



LESSON LEARNED

Focus: Linear Measurement

Nova Scotia Assessment: Mathematics Grade 3

“For learners to succeed, teachers must assess students’ individual abilities and characteristics and choose appropriate and effective instructional strategies accordingly.”

– Helene J. Sherman



Purpose of this Document

This Lessons Learned document was developed based on an analysis of the Item Description Reports for the Nova Scotia Assessment: Mathematics in Grade 3 (NSA-M3). This document is intended to support all classroom teachers at grades Primary – 3, and administrators at the school, region, and provincial levels. The focus of the document is to help educators work through the process of taking in the information provided by the data analysis and see how it can inform lesson design and assessment in the classroom.

It is suggested that school teams make use of this resource in concert with their school's Item Description Report provided by the Department of Education and Early Childhood Development to all regional centres for education. These reports include student achievement data at the school, regional centre, and provincial level for all questions appearing on the Mathematics in Grade 3 Assessment. By analyzing their own performance on groupings of questions dealing with similar outcomes, schools can identify areas of strength and areas where changes in instruction and/or assessment might be made. This process is designed to foster continued discussions, explorations, and support for mathematics focus at the classroom, school, regional centre, and provincial levels that are all based on valid and reliable data.

This document specifically addresses some of the areas that students across the province found challenging based on provincial assessment data. It is essential that teachers consider assessment evidence from a variety of sources to inform the next steps most appropriate for their students. Effective classroom instruction and assessment strategies are responsive to the individual learners within a classroom.

This document highlights those outcomes where students seem to require additional support. It provides some information about student performance on the assessment in addition to suggested classroom instruction strategies. Sample assessment items are included for each topic explored.

Overview of the Nova Scotia Assessment: Mathematics in Grade 3

Nova Scotia Assessments are large-scale assessments that provide reliable data about how well all students in the province are learning the mathematics curricula. It is different from many standardized tests in that all questions are written by Nova Scotia teachers to align with curriculum outcomes, and the results reflect a snapshot of how well students are learning these outcomes. These results can be counted on to provide a good picture of how well students are learning curriculum outcomes within schools, regions and in the province. Since the assessments are based on the Nova Scotia curriculum, and are developed by Nova Scotia teachers, results can be used to determine whether the curriculum, approaches to teaching and allocation of resources are effective. Furthermore, because individual student results are available, these, in conjunction with other classroom assessment evidence, help classroom teachers understand what each student has under control and identify next steps to inform instruction.

The assessment provides information about mathematics for each student and complements assessment data collected in the classroom. This assessment is administered at the end of Grade 3. It is designed to provide detailed information for every student in the province regarding their progress in achieving a selection of mathematics curriculum outcomes at the end of Grade 3. Information from this assessment can be used by teachers to inform their instruction and next steps in providing support and intervention for their students.

Lessons Learned Overview

Provincial assessments and examinations generate information that teachers can use to help inform classroom instruction and assessment. Following the analysis of each assessment or examination, patterns and trends are identified. These include areas of strength and areas for growth. The Lessons Learned documents specifically highlight concepts where growth is still needed.

There are four areas that have been identified as the areas of focus for this Lessons Learned document. They are:

- Solving whole number addition and subtraction questions in context.
- Linear measurement.
- Identifying and sorting irregular polygons.
- Interpreting data represented in tables and graphs.

This section specifically addresses linear measurement in the context of estimating and measuring length and determining perimeter. It begins with an overview of the student errors and misconceptions identified through the provincial assessment. These include:

- Using a ruler
- Using personal referents
- Reading and interpreting information from a diagram
- Determining dimensions from perimeter

Strategies are then outlined that are designed to enhance student comprehension, drawing from researched best practices. The strategies emphasize the integration of essential models, tools, and interconnections to facilitate the transition between concrete, pictorial, and abstract representations of concepts, highlighted by the importance of deliberate planning and purposeful questioning. To support both assessment and instruction, sample lesson activities are presented alongside a series of cognitive-level questions, providing educators with ideas for addressing knowledge gaps and fostering strategic reasoning and problem-solving skills. Each section culminates with a selection of print and online resources, as well as recommended manipulatives to support professional learning and student understanding of that topic.

Estimating and Measuring Length

Alignment to previous Outcomes		Related Outcome	
PM01: Students will be expected to use direct comparison to compare two objects based on a single attribute, such as length, mass, volume, and capacity	1M01: Students will be expected to demonstrate an understanding of measurement as a process of comparing by <ul style="list-style-type: none"> ▪ identifying attributes that can be compared ▪ ordering objects ▪ making statements of comparison ▪ filling, covering, or matching 	2M04: Students will be expected to measure length to the nearest nonstandard unit by using multiple copies of a unit and using a single copy of a unit (iteration process).	3M03: Students will be expected to demonstrate an understanding of measuring length (cm, m).

