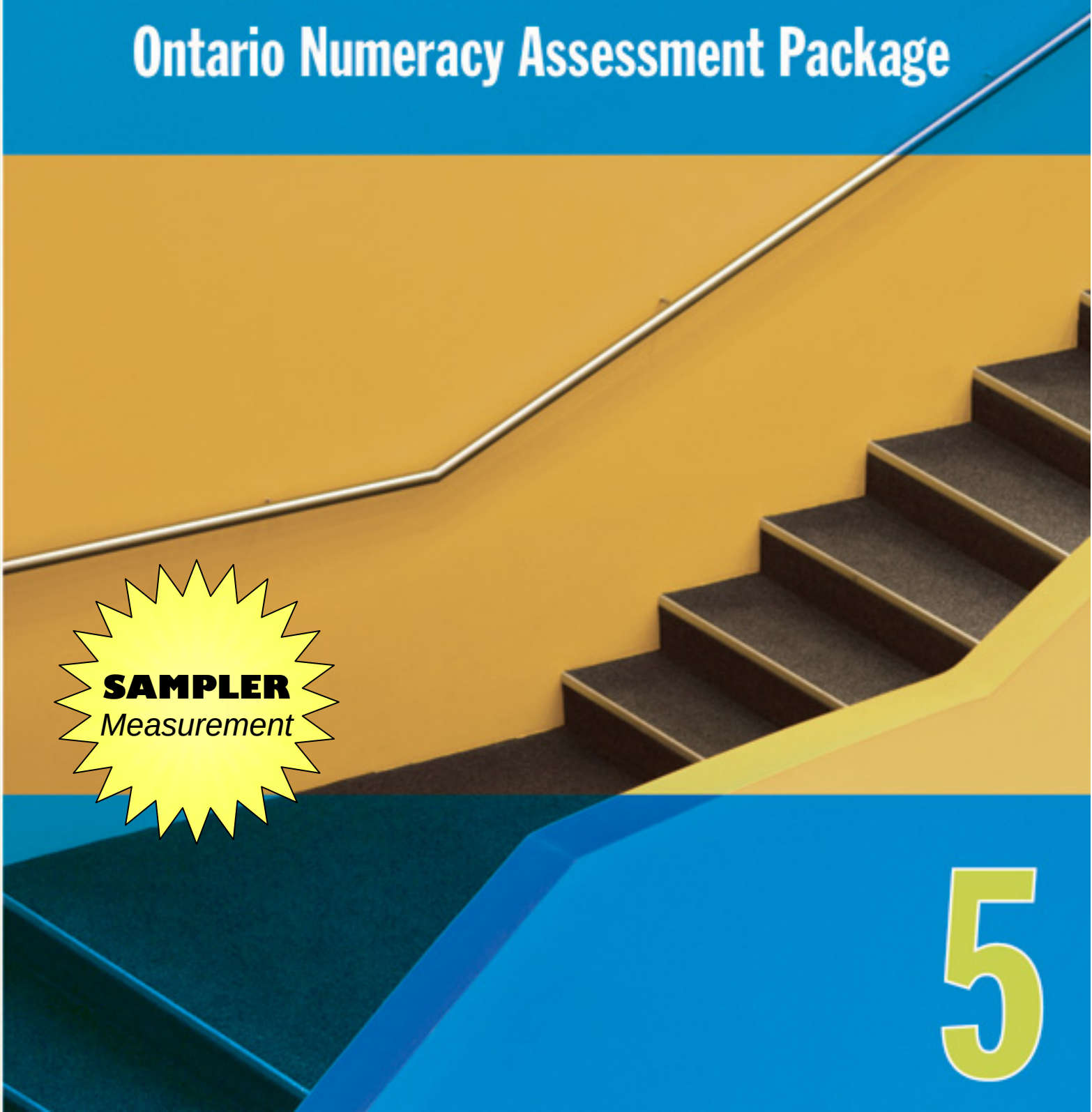
ONAP

Ontario Numeracy Assessment Package



SAMPLER
Measurement

5

MEASUREMENT

The Measurement Strand of the Ontario Curriculum for Grade 4 identifies seven Mathematical Process Expectations: problem solving, reasoning and proving, reflecting, selecting tools and computational strategies, connecting, representing, and communicating. Using these process expectations, students study, learn, and apply concepts and skills organized under the big ideas/headings of Attributes, Units, and Measurement Sense, and Measurement Relationships.

The following chart highlights key knowledge and skill development as students move from Grade 4 to 5.

GRADE 4	GRADE 5
• estimate, measure, and record linear measurements, using standard units	• select and justify the most appropriate standard unit for linear measurements
• estimate, measure, and record perimeter and area of polygons	• estimate, measure, and record perimeter and area of regular and irregular polygons
• estimate, measure, and record the mass (kilograms, grams), capacity (litres, millilitres), and volume (related to space taken up by an object)	• select and justify the most appropriate standard unit to measure mass (grams, kilograms, tonnes)
• estimate, measure, and represent time intervals (nearest minute) and estimate and determine elapsed time	• estimate, measure, and represent time intervals (nearest second) and estimate and determine elapsed time
• describe, through investigation, the relationship among various units of length, mass, and capacity	• solve problems requiring conversion from metres to centimetres and kilometres to metres
• pose and solve meaningful problems that require the ability to distinguish perimeter and area	• solve problems requiring the estimation and calculation of perimeters and areas of rectangles
• determine, through investigation, the relationship between the side lengths of a rectangle and its perimeter and area	• generalize to develop the formula for perimeter, area, and volume
	• create two-dimensional shapes with the same perimeter or the same area
	• determine, through investigation, the relationship between capacity and volume
• solve problems involving the relationship between years, decades, and centuries	• solve problems involving the relationship between a 12-hour clock and a 24-hour clock

For each strand of the curriculum, ONAP provides three types of assessment materials. Consider the following points when administering the assessments for the strand:

Part A: Activating Prior Knowledge (page 85)

- The activities in Part A have been created to activate students' prior knowledge before they complete the Part B assessment or the Part C performance tasks.
- No score is assigned during this part of the assessment.
- It is recommended that you spend one or two periods working on and discussing the activities provided in this part.

Part B: Concepts and Skills Assessment (page 90)

- The paper-and-pencil assessment in Part B addresses each of the specific expectations within the two overall expectations in the Measurement Strand.
- Students will be responding to a mix of questions: short-response, fill-in-the-blank, and multiple-choice.
- Most students will be able to complete the entire assessment in a 60-minute period. If necessary, provide students with additional time to complete the assessment, as long as they complete it in one sitting.

Part C: Performance-Based Assessment (page 108)

- The two performance tasks in Part C are designed to provide you with insights into how well students are able to perform measured against the categories of the Ontario Achievement Chart: Knowledge and Understanding, Thinking, Communication, and Application.
- All of the overall expectations for this strand have been assessed through the Concepts and Skills Assessment in Part B.
- It is recommended that you select one performance task for the Measurement Strand.
- Each task is designed to be completed in a 45- to 60-minute period. If necessary, provide additional time as long as students complete the task in one sitting.
  Note: *Time permitting, students may complete both performance tasks to provide you with additional insight regarding their ability to problem solve, apply mathematical understanding, and communicate effectively.*

Part A: Activating Prior Knowledge

Administration

To activate students' prior knowledge of the Measurement Strand, choose one or two of the following activities to work on prior to administering the assessments. Introductory and culminating suggestions have been provided for each. No score is assigned for these activities.

