducing centimetres

Date ____/____/____

Toy Trains

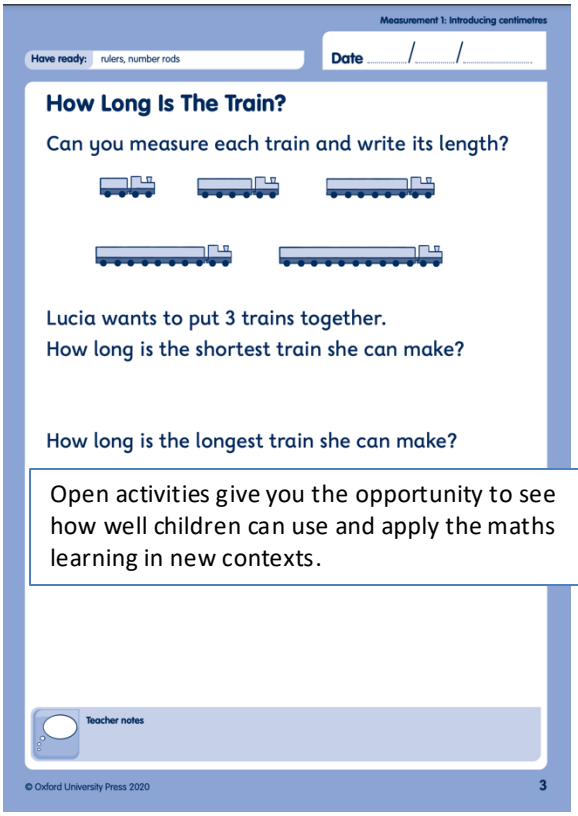
Can you find out how long each toy train is?

What is the difference between their lengths?

Teacher notes

2 © Oxford University Press 2020

Explorer Progress books provide a record of achievement and offer an individual chance to see children's thinking, monitor their progress and assess their understanding



Measurement 1: Introducing centimetres

Have ready: rulers, number rods

Date ____/____/____

How Long Is The Train?

Can you measure each train and write its length?

Lucia wants to put 3 trains together.
How long is the shortest train she can make?

How long is the longest train she can make?

Teacher notes

© Oxford University Press 2020 3

Open activities give you the opportunity to see how well children can use and apply the maths learning in new contexts.

Assessment Tracker
– weekly assessment tool

Geometry, Measurement & Statistics 2 Milestone 1						Started	Not start
By this point, children should be able to:						2 out of 10	0 out of
• Compare and order lengths using <, > and = symbols	GMS 2:1a	GMS	M	M1	Measurement		
• Measure straight and curved lengths to the nearest cm, choosing suitable equipment, e.g. ruler, tape measure, cm cubes	GMS 2:1b	GMS	M	M1	Measurement		
• Record measurement data in a simple table and pictogram or block graph	GMS 2:1c	GMS	M	G2	Statistics		
• Make, draw and name different polygons, showing straight sides and lines joined at corners, e.g. pentagon, octagon	GMS 2:1d	GMS	G	G1	Geometry - properties of shape		
• Identify 2D shapes that are not polygons e.g. semi-circle, oval	GMS 2:1e	GMS	G	G1	Geometry - properties of shape		
• Sort collections of polygons into 'congruent' and 'similar' groups	GMS 2:1f	GMS	G	G1	Geometry - properties of shape		
• Describe 3D shapes in terms of curved faces or the 2D shape of flat faces	GMS 2:1g	GMS	G	G2	Geometry - properties of shape		
• Investigate systematically the number of faces, edges or vertices of 3D shapes	GMS 2:1h	GMS	G	G2	Geometry - properties of shape		
• Make or complete symmetrical patterns and pictures	GMS 2:1i	GMS	G	G3	Geometry - properties of shape		
• Visualize or test which 2D shapes are symmetrical and show the position of at least one line of symmetry	GMS 2:1j	GMS	G	G3	Geometry - properties of shape		

GREEN – Achieved
ORANGE – on the way
RED – to target
WHITE – not started

Your next steps…

Find out how Numicon can make a difference in your school and discover Numicon's potential, **arrange an appointment, or Professional Development with us:**

Web: www.numicon.co.nz and www.edushop.nz

Email: info@numicon.co.nz

Phone: 0800 678 581