What conclusions can be drawn from the NSA: Mathematics in Grade 3?

Students continue to have difficulty accurately reading and interpreting measurements on a ruler. More than half of students rely on the number aligned with the end of the object rather than counting the intervals between the starting and ending points, which is essential for determining length. In addition, many students still struggle to use personal referents to visualize standard units such as centimetres and metres. This indicates that students need additional opportunities to develop reliable mental benchmarks. Ongoing, hands-on experiences with measurement tools, both standard and non-standard, remain important to help students build a stronger conceptual understanding of length.

Why is this an area of need and how can we support students?

Using a Ruler

Misconceptions/Errors in Student Work

When using rulers, students tend to only look at the number on the ruler that is aligned with the end of the object.



For example, students read the line as being 12 cm instead of 11 cm. Looking at the end tick mark and not the distance between the start and end points.

Some students also count the numbers or tick marks along the length of an object, rather than the intervals between the numbers.



For example, students read the line above as being 12 cm instead of 11 cm. They use the count of 12 tick marks beginning at 1 cm and using the distance between the start and end points or the jumps from 1 to 12.

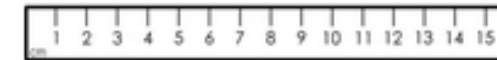
Possible Next Steps in the Classroom

Measuring with a Ruler

The skill of learning how to use a ruler is introduced for the first time in grade 3. Emphasis should be on counting the intervals between the numbers, rather than looking at the number on the ruler that is aligned with the end of the object. In younger grades this can be modelled using a number line by highlighting jumps forwards and backwards between the numbers rather than just counting the tick marks. In addition, using a number path helps to highlight the space between the tick marks and when using the same jumping motions instead of just counting the number of units (squares, cubes) supports the transition to reading values on rulers.

Have students use simple rulers that are created by students initially. Move onto tools that are easy for students to read.

Students should use rulers (or the side of the ruler) that show only numbered centimetres and not millimetres.




Show students how to measure something that is longer than a ruler by marking, recording, and starting again. When using nonstandard units, help students to make sure there are no spaces between the units being used.

When transitioning from nonstandard to standard units, demonstrate that the numbers on the ruler correspond to the number of small cubes by starting at 0 and lining up small cubes from base-ten materials along the ruler. Cuisenaire rods and base-ten blocks are a nice tool to show units of 1 cm and 1 dm or their relation to 1 m.

To further support understanding of length, students should identify objects from around the classroom that would be an appropriate referent for a centimetre or a metre; for example, the width of a pencil (cm), the distance from the bottom of a door to the doorknob (1m). Practice with referents will support reasoning skills when working with larger and smaller scales of measurement.

Activities to Support Lesson Planning

Grade P	Grade 1	Grade 2	Grade 3
<p>In the classroom or outside on the playground, have students compare the length, width, or height of given objects. Use direct and indirect comparison.</p> <p>Question prompts: Knowledge: Which object is longer? Shorter? How do you know?</p> <p>Application: Find two object that have the same or similar length, width, or height. Compare your objects with another person’s object. Which is shorter? Longer?</p> <p>Analysis: Sort all the collected objects from shortest to longest. How do you know you are correct? If I was to add one more object, where would you place the object in comparison to the others already lined up?</p>	<p>In the classroom or outside on the playground, have students compare the length, width, or height of given objects. Use direct and indirect comparison.</p> <p>Question prompts: Knowledge: Which object is longer? Shorter? How do you know?</p> <p>Application: Find two object that have the same or similar length, width, or height. Compare your objects with another person’s object. Which is shorter? Longer? How do you know? What attributes are you using?</p> <p>Analysis: Sort all the collected objects from shortest to longest. How do you know you are correct? If I was to add one more object, where would you place the object in comparison to the others already lined up? What attributes are you using to make that decision?</p>	<p>In the classroom or outside on the playground, have students measure the length, width, or height of given objects using two different units (e.g., snap cubes, base-ten rods, short and long paperclips, string).</p> <p>Question Prompts: Knowledge: How long is each of your objects?</p> <p>Application: How does the length of the object compare to others you measured (shorter, longer)? By how much?</p> <p>Analysis: What happens when you don’t use the same units to measure the object? Does it increase in size? Does it become shorter or longer? How does it compare to other objects measured? Explain what happens when you use different units?</p>	<p>In the classroom or outside on the playground, have students measure the length, width, or height of given objects. They can use a standard ruler or tape measure.</p> <p>Have students complete the activity again using a ripped tape measure and ask them to measure items in the classroom. Observe how they attempt to measure items.</p>  <p>Question Prompts: Knowledge: How long are each of your objects? Did you get the same lengths as your partner or another group?</p> <p>Application: How do you use the ruler to make sure you get the same length as your partner?</p> <p>Analysis: If you are going to measure the length of the bookshelf, what strategy would you use if your ruler isn’t long enough? How do you know your strategy is going to work?</p>