Timing

It is recommended that you spend one or two periods working on and discussing the activities provided in this part.

Accommodating Students with Special Needs

Observe students as they complete the activities. While the activities in this section are not designed as a formal diagnostic assessment, you may want to consider whether students who are having extreme difficulties with the activities are ready to participate in the full ONAP assessment for this grade level. Observations at this stage might also indicate students who will need special accommodations during the assessment such as someone to read questions to them or to scribe responses.

Activity 1: Measuring Scavenger Hunt

Materials

- BLM A1: *Activity 1: Measuring Scavenger Hunt*
- metric rulers
- metre sticks or measuring tapes
- tool to measure mass (scale and gram weights)
- calibrated measuring cups in millilitres and litres
- empty plastic containers
- water

Introducing the Activity

Brainstorm with students all the considerations that need to be made before an item is measured (e.g., the units and measuring tool to be used, the precision needed, the method to be used for recording the measurement). List students' suggestions on the chalkboard.

Have students work in pairs to complete the BLM A1: *Activity 1: Measuring Scavenger Hunt*. Make sure that there are enough materials for half of the student pairs to be working on a type of measuring at a time; for example, half of the students measure time and length, while the other half measure mass and capacity.

Culminating Discussion

1. What did you do if your measurement included a part of a unit (for example, a measurement that is longer than 3 m but not as long as 4 m)?
   Sometimes I just estimated the extra part. I said 3 and $\frac{1}{2}$ m. Sometimes I measured the extra part with smaller units. Then I could say 3 m and 45 cm. This is probably the best way.

2. How did you use your measurement of the height of the door to help you estimate the measurement of an object half as high as the door?
I sort of know how high a door is, so when I looked around, I could find things that were about half as high as the door. I know about how far the top of the door is to the ceiling, and I also know about how much taller the door is than I am. This all helped me find something half as high as the door.

3. What is the difference between using a measuring tool to determine a precise measurement and making an estimate? Why might you need to do both?
When I measured with the metre stick, I could see how many centimetres high the chair was. I could have estimated because the chair is not as high as half the door, so I know it is less than 100 cm. Sometimes you need to measure, like when the doctor measures how tall I am, but sometimes an estimate is okay, like when my mom buys me a shirt, and she says this looks like it's about your size.

Activity 2: Geoboard Challenge

Materials

- geoboards and geobands (preferably 11 × 11 units; one per student pair)
- BLM A2: *Activity 2: Geoboard Challenge* (one per student)
- dot paper (one per student)

Introducing the Activity

Use an overhead geoboard to look at a 4 unit by 5 unit rectangle. Discuss how to determine the perimeter (18 units) and area (20 square units) and the units for each measurement. Do the same for a polygon that is not rectangular but follows the geoboard pegs. Discuss the meaning of the term *polygon*. You may also choose to model how to record geoboard figures on dot paper. Have the students work in pairs to complete the activities on BLM A2: *Activity 2: Geoboard Challenge*.

Culminating Discussion

1. What did you notice about rectangles that have the same area but different perimeters?
They all have the same number of squares, but they are different shapes.

2. What did you notice about rectangles that have the same perimeter but different areas?
They have different numbers of squares. They start long and skinny and then get more like a big square. The square shapes have the most number of inside squares.

3. How many different rectangles with an area of 48 square units can you draw using whole number units? How would you know if you had found all the rectangles that have an area of 48 square units?
You can draw five different rectangles with an area of 48 units: 48 × 1, 24 × 2, 16 × 3, 12 × 4, 8 × 6. To find all the rectangles, I figured out all of the numbers that multiplied to 48. I used an organized list to make sure I found all of them. I started with 1 × 48, then 2 × 24, then 3 × 16. I had to skip some numbers because they did not work, and I stopped when the numbers started to repeat.

Name: _____ **Date:** _____

Activity 1: Measuring Scavenger Hunt

Time

Write the time that you and your partner(s) started the hunt: _____

Write the time that you and your partner(s) finished the hunt: _____

How much time did you spend on the hunt?
Write this time to the nearest five minutes: _____

Length, Perimeter, and Area

Measure each of the following:

height of a door	measurement: _____	unit: _____
length of a pencil	measurement: _____	unit: _____
width of the classroom	measurement: _____	unit: _____
height of a chair	measurement: _____	unit: _____
perimeter of the classroom	measurement: _____	unit: _____
area of a desktop	measurement: _____	unit: _____

Find one object in the room that is about half as high as the door.
Measure the object. Was your estimate reasonable?

name of object: _____ height of object: _____ unit: _____

Mass

What is the mass of 20 pattern block hexagons (yellow blocks)?

estimate: _____ measurement: _____ unit: _____

What is the mass of your math textbook?

estimate: _____ measurement: _____ unit: _____

Capacity

Use the measuring cups and water to determine the capacity of the three containers.

Container 1	measurement: _____	unit: _____
Container 2	measurement: _____	unit: _____
Container 3	measurement: _____	unit: _____

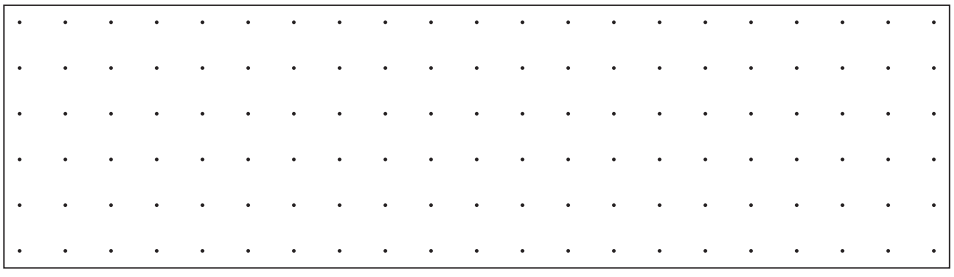
Name: _____ Date: _____

Activity 2: Geoboard Challenge (page 1)

Challenge 1

Create as many different rectangles as you can that have a perimeter of 24 units.

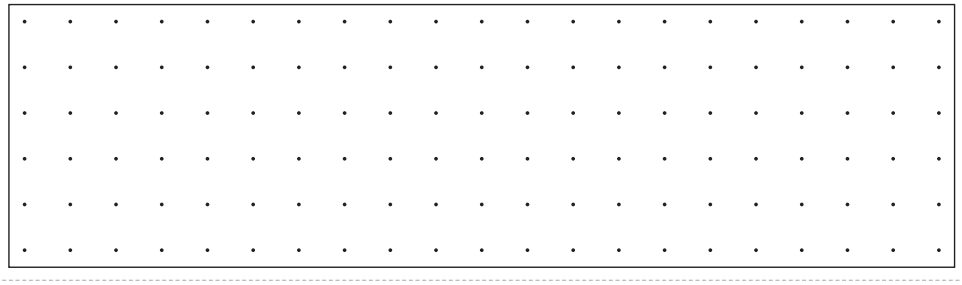
Create three different polygons that are not rectangles but also have a perimeter of 24 units.



Challenge 2

Create as many different rectangles as you can that have an area of 18 square units.

Create three different polygons that are not rectangles but also have areas of 18 square units.



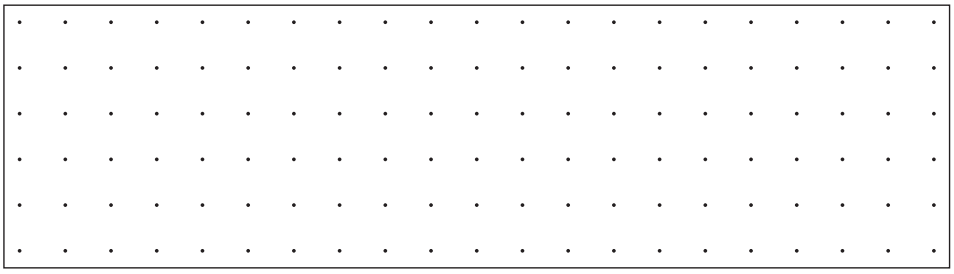
Name: _____ Date: _____

Activity 2: Geoboard Challenge (page 2)

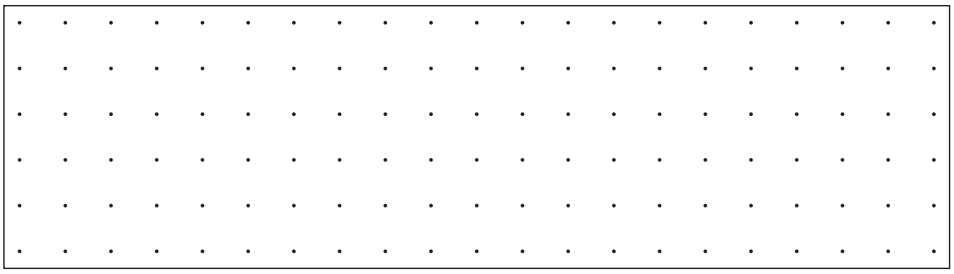
Challenge 3

Create two rectangles that have the same area but different perimeters.

Create a rectangle that has an area of 20 square units and a perimeter of 24 units.



Create two different polygons that are not rectangles. Each polygon should have an area of 12 square units.



Part B: Concepts and Skills Assessment

Administration

The paper-and-pencil assessment in Part B addresses each of the specific expectations within both of the overall expectations in the Measurement Strand. Part B includes several styles of questions: short-response, matching, fill-in-the-blank, and multiple-choice.

Timing

Most students will be able to complete the entire assessment in a 60-minute period. If necessary, provide students with additional time to complete the assessment as long as they complete it in one sitting.

Materials

FOR THE TEACHER	FOR EACH STUDENT	FOR EACH GROUP OF STUDENTS
• Individual Student Scoring Guide: p. 100 • Class Tracking Sheet: p. 104 • ONAP 5 CD-ROM (optional)	• Assessment Part B: p. 92 • pencil • eraser • ruler • centimetre grid paper	• colour tiles • connecting cubes

Introducing the Assessment

Inform students that they will be completing an assessment to help you get to know what they have learned about math in earlier grades. Tell students that it is important that they answer the questions as fully as possible. To communicate effectively, they can use pictures, numbers, words, and/or diagrams to represent their thinking.

Point out the manipulative materials you have provided for students to use throughout the assessment. Encourage students to access other materials available in the classroom that they think might help them to answer questions and/or solve problems.

Note: *Calculators are not recommended during this assessment.*

Accommodating Students with Special Needs

If individuals or groups of students have difficulties with reading, consider reading the questions orally as they complete the assessment.

If individual students have difficulties explaining their thinking in writing, consider providing scribes to record for the students or encourage students to show and explain their thinking using concrete materials.

Some students will require additional time to complete the assessment. You may wish to note this accommodation in your anecdotal records about the student. However, there should be no reduction of the student's overall score in terms of the amount of time it takes the student to complete the assessment.

Scoring the Assessment

A detailed Individual Student Scoring Guide has been provided on page 100. The guide is designed to be completed for each student. The individual scores can then be used to fill in the Class Tracking Sheet. Alternatively, you may record student results directly on the Class Tracking Sheet. The results can be recorded on a photocopy, or electronically using the ONAP 5 CD-ROM.

While great care has been taken to consider the range of possible answers for each question, there will be times when you will need to apply your professional judgment to score an individual answer. You may use the Curriculum Correlation chart provided on page 106 to help you to determine whether the student has demonstrated the intended concept knowledge or skill based on the overall and specific expectations being assessed by the particular question.

At times a student may provide an answer that you think does not completely represent his or her knowledge and skill level. You may ask probing questions to better assess the student's overall understanding.

Some questions are delivered in more than one part (a and b) and are given more than one point. Should a student's answer in one part reveal that a correct answer in the other part was arrived at for the wrong reason, a score of zero should be given for both parts.

Summarizing Individual and Class Achievement

Once you have completed scoring the students' assessments, you will need to record the results. You may record the results electronically using the ONAP 5 CD-ROM, or use a photocopy of the Class Tracking Sheet provided on pages 104 and 105.

Name: _____ **Date:** _____

Measurement

1. What is the length of the line segment in millimetres?

_____

2. Use a ruler to draw a line segment that is 95 mm long.

3. Write the time.

_____

_____

4. You leave school at 3:30 p.m. It takes you
- 20 minutes to walk to your friend's house,
- then 10 minutes to eat a snack,
- then 25 minutes to play a video game,
- then 10 minutes to walk home, and
- then 30 minutes to do your homework.

At what time will you be finished your homework?

A 5:00 p.m.

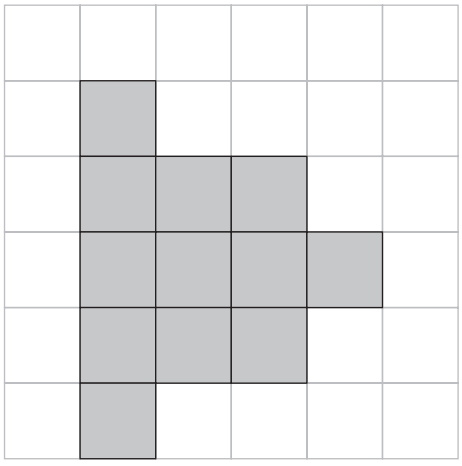
B 6:00 p.m.

C 5:05 p.m.

D 6:05 p.m.

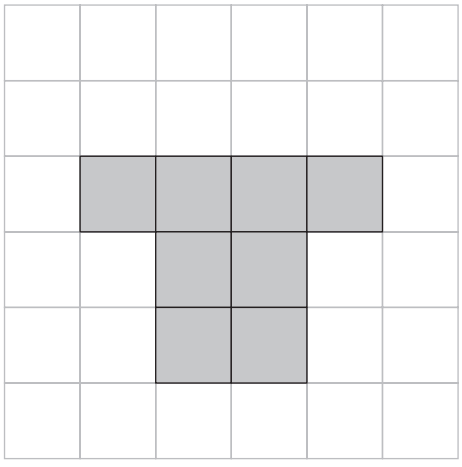
Name: _____ **Date:** _____

5. Use the centimetre grid to measure the perimeter and the area of each polygon.



a) perimeter: _____

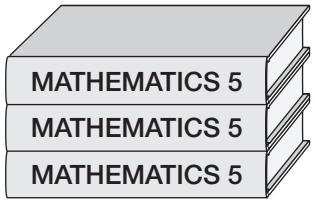
area: _____



b) perimeter: _____

area: _____

6. Estimate the mass of three math textbooks.
Circle the answer you think is most reasonable.



A 15 g

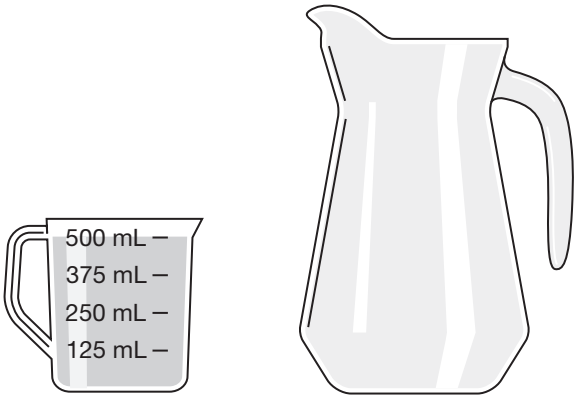
B 3 kg

C 300 g

D 750 g

Name: _____ **Date:** _____

7. a) It takes four full measuring cups to fill this container. What is the capacity of the container? (How much liquid is needed to fill the container?)