Using Personal Referents

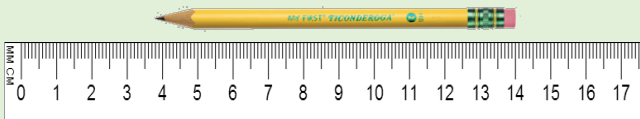
Misconceptions/Errors in Student Work	Possible Next Steps in the Classroom
<p>When students do not understand the size of a standard unit, using personal referents becomes harder to do. For example, students may overestimate and underestimate length.</p> <p>Students may have yet to develop familiar benchmarks they can apply everyday to estimate length. This leads to the lack of mental internalization of their personal referents so they cannot call upon these visual images when estimating.</p> <p>Errors when estimating or comparing length become difficult. For examples:</p> <p><i>Which object is the best referent for 1 metre?</i></p> <ul style="list-style-type: none"> • <i>the length of a hallway (students understand that a hallway is longer than then them and a metre is long, but have limited relation between them – assume they are the same)</i> • <i>the width of a finger (students may have a lot of experience with this referent, but may confuse the lengths of a centimetre and a metre)</i> • <i>the height of a building (students understand that a building is taller than them and a metre is long, but have limited relation between them – assume they are the same)</i> • <i>the width of a door (correct answer)</i> 	<p>Establishing Referents and Practicing Estimation</p> <p>The best approach to improving estimation skills is to have students do a lot of estimating. Referents for useful measures can be developed and recorded on a class chart.</p> <p>Help students to develop strategies that enable them to use their referent lengths. For example, the height of the doorknob or bookshelf or the length of a book or pencil. Hand and finger widths are also helpful estimation tools. Verify with rulers of different lengths.</p> <p>Use chunking when appropriate. In other words, use smaller referents/lengths to help estimate longer ones. Help students to iterate mentally or physically.</p> <p>Be precise with your language, and do not use the word “measure” interchangeably with the word “estimate”.</p>

Activities to Support Lesson Planning

Estimation activities do not have to be elaborate. Any measurement activity can have an “estimate first” component. For more emphasis on the process of estimation itself, simply think of measures that can be estimated, and have students estimate. Below are a few suggestions.

Grade P			Grade 1			Grade 2			Grade 3		
<p>Ask students to find something that is the same size, shorter or longer than a given object. Have them the object or a picture of the object to select something in the classroom.</p>	OR	<p>Conduct estimation scavenger hunts. Give teams a list of visual images of objects of different lengths and have students find items in the classroom that are close to having those lengths. Have students order the objects by length. Do not use measuring instruments.</p>	<p>Ask students to find something that is the same size, shorter or longer than a given object. Have them use a mental picture of an object known to them to select something in the classroom.</p>	OR	<p>Conduct estimation scavenger hunts. Give teams a list of visual images of objects of different lengths and have students find items in the classroom that are close to having those lengths. Have students order the objects by length. Do not use measuring instruments.</p>	<p>Ask students to find something that is about the length of a paperclip, 10 snap cubes, or other non-standard unit items students are used to using. Have them use a mental picture of an object known to them to select something in the classroom of the same length.</p>	OR	<p>Conduct estimation scavenger hunts. Give teams a list of nonstandard measurements and have them find things that are close to having those measurements. Do not use measuring instruments.</p>	<p>Ask students to find something that is about 1 cm, 10 cm, or 1 m long. Have them use a mental picture of an object known to them to select something in the classroom of the same length.</p>	OR	<p>Conduct estimation scavenger hunts. Give teams a list of standard measurements and have them find things that are close to having those measurements. Do not use measuring instruments.</p>
<p>Knowledge: Which object is longer? Shorter? How do you know?</p> <p>Application: Find two object that have the same or similar length, width, or height. Compare your objects with another person’s object. Which is shorter? Longer? How do you know? What attributes are you using?</p> <p>Analysis: Sort all the collected objects from shortest to longest. How do you know you are correct? If I was to add one more object, where would you place the object in comparison to the others already lined up? What attributes are you using to make that decision?</p>			<p>Knowledge: Which object is longer? Shorter? How do you know?</p> <p>Application: Find two object that have the same or similar length, width, or height. Compare your objects with another person’s object. Which is shorter? Longer? How do you know? What attributes are you using?</p> <p>Analysis: Sort all the collected objects from shortest to longest. How do you know you are correct? If I was to add one more object, where would you place the object in comparison to the others already lined up? What attributes are you using to make that decision?</p>			<p>Knowledge: What did you do to help you estimate the length?</p> <p>Application: How does your estimate compare to the nonstandard measurement given? How does your estimate compare to your partner’s estimate?</p> <p>Analysis: Did you use the same referent? Does it matter if your referents are different?</p>			<p>Knowledge: What referent did you use to help you estimate the length?</p> <p>Application: How does your estimate compare to the actual measurement? How does your estimate compare to your partner’s estimate?</p> <p>Analysis: Did you use the same referent? Does it matter if your referents are different?</p>		