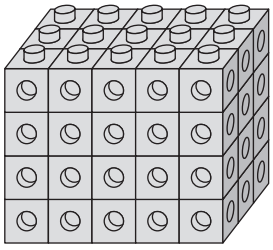
capacity of container: _____

b) How many 500 mL cups of juice are needed to fill the container in the picture below?

3.5 L

number of 500 mL cups: _____

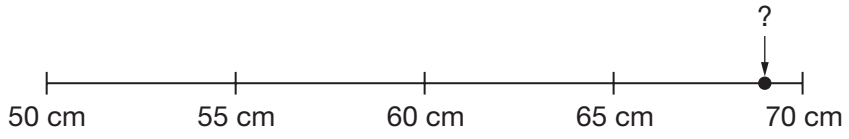
8. What is the volume of this prism made out of connecting cubes?



volume of the prism: _____

Name: _____ **Date:** _____

9. a) Which of the following measurements would you use to label the point on the number line marked by the large dot?



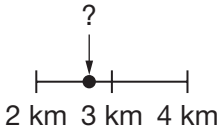
A 690 mm

B 62 cm

C 69 mm

D 595 mm

b) Which of the following measurements would you use to label the spot marked with the large dot?



A 3700 m

B 37 km

C 2700 m

D 4000 m

10. Write the standard metric unit that you are most likely to use to measure each of the following (millimetre, centimetre, metre, kilometre).

a) the perimeter of a CD cover: _____

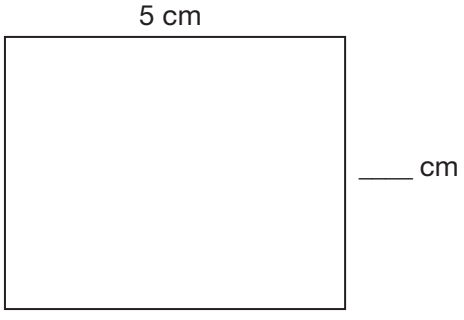
Explain your thinking.

Name: _____ **Date:** _____

b) the distance between two cities: _____

Explain your thinking.

11. The area of a rectangle is 20 cm^2. The length of one side is 5 cm.



a) What is the length of the other side? _____

b) What is the perimeter? _____

12. a) Can two rectangles have the same area but different perimeters?

YES _____ NO _____

Explain your thinking.

b) Circle either *area* or *perimeter* to complete the following sentences.

I need to know about *area* / *perimeter* if I want to seed the schoolyard with new grass.

I need to know about *area* / *perimeter* if I want to build a new fence for the schoolyard.

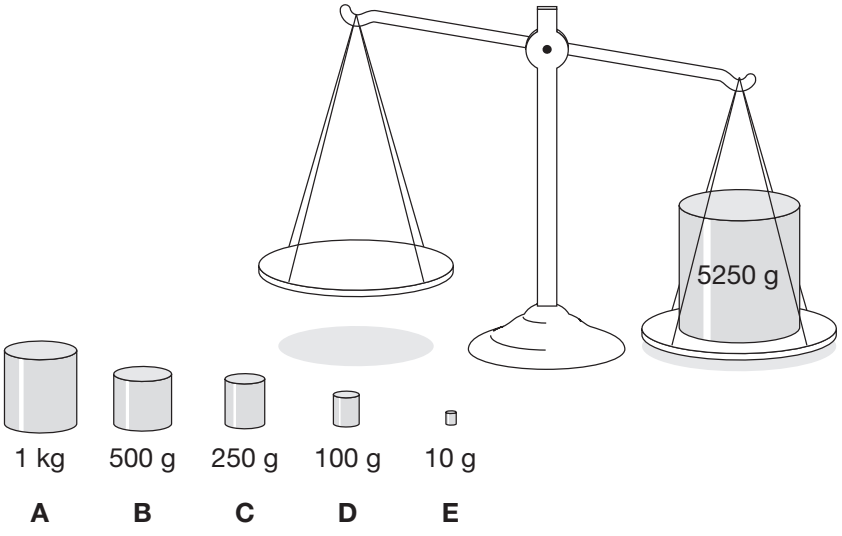
Name: _____ **Date:** _____

13. Order these four amounts from least capacity to greatest capacity:

3 L, 3004 mL, 2.2 L, 2950 mL

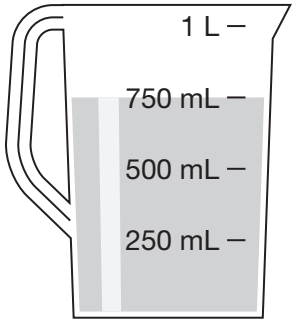
_____

14. How many of each of the weights shown (labelled A, B, C, D, and E) do you need to balance this scale? Write the number needed of each weight beside the letter label in the table below.



_____ A	_____ B	_____ C	_____ D	_____ E

15. This container of fruit juice was full to the 1 L mark before Greg had a drink. How many millilitres of fruit juice did Greg drink?



number of millilitres Greg drank: _____

Name: _____ **Date:** _____

16. a) What is the most appropriate unit of mass to measure each of the following (milligrams, grams, kilograms)?

a calculator: _____

a desk: _____

Explain your thinking.

b) What is an appropriate unit of mass to measure each of the following (millilitres, litres)?

a glass of water: _____

a bag or carton of milk: _____

Explain your thinking.

17. a) Canada became a country in 1867. Canada has been a country for

A more than two centuries

B less than one century

C less than two centuries

D exactly two centuries

b) A grandmother is 87 years old. How many complete decades has she lived?

A eight

B nine

C seven

D ten

Name: _____ **Date:** _____

18. a) Draw three different rectangles, each with a perimeter of 12 units, on the grid paper. Label the lengths of the sides.

b) Draw three different rectangles, each with an area of 36 square units, on the grid paper. Label the lengths of the sides.

ONAP INDIVIDUAL STUDENT SCORING GUIDE
GRADE 5: MEASUREMENT — PART B

Name: _____ **Date:** _____

Overall Expectation 4m38 (Attributes, Units, and Measurement Sense):
Estimate, measure, and record length, perimeter, area, mass, capacity, volume, and elapsed time, using a variety of strategies.

4m40 1	65 mm or 6 cm and 5 mm (accept any answer between 63 mm and 67 mm) **1 point**	
4m41 2	**1 point** for drawing a line that measures 95 mm long (accept any answer between 93 mm and 97 mm)	
4m42 3	2:27 or two twenty-seven or twenty-seven after two; 11:40 or eleven forty or 20 minutes before (or of) 12 **1 point** for both correct answers	
4m43 4	C **1 point**	
4m44 5 a)	Perimeter: 18 cm Area: 12 cm^2 **1 point** for two correct dimensions	
4m44 5 b)	Perimeter: 14 cm Area: 8 cm^2 **1 point** for two correct dimensions	
4m45 6	B **1 point**	
4m46 7 a)	2 L or 2000 mL **1 point**	
4m46 7 b)	7 **1 point**	

4m47 8	60 cubes **1 point**	
	Total for Overall Expectation 4m38	___ 10
Overall Expectation 4m39 (Measurement Relationships): **Determine the relationships among units and measurable attributes, including the area and perimeter of rectangles.**		
4m48 9 a)	A **1 point**	
4m48 9 b)	C **1 point**	
4m49 10 a)	**1 point** for a partial explanation that demonstrates some understanding, e.g., *Metres are too big.* OR **2 points** for a complete explanation that demonstrates full understanding, e.g., *Metres and kilometres are way too big. It could be millimetres, but the number would be big so I'd use centimetres.*	
4m49 10 b)	**1 point** for answering "kilometres" and a partial explanation that demonstrates some understanding, e.g., *I've seen signs on the road that show kilometres.* OR **2 points** for answering "kilometres" and a complete explanation that demonstrates full understanding, e.g., *Cities are very big and have towns and spaces between them, so a big unit, like kilometres, makes sense*.	
4m50 11 a)	4 cm **1 point**	
4m50 11 b)	18 cm **1 point**	
4m51 12 a)	**1 point** for answering "Yes" and a partial explanation that demonstrates some understanding, e.g., *You can spread out the space in different ways.* OR **2 points** for answering "Yes" and and a complete explanation that demonstrates full understanding, e.g., *Two rectangles can have an area of 20 but have different perimeters: 4×5 and 10×2.*	

4m51 12 b)	area; perimeter **1 point** for two correct responses	
4m52 13	2.2 L, 2950 mL, 3 L, 3004 mL **1 point**	
4m53 14	Sample answer: 5 A, 1 C 5 A, 2 D, 5 E 4 A, 2 B, 1 C or any other combination of weights that adds to 5250 g **1 point**	
4m54 15	250 mL **1 point**	
4m55 16 a)	**1 point** for answering "grams" and "kilograms" and a partial explanation that demonstrates some understanding, e.g., *A calculator is smaller, so grams for calculators and kilograms for a desk.* OR **2 points** for answering "grams" and "kilograms" and a complete explanation that demonstrates full understanding, e.g., *A kilogram weighs about the same as a book. A calculator is much lighter than a book and a desk is much heavier. Since grams are light, I'd use them for the calculator and kilograms for the desk.*	
4m55 16 b)	**1 point** for answering "millilitres" and "litres" and a partial explanation that demonstrates some understanding, e.g., *We buy bags or cartons of milk marked litres. Glasses hold less.* OR **2 points** for answering "millilitres" and "litres" and a complete explanation that demonstrates full understanding, e.g., *A litre is 1000 mL. A litre is like a container of ice cream, so that's about the same size as a small bag or carton of milk. It could even be more. A glass of water holds a lot less, so I'd use a smaller unit like millilitres.*	
4m56 17 a)	C **1 point**	
4m56 17 b)	A **1 point**	

4m57 18 a)	**1 point** for drawing two correct rectangles with two adjacent sides adding up to 6, e.g., 3×3, 4×2, or 5×1 OR **2 points** for drawing all three rectangles with two adjacent sides adding up to 6, e.g., 3×3, 4×2, 5×1 NOTE: Credit should be given to students who correctly identify a decimal or fraction (mixed number) solutions.	
4m57 18 b)	**1 point** for drawing and labelling two rectangles with two adjacent sides that, when multiplied, equal 36 OR **2 points** for drawing and labelling three rectangles correctly: i.e., three of, for example, 36×1, 18×2, 12×3, 9×4, 6×6 NOTE: Credit should be given to students who correctly identify decimal or fraction (mixed number) solutions.	
	Total for Overall Expectation 4m39	24

ONAP GRADE 5: MEASUREMENT

Date: _____ **Grade:** _____ **School:** _____

Overall Expectation	**4m38 (Attributes, Units, and Measurement Sense)** Estimate, measure, and record length, perimeter, area, mass, capacity, volume, and elapsed time, using a variety of strategies.

Specific Expectation #			4m40	4m41	4m42	4m43	4m44		4m45	4m46		4m47	Total
Question #			1	2	3	4	5(a)	5(b)	6	7(a)	7(b)	8	
Student Name	Gender (M/F)	IEP/ELL											

CLASS TRACKING SHEET — PART B

Board: _____ **Teacher Name:** _____

4m39 (Measurement Relationships)

Determine the relationships among units and measurable attributes, including the area and perimeter of rectangles.

4m48		4m49		4m50		4m51		4m52	4m53	4m54	4m55		4m56		4m57		Total
9(a)	9(b)	10(a)	10(b)	11(a)	11(b)	12(a)	12(b)	13	14	15	16(a)	16(b)	17(a)	17(b)	18(a)	18(b)	

ONTARIO CURRICULUM CORRELATION TO ONAP MEASUREMENT 5 — PART B
NOTE: This correlation is to the Grade 4 Ontario Curriculum Expectations.

Overall Expectation 4m38 (Attributes, Units, and Measurement Sense):
Estimate, measure, and record length, perimeter, area, mass, capacity, volume, and elapsed time, using a variety of strategies.

Question Number	Specific Expectation
1	**4m40:** estimate, measure, and record length, height, and distance, using standard units (i.e., millimetre, centimetre, metre, kilometre) (e.g., a pencil that is 75 mm long)
2	**4m41:** draw items using a ruler, given specific lengths in millimetres or centimetres
3	**4m42:** estimate, measure (i.e., using an analogue clock), and represent time intervals to the nearest minute
4	**4m43:** estimate and determine elapsed time, with and without using a timeline, given the durations of events expressed in five-minute intervals, hours, days, weeks, months, or years
5 a)–b)	**4m44:** estimate, measure using a variety of tools (e.g., centimetre grid paper, geoboard) and strategies, and record the perimeter and area of polygons
6	**4m45:** estimate, measure, and record the mass of objects (e.g., apple, baseball, book), using the standard units of the kilogram and the gram
7 a)–b)	**4m46:** estimate, measure, and record the capacity of containers (e.g., a drinking glass, a juice box), using the standard units of the litre and the millilitre
8	**4m47:** estimate, measure using concrete materials, and record volume, and relate volume to the space taken up by an object (e.g., use centimetre cubes to demonstrate how much space a rectangular prism takes up)
Overall Expectation 4m39 (Measurement Relationships): **Determine the relationships among units and measurable attributes, including the area and perimeter of rectangles.**	
9 a)–b)	**4m48:** describe, through investigation, the relationship between various units of length (i.e., millimetre, centimetre, decimetre, metre, kilometre)
10 a)–b)	**4m49:** select and justify the most appropriate standard unit (i.e., millimetre, centimetre, decimetre, metre, kilometre) to measure the side lengths and perimeters of various polygons
11 a)–b)	**4m50:** determine, through investigation, the relationship between the side lengths of a rectangle and its perimeter and area