What are some sample questions to help support assessment?

Cognitive Level	Grade P	Grade 1	Grade 2	Grade 3
Knowledge	<p>Have a few objects available and a piece of string. Which is shorter than this piece of string? Which is longer than this piece of string? Have students explain their thinking.</p> <p>Give students two objects (e.g., crayon, pencil, paper clip) and ask to predict which item is longer or shorter. Have them explain their thinking.</p>	<p>Can you tell me which of these two objects is longer? Shorter? How do you know?</p> <p>Show students five different objects one at a time. For each object, ask students if the length of the object is less than, greater than, or about the same as the length of a sheet of paper. After students record the estimation for each object, do a direct comparison of that object to a piece of paper. After students have estimated and compared the length of each object, ask them to place the objects in order from shortest to longest.</p>	<p>What are some things that are easy to measure? Hard to measure? Why?</p> <p>What are some tools we can use to measure the length of an object?</p>	<p>What could you use to measure if you don't have a ruler?</p> <p>What object could you use as a referent for 1 m?</p> <p>The width of your thumb is about what unit of measure?</p>
Application	<p>Give students a piece of string and ask them to find two objects that are the same length, two that are shorter and two that are longer. Sort them into "shorter", "same", and "longer" groups.</p> <p>Show students a length of string. Ask them if they think they are taller than the string without allowing them to stand beside it. After making a prediction, students should measure themselves against the string.</p>	<p>Give each student a true and a false card. Make comparative statements and ask students to hold up either the true or false card in response. For example, "My desk is longer than the white board." "The white board eraser is shorter than this paper clip." Have students explain their thinking.</p> <p>How can you compare these objects? (e.g. pencil and book; block and a counter; bookshelf and chair)</p> <p>Ask students to order objects from shortest to longest, shortest to tallest. Include situations in which students are dealing with an independent variable, such as objects that are not straight and objects that are also wide or thick.</p>	<p>Show students measurements with non-standard units, some of which are correct and others of which have obvious gaps and overlapping and ask them to explain which measurements are accurate and which are not. Students should fix the incorrect measurements.</p> <p>Before students make any measurement of length, have them examine the object that they are going to measure and the non-standard unit they will use, and get them to commit in writing their estimates of the number of units they will use. After they measure the length, get them to compare it to their estimates, and have them discuss strategies that could be used to get closer estimates.</p>	<p>Estimate the height of a doorknob from the floor.</p> <p>Is this pencil 14 cm long? Explain your thinking.</p>  <p>Using a broken tape measure, measure length of your desk. Have a partner measure the same length. Are the results the same? Verify with another group.</p>

Analysis	<p>Ask students if it is possible or impossible for some of the following: my arm is longer than my foot, my hand is longer than this crayon, or my finger is longer pencil.</p> <p>Am I taller when I stand up compared to when I lie down?</p> <p>Ask students to describe the steps, in order, that one would take to decide which of two objects is longer.</p>	<p>Have students participate in “dramas” in which someone measures incorrectly, and the other students figure out what is wrong. For example, one student could line up pencils of different lengths to measure an item, or could use uniform units, but counts, “1, 2, 4, 5, ...</p> <p>Ask two students to perform standing long jumps. Encourage them to find a way to determine who jumped farther. Emphasize afterwards, with the students, the importance of a common starting point.</p>	<p>Give students common objects found in the classroom that can be easily bent into curvy lines, such as pipe cleaners and wool/string. Have students first estimate and measure the objects straight and then curvy. They could also measure all around an object, such as their desk or a picture frame.</p> <p>Explain your strategies when measuring. What do you do when the objects do not have straight lines to measure? How did you determine your lengths?</p>	<p>How can you use a piece of string to identify objects that are about half a metre in length?</p> <p>Explain the relationship between 1 mm, 1 cm and 1 m. When would you use each of these units to measure?</p>
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Determining Perimeter

Alignment to previous Outcomes		Related Outcome	
<p>PM01: Students will be expected to use direct comparison to compare two objects based on a single attribute, such as length, mass, volume, and capacity</p>	<p>1M01: Students will be expected to demonstrate an understanding of measurement as a process of comparing by</p> <ul style="list-style-type: none"> ▪ identifying attributes that can be compared ▪ ordering objects ▪ making statements of comparison ▪ filling, covering, or matching 	<p>2M02: Students will be expected to relate the size of a unit of measure to the number of units (limited to non-standard units) used to measure length and mass.</p> <p>2M03: Students will be expected to compare and order objects by length, height, distance around, and mass using non-standard units and make statements of comparison.</p>	<p>3M05: Students will be expected to demonstrate an understanding of perimeter of regular, irregular, and composite shapes by</p> <ul style="list-style-type: none"> ▪ estimating perimeter using referents for centimetre or metre (cm, m) ▪ measuring and recording perimeter (cm, m) ▪ create different shapes for a given perimeter (cm, m) to demonstrate that many shapes are possible for a perimeter

What conclusions can be drawn from the NSA: Mathematics in Grade 3?

When analyzing assessment results, it is important to recognize that while linear measurement has been explored in various ways since Grade Primary, perimeter is formally introduced in Grade 3. This context helps explain several findings. When students are given shapes with all sides labeled, they typically succeed in calculating the perimeter. However, when shown a rectangle with only one length and one width labelled, some students overlook the unlabeled sides and calculate only half of the actual perimeter. Similarly, when working with composite shapes on a grid, some students count the number of sides rather than using the grid to determine side lengths. More complex tasks that require solving for missing dimensions often reveal deeper gaps in understanding the relationship between dimensions and perimeter. To strengthen this understanding, students need continued practice; not only in measuring side lengths, but also in connecting dimensions to the concept of perimeter.

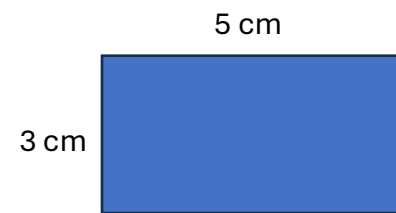
Why is this an area of need and how can we support students?

Using a Ruler

Misconceptions/Errors in Student Work

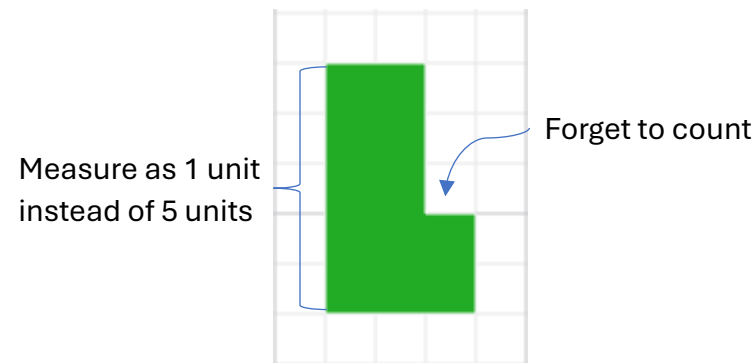
Reading and interpreting information from a diagram

When some of the measurements in a diagram are labelled and others are not, students sometimes forget to include the measures of the unlabelled sides in calculating the perimeter. In the example, the student has only added one of the lengths and one of the widths when determining the perimeter of the object.



$$P = 3 \text{ cm} + 5 \text{ cm} \\ = 8 \text{ cm}$$

When presented with an irregular shape, some students will count the number of sides rather than the unit length of each of the squares in the grid. Others will forget to count all the sides, like in the example below of the L-shape.

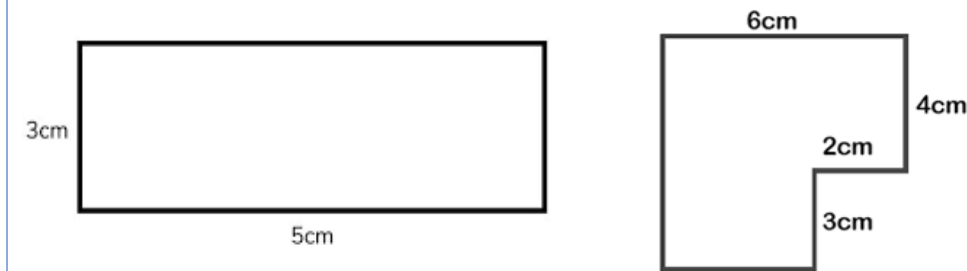


Possible Next Steps in the Classroom

Labelling

Provide opportunities for students to practice their understanding of perimeter by giving them examples with unlabeled side lengths. This will also support problem solving with composite shapes. Before students begin to calculate the perimeter, encourage them to label any side lengths that do not already have labels. Discuss why these labels were not originally provided on the diagram. Emphasize that the perimeter is the entire distance around the shape.