Question Number	Specific Expectation
12 a)–b)	**4m51:** pose and solve meaningful problems that require the ability to distinguish perimeter and area (e.g., "I need to know about area when I cover a bulletin board with construction paper. I need to know about perimeter when I make the border.")
13	**4m52:** compare and order a collection of objects, using standard units of mass (i.e., gram, kilogram) and/or capacity (i.e., millilitre, litre)
14	**4m53:** determine, through investigation, the relationship between grams and kilograms
15	**4m54:** determine, through investigation, the relationship between millilitres and litres
16 a)–b)	**4m55:** select and justify the most appropriate standard unit to measure mass (i.e., milligram, gram, kilogram) and the most appropriate standard unit to measure the capacity of a container (i.e., millilitre, litre)
17 a)–b)	**4m56:** solve problems involving the relationship between years and decades and between decades and centuries
18 a)–b)	**4m57:** compare, using a variety of tools (e.g., geoboard, pattern blocks, dot paper), two-dimensional shapes that have the same perimeter or the same area

Part C: Performance-Based Assessment

Administration

The two performance tasks in Part C are designed to provide insight into how well students are able to perform in terms of the categories of the Ontario Achievement Chart: Knowledge and Understanding, Thinking, Communication, and Application.

Since all of the specific and overall expectations for this strand have been assessed through the Concepts and Skills Assessment in Part B, it is recommended that you select one performance task for the Measurement Strand.

Read all parts of the problem orally to students. Tell students that they should provide detailed answers to the problem, including showing how they solved the problem. Remind students that they may use pictures, numbers, words, diagrams, and/or charts to explain effectively how they solved the problem.

Timing

Each task is designed to be completed in a 45- to 60-minute period. If necessary, provide additional time as long as students complete the task in one sitting.

Accommodating Students with Special Needs

If individual students have difficulties explaining their thinking in writing, consider providing scribes to record for the students or encourage students to show and explain their thinking using concrete materials.

Scoring the Assessment

A general rubric based on the Ontario Achievement Chart for Mathematics has been provided on page 115 to assist with scoring student responses to the tasks. Spend some time reviewing the anchors and rationales provided for each level of achievement on pages 116 to 131. The four categories should be considered as interrelated, reflecting the wholeness and interconnectedness of learning. Each student's performance should therefore be determined holistically by selecting the level that best describes the student's overall achievement.

Sometimes a student will not achieve at the same level for each criterion within a category or across categories. For example, a student may perform at Level 3 on Knowledge and Understanding, Thinking, and Application but at Level 2 on Communication. While you may determine that, overall, the student performed most consistently at Level 3, you may want to make a note that this student would benefit from additional instruction in the area of Communication.

Note: *When scoring student work on the performance tasks, it is appropriate to note what you observed and heard while the student worked on the task.*

Once you have completed scoring the students' assessments, you will need to record the results. You may record the results electronically using the ONAP 5 CD-ROM, or use a photocopy of the Performance Task Class Tracking Sheet provided on page 114.

Next Steps

Strategies for improving performance in the four areas of the Achievement Chart are provided in the ONAP introduction, pages 18 and 19.

Performance Task 1: Determining Dimensions

Materials

FOR THE TEACHER	FOR EACH STUDENT	FOR EACH GROUP OF STUDENTS
• Performance Task Class Tracking Sheet: p. 114 • Performance Task Rubric: p. 115 • anchors and rationales: p. 116 • ONAP 5 CD-ROM (optional)	• BLM C1: *Performance Task 1: Determining Dimensions:* p. 111 • grid paper • colour tiles • pencil • eraser • calculator	• small counters (e.g., centicubes, snap cubes, bingo chips)

Introducing the Task

In this task, students are asked to determine how to divide a ribbon into lengths to go around the perimeter of a bulletin board, and to calculate the possible dimensions and areas of the bulletin board.

Tell students that they will
- determine the possible dimensions of the bulletin board given the length of ribbon
- determine the possible areas of the bulletin board

Have students use BLM C1: *Performance Task 1: Determining Dimensions* to complete this activity.

Answers

1. a) *Four possible dimensions:*
8 m × 1 m
7 m × 2 m
6 m × 3 m
5 m × 4 m

b) Sample answer: *Perimeter is the distance around the bulletin board. There are 4 sides in total, but only 2 dimensions. I knew the longest and skinniest would be 8 m on two sides and 1 m on the other two sides. Then I made an organized list. The long side went down by 1 m each time. The next one would be 4 m × 5 m, but that is really the same as 5 m × 4 m, so I knew I had them all.*

c) *I would choose the 5 m × 4 m bulletin board because it has the greatest area. It is 20 m^2 in area, which is more than all of the others.*
$5 \times 4 = 20\ m^2$
$8 \times 1 = 8\ m^2$
$7 \times 2 = 14\ m^2$
$6 \times 3 = 18\ m^2$
The more area that the bulletin board has, the more space there is for display.

Performance Task 2: Spilled Milk

Materials

FOR THE TEACHER	FOR EACH STUDENT	FOR EACH GROUP OF STUDENTS
• Performance Task Class Tracking Sheet: p. 114 • Performance Task Rubric: p. 115 • anchors and rationales: p. 116 • ONAP 5 CD-ROM (optional)	• BLM C2: *Performance Task 2: Spilled Milk:* p. 113 • pencil • eraser • calculator	• small counters (e.g., centicubes, snap cubes)

Introducing the Task

In this task, students will determine how many different ways they can measure the amount of spilled milk and explain their reasoning.

Have students use BLM C2: *Performance Task 2: Spilled Milk* to complete this activity.

Answers

1. *You could put a string around the edges of the puddle. Then you could measure how long the string is in centimetres, and that would tell you the perimeter of the puddle.*

   You could draw a rectangle that covers most of the puddle. You would measure the sides, and then multiply the width and length and get close to the area of the puddle. The area could be in square centimetres.

   You could pour the puddle into a measuring cup. That would tell you how many millilitres of milk is spilled.

   You could look at the container that the milk spilled from and figure out how much milk it could hold before the milk spilled. Then you could figure out how much milk it holds now that some has spilled. Then you could figure out how much milk spilled by subtracting these amounts.

   You could pour the milk into a glass and then measure the combined mass of the glass and the milk. Then you could pour out the milk and measure the mass of the glass. Subtract the mass of the glass from the mass of the milk and glass together, and you will know the mass of the milk alone. The mass would be in grams.

Name: _____ **Date:** _____

Performance Task 1: Determining Dimensions (page 1)

Alyssa has a piece of blue ribbon that is 18 m in length. She wants to use the ribbon to make a border for a rectangular bulletin board. The length and the width of the bulletin board are whole numbers of metres.

1. a) If Alyssa uses all of the ribbon, what are all the possible whole number dimensions of the rectangular bulletin board? List them below.

b) How do you know you have found all the possible combinations?

Name: _____ **Date:** _____

Performance Task 1: Determining Dimensions (page 2)

c) If you want to use the bulletin board that has the greatest area for display, which dimensions will you choose?

Explain your reasoning.

Name: _____ **Date:** _____

Performance Task 2: Spilled Milk

1. A puddle of milk was found on a table in the lunchroom.
How many different ways could you measure the spilled milk?

Explain your thinking.