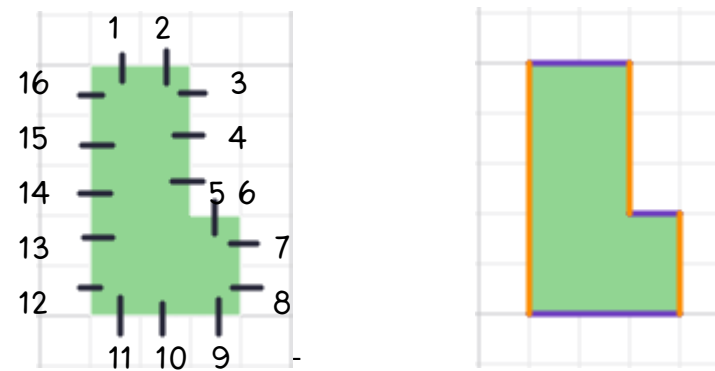
Examples of possible rectangles and composite shapes include the following:



Tracing and Using Appropriate Units

Activities that include physically measuring composite shapes/objects, like an L and drawing them on graph paper should help students to understand how physical measurements relate to a grid. Counting each length of a grid square and relating it to units will help to reinforce the length around an object rather than counting the number of sides. Always have students write units when working with any type of measurement – standard or non-standard.

Students can also trace the outline of a shape with their finger or use their pencil on the diagram to track the side lengths as they move around it. They could also use two different colours of markers to trace the horizontal lengths and the vertical lengths they add together. Using different colours to organize their work may support any spatial reasoning difficulties student have when working with diagrams. Overall, this physical movement and tracking will reinforce that perimeter means the entire length around a shape.



Determining Dimensions from Perimeter

An error when working from a given perimeter rather than adding up to a perimeter is remembering what perimeter of a rectangle represents two lengths plus two widths. Students commonly think of two values that add to the perimeter forgetting there are 2 lengths and 2 widths.

For example, when students are asked to determine the dimensions of a rectangle with a perimeter of 20 cm, they may show the following as their answer (or another combination that add to 20 cm).



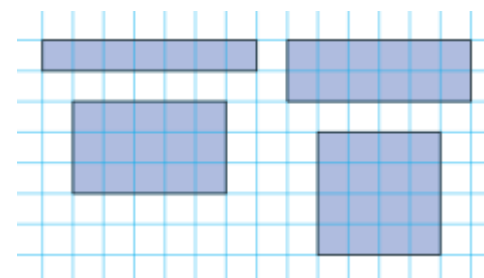
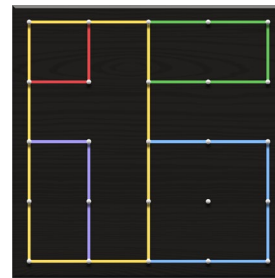
Emphasizing the Relationship Between Perimeter and Dimensions

When teaching perimeter, use concrete and visual models such as grid paper, geoboards, tiles, or sticks to build understanding. Label and track each side explicitly on these models and show how this information translates into written notation (e.g., $P = 3\text{ cm} + 2\text{ cm} + 3\text{ cm} + 2\text{ cm}$). This makes the connection between dimensions and perimeter visible and meaningful.

Encourage students to look for patterns and relationships through strategies like systematic guess-and-check. For example, ask guiding questions such as:

- *What happens to the perimeter as you increase the length?*
- *How does changing the width affect the perimeter?*
- *Is there a pattern you are noticing between the dimensions and perimeter?*

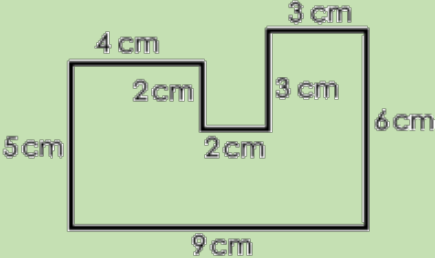
These approaches help students move beyond simply adding given numbers to understanding how dimensions determine perimeter.



Activities to Support Lesson Planning

Grade P	Grade 1	Grade 2	Grade 3
<p>*These are similar activities as that in the measurement with ruler section, but the focus here is on the distance around an object or a shape.</p> <p>In the classroom or outside on the playground, have students estimate and compare the distance around different objects. Use direct and indirect comparison.</p> <p>Question prompts: Knowledge: Use the cubes to make a shape. How many cubes did you use to make the outside edge of your shape?</p> <p>Application: Use the piece of string and find a shape or object that is smaller and one that is larger than your current shape. Compare your objects with another person's objects.</p> <p>Analysis: Sort all the collected objects from shortest to longest. How do you know you are correct? If I was to add one more object, where would you place the object in comparison to the others already lined up?</p>	<p>*These are similar activities as that in the measurement with ruler section, but the focus here is on the distance around an object or a shape.</p> <p>In the classroom or outside on the playground, have students estimate and compare the distance around different objects. Use direct and indirect comparison.</p> <p>Question prompts: Knowledge: Use the cubes to make a shape. How many cubes did you use to make the outside edge of your shape?</p> <p>Application: Use the piece of string and find a shape or object with a distance around that is smaller and one that is larger. Compare your objects with another person's objects.</p> <p>Analysis: Sort all the collected objects from shortest to longest. How do you know you are correct? If I was to add one more object, where would you place the object in comparison to the others already lined up? What attributes are you using to make that decision?</p>	<p>In the classroom or outside on the playground, have students measure the distance around given objects using two different units (e.g., snap cubes, base-ten rods, short and long paperclips, string).</p> <p>Question Prompts: Knowledge: How long is the distance around each of your objects?</p> <p>Application: How does the distance around each of the object compare to others you measured (shorter, longer)? By how much?</p> <p>Analysis: What happens when you don't use the same units (e.g. cubes, rods, paperclips) to measure the object? Does it increase in size? Does it become shorter or longer? How does it compare to other objects measured? Explain what happens when you use different units (e.g. cubes, rods, paperclips) to measure?</p>	<p>In the classroom or outside on the playground, have students measure the perimeter of given objects. They can use a standard ruler or tape measure. Have them compare the lengths and widths. Identify objects with similar perimeters and compare the dimensions.</p> <p>OR Draw 3 different rectangles with a perimeter of 12 cm. OR Draw 3 different shapes with a perimeter of 12 cm with at least one being a composite and/or irregular shape.</p> <p>Knowledge: What do your rectangles /shapes look like? What are the side lengths?</p> <p>Application: What do you notice about the rectangles/shapes you drew? How are they the same/different? How do they compare to others in the class? Compare the lengths and widths. What do you notice?</p> <p>Analysis: How many different rectangles/shapes can you have with a perimeter of 12 cm? How do you know you are correct?</p>

What are some sample questions to help support assessment?

Cognitive Level	Grade P	Grade 1	Grade 2	Grade 3
Knowledge	<p>Either outside or inside the classroom: I spy something that is longer/taller than this pencil/stick. What is it?</p> <p>Give students two objects (e.g., crayon, pencil, paper clip) and ask to predict which item is longer or shorter. Have them explain their thinking.</p>	<p>Build a snap cube train that is as long as your foot and as wide as your foot. Use your train to find objects in the room that are about as long as your foot and as wide as your foot.</p> <p>Measure around the outside of a piece of paper or desk. How many units is it? What in the room is longer and what is shorter than this distance?</p>	<p>What are some tools we can use to measure the distance around an object?</p> <p>Choose an object to measure. How many snap cubes do you think you will need to make a train that goes all the way around the object? Test your prediction.</p>	<p>What is the perimeter of this shape?</p>  <p>Draw a rectangle with a perimeter of 12 cm.</p> <p>Draw a shape with a perimeter of 12 cm.</p>
Application	<p>Give students a piece of string and ask them to find two objects that might have the same distance around, two that could be shorter and two that are longer. Sort them into “shorter”, “same”, and “longer” groups. Verify using a tool of choice.</p> <p>Cut three pieces of string to make:</p> <ul style="list-style-type: none"> - one piece a little longer than your hand - one piece a little shorter than your foot - one piece almost as long as a marker <p>Are any of your pieces almost the same length? Are any of them shorter than the others? Explain your thinking.</p>	<p>Provide students with a piece of string. Have them cut the string into two pieces that are almost the same length. Have them think about how long the pieces will be when they are laid down together end to end. Then, cut a third piece of string to make it a little shorter than the other two pieces put together. How do you know that your third piece of string will be shorter than the first two pieces put together?</p> <p>How can you compare the distance around objects? (e.g. desk and book; block and a counter; bookshelf and chair)</p>	<p>Choose three different objects. Use string to make a belt around the object. Measure the length of each of the belts using a non-standard unit tool of choice. Then, put all the objects in order from smallest to largest. Now use a different unit. Does the order change? Why?</p> <p>Choose an object that you think has similar side lengths, another with different side lengths and a third with very different side lengths. Make a unit train along each side of your object. Line them up and compare the lengths. What is the total distance around your object? Now do the same with your other two objects. What do you notice?</p>	<p>How can you estimate the perimeter of a playing card? What tools or personal referents could you use? Estimate and then measure. Compare your estimate and the measure. Is there something you could do differently next time?</p> <p>Find two different books you think have similar perimeters. Measure the dimensions and the perimeter. How are they the same / different?</p>

Analysis

Ask students if it is possible or impossible for some of the following: my arm is longer than my foot, my hand is longer than this crayon, or my finger is longer pencil.