ONAP PERFORMANCE TASK CLASS TRACKING SHEET
GRADE 5: MEASUREMENT
PART C

Date: _____ **Grade:** _____

School: _____ **Board:** _____

Teacher Name: _____

Performance Task Title: _____

Student Name	Level 1–4	Comments

Performance Task Rubric

Assessment of Learning — What to Look For in Student Work				
CATEGORY	**LEVEL 1**	**LEVEL 2**	**LEVEL 3**	**LEVEL 4**
Knowledge and Understanding	• demonstrates a limited or inaccurate understanding of the concepts needed to solve the problem • demonstrates a limited or inaccurate knowledge of the specific concepts, terms, or procedural skills that have been taught	• demonstrates some understanding of the concepts needed to solve the problem • demonstrates some knowledge of the specific concepts, terms, or procedural skills that have been taught	• demonstrates considerable understanding of the concepts needed to solve the problem • demonstrates considerable knowledge of the specific concepts, terms, or procedural skills that have been taught	• demonstrates a thorough understanding of the concepts needed to solve the problem • demonstrates a thorough knowledge of the specific concepts, terms, or procedural skills that have been taught
Thinking	• demonstrates a limited understanding of the problem • shows little or no evidence of a plan • uses a strategy and attempts to solve the problem but does not arrive at an answer	• demonstrates some understanding of the problem • shows some evidence of a plan • carries out the plan to some extent by using a strategy and develops a partial and/or incorrect solution	• demonstrates considerable understanding of the problem • shows evidence of an appropriate plan • carries out the plan effectively by using an appropriate strategy and solving the problem	• demonstrates a thorough understanding of the problem • shows evidence of a thorough plan • shows flexibility and insight when carrying out the plan by trying and adapting when necessary one or more strategies to solve the problem
Communication	• provides a limited or inaccurate explanation/ justification that lacks clarity or logical thought • communicates with limited effectiveness (may include words, pictures, symbols, and/or numbers)	• provides a partial explanation/justification that shows some clarity and logical thought • communicates with some effectiveness (may include words, pictures, symbols, and/or numbers)	• provides a complete, clear, and logical explanation/ justification • communicates with considerable effectiveness (may include words, pictures, symbols, and/or numbers)	• provides a thorough, clear, and insightful explanation/justification • communicates with a high degree of effectiveness (may include words, pictures, symbols, and/or numbers)
Application	• demonstrates a limited ability to apply mathematical knowledge and skills	• demonstrates some ability to apply mathematical knowledge and skills	• demonstrates a considerable ability to apply mathematical knowledge and skills	• demonstrates a sophisticated ability to apply mathematical knowledge and skills

Performance Task 1: Determining Dimensions LEVEL 1 (Anchor 1)

Knowledge and Understanding

- demonstrates a limited and inaccurate understanding of area and perimeter; does not know procedure for finding area
- identifies three of four rectangles correctly, but rationale indicates confusion as to whether perimeter is additive or multiplicative
- unit use is correct

Communication

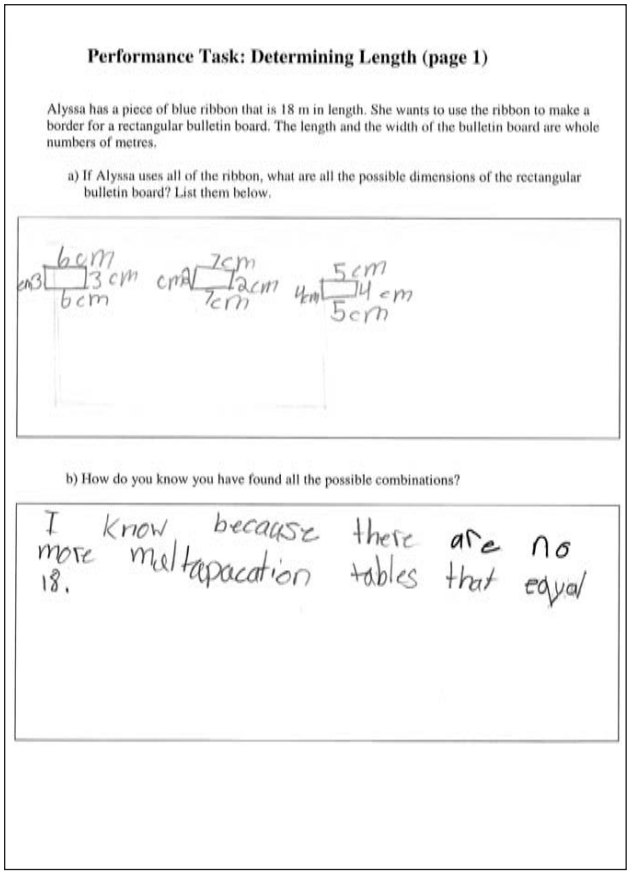
- provides an explanation in 1 b) that is not logical
- provides an explanation in 1 c) that lacks clarity

Thinking

- demonstrates a limited understanding of the problem
- applies a flawed strategy of multiplying like dimensions to determine area, but the actual multiplication is quite good

Application

- demonstrates a limited ability to apply knowledge of perimeter to solve a problem



Performance Task: Determining Length (page 1)

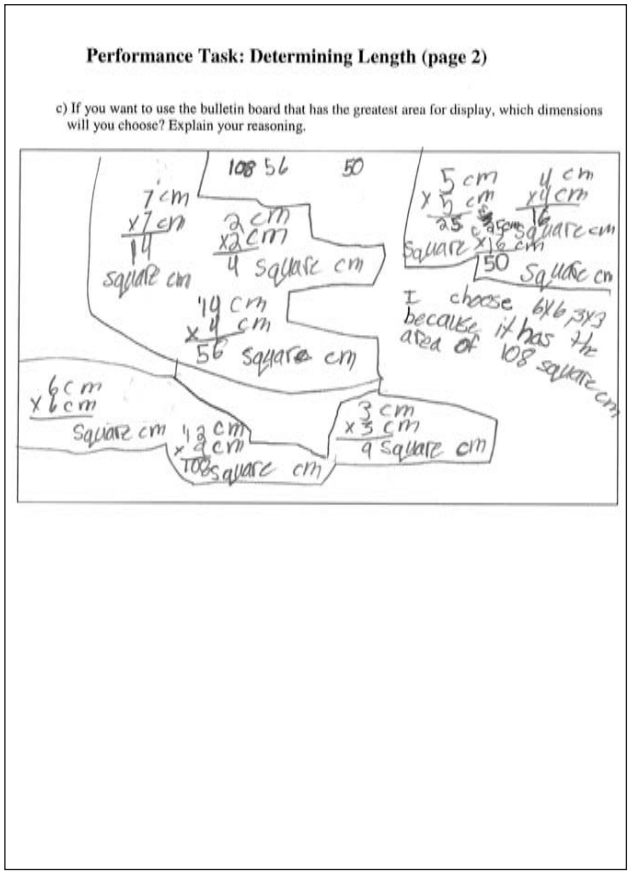
Alyssa has a piece of blue ribbon that is 18 m in length. She wants to use the ribbon to make a border for a rectangular bulletin board. The length and the width of the bulletin board are whole numbers of metres.

a) If Alyssa uses all of the ribbon, what are all the possible dimensions of the rectangular bulletin board? List them below.

6cm 3cm 6cm | 7cm 2cm 7cm | 5cm 4 cm 5cm

b) How do you know you have found all the possible combinations?

I know because there are no more multiplacation tables that equal 18.



Performance Task: Determining Length (page 2)

c) If you want to use the bulletin board that has the greatest area for display, which dimensions will you choose? Explain your reasoning.