Build two block towers that are about the same height but place them in different locations. How would you decide which block tower is taller than the other?

Ask students to describe the steps, in order, that one would take to decide which of two objects is longer.

Describe a good way to compare the height of two people. Describe a bad way to do this.

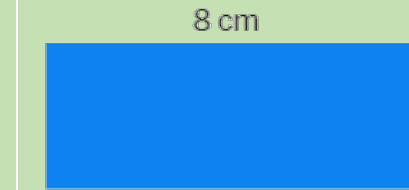
Three students build a tower. The first student builds a tower that is a little shorter than their leg. The second student builds a tower that is a little longer than their arm. The third student builds a tower that is a lot longer than their foot. Whose tower do you think is the tallest? How do you know?

How do you think you could measure the distance around the room?

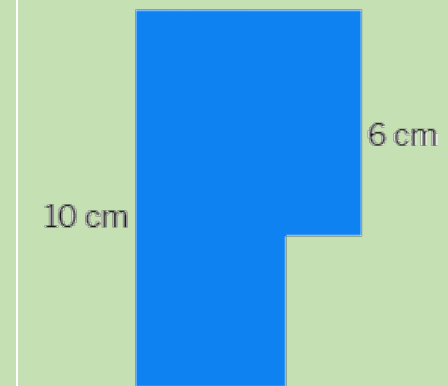
Give students common objects found in the classroom that can be easily bent into curvy lines, such as pipe cleaners and wool/string. Have students first estimate and measure the objects straight and then curvy. They could also measure all around an object, such as their desk, shelf or a picture frame. Explain your strategies when measuring. What do you do when the objects do not have straight lines to measure? How did you determine your lengths? What happens to the length if you change the tool you use?

Can you look at three objects and decide how to order them based on the distance around from smallest to largest? Or do you think you need to use a unit of measurement to find the distance around each of them before you can order them? Explain your thinking.

What are the missing side lengths if the perimeter is 26 cm?



The figure below is made up of two squares. What is the perimeter of the composite shape?



Supporting Resources

Manipulatives and Models to Support Learning

String, Yarn, or Rope 	Paper clips or Plastic links 	Markers or Crayons 	Craft Sticks 	Linking Cubes 	Centimetre cubes 
Cuisenaire Rods 	Base-ten blocks (units, rods) 	Ruler 	Measuring Tape 	Trundle Wheel 	Finger, hand, and arm lengths 

Printed and Electronic Resources

Cameron, Antonia. (2020). *Early Childhood Math Routines: Empowering Young Minds to Think*. Portsmouth, New Hampshire, Stenhouse Publishers.

Costello, D. (2021), *Making Math Stick: Classroom strategies that support the long-term understanding of math concepts*. Markham, ON: Pembroke Publishers.

Department of Education and Early Childhood Development (EECD), Province of Nova Scotia (2019a). *Mathematics Primary Curriculum Guide*. Halifax, NS: Author.

Department of Education and Early Childhood Development (EECD), Province of Nova Scotia (2019b). *Mathematics 1 Curriculum Guide*. Halifax, NS: Author.

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Fiore, M. and Lebar, M. L.. (2016). *The Four Roles of the Numerate Learner*. Pembroke Publishers Limited.

Lawson, Alex. (2016). *What to Look for: Understanding and Developing Student Thinking in Early Numeracy*. Don Mills, On, Pearson Canada Inc.

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- Newton, Nicki. (2021). *Guided Math in Action: Building Each Student's Mathematical Proficiency with Small-Group Instruction*. London, Routledge.
- SanGiovanni, John. (2016). *Mine the Gap for Mathematical Understanding, Grades K-2*. Corwin Press.
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- Small, M. (2009). *Making mathematics meaningful to Canadian students, K–8*. Toronto, ON: Nelson Education Ltd.
- Van De Walle, J.A. (2001). *Elementary and middle school mathematics teaching developmentally fourth edition*. New York, NY: Addison Wesley Longman.
- Van de Walle, J.A. and Lovin, L. (2006). *Teaching student-centered mathematics grades K–3*. Boston: Pearson Allyn & Bacon.
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