7cm x 7cm = 14 square cm; 2cm x 2cm = 4 square cm; 10 cm x 4 cm = 56 square cm; 108 56 50; 5 cm x 5 cm = 25 square cm; 4 cm x 4 cm = 16 square cm; 50 Square cm; I choose 6x6 3x3 because it has the area of 108 square cm; 6cm x 6cm square cm; 3 cm x 3 cm = 9 square cm; 12 cm x 2 cm = 108 square cm

Performance Task 1: Determining Dimensions LEVEL 1 (Anchor 2)

Knowledge and Understanding

- demonstrates a limited and inaccurate understanding of both perimeter and area

Communication

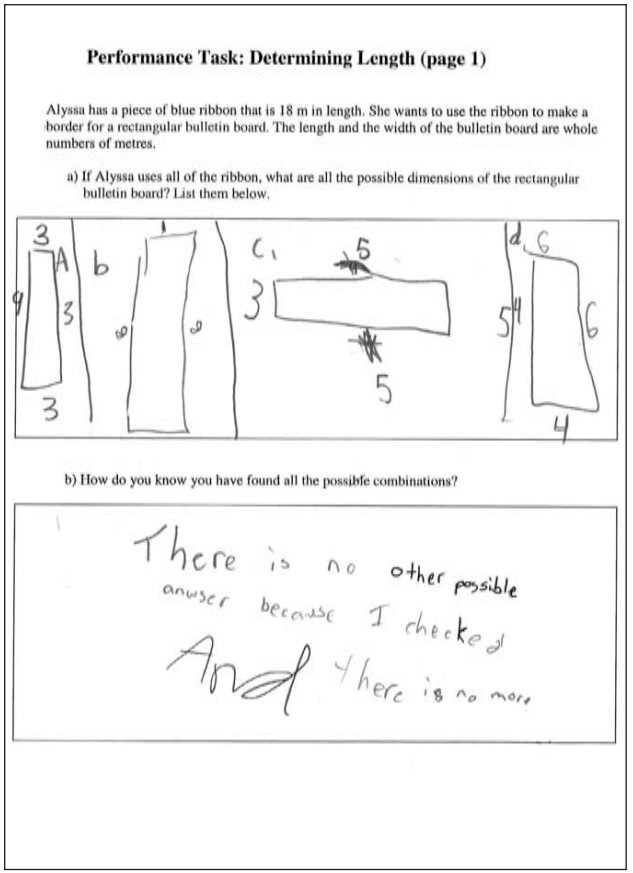
- provides both limited and inaccurate explanations
- states numerical value but does not use any units

Thinking

- demonstrates a limited understanding of the problem by identifying several rectangles, one of which is correct
- uses a strategy that results in an incorrect answer in 1 c) by selecting the rectangle that is longest

Application

- demonstrates a limited ability to apply an understanding of perimeter to solve a problem
- demonstrates some understanding of perimeter but not area



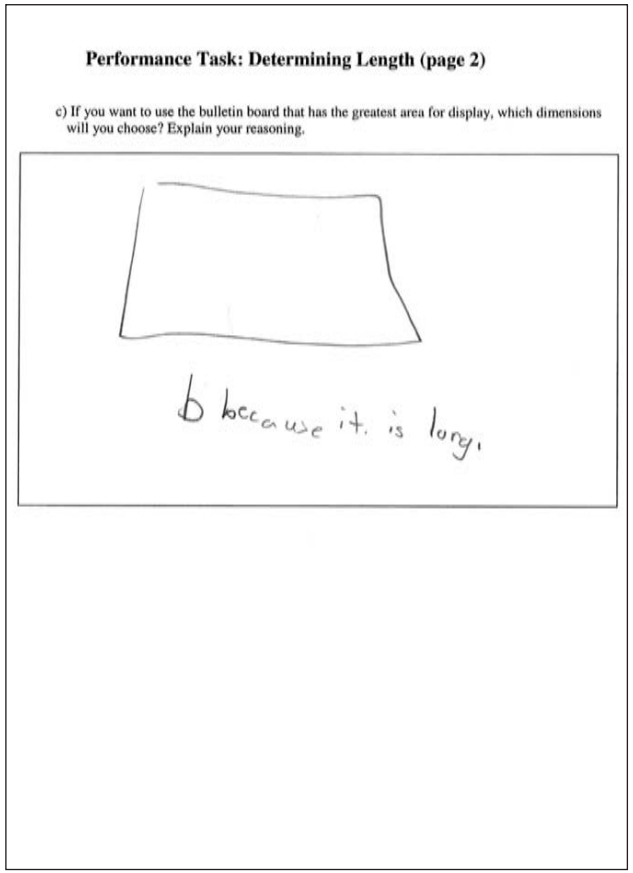
Performance Task: Determining Length (page 1)

Alyssa has a piece of blue ribbon that is 18 m in length. She wants to use the ribbon to make a border for a rectangular bulletin board. The length and the width of the bulletin board are whole numbers of metres.

a) If Alyssa uses all of the ribbon, what are all the possible dimensions of the rectangular bulletin board? List them below.

b) How do you know you have found all the possible combinations?

There is no other possible answer because I checked And there is no more



Performance Task: Determining Length (page 2)

c) If you want to use the bulletin board that has the greatest area for display, which dimensions will you choose? Explain your reasoning.

b because it is long.

Performance Task 1: Determining Dimensions LEVEL 2 (Anchor 1)

Knowledge and Understanding

- demonstrates some understanding of the concept of perimeter but no understanding of area

Communication

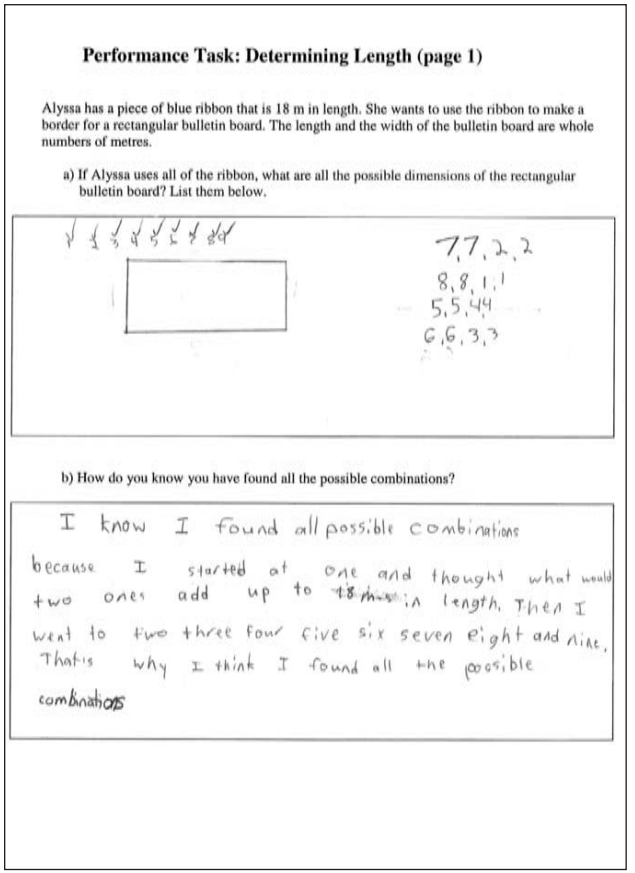
- provides an explanation in 1 b) that is somewhat logical but lacks clarity

Thinking

- identifies all of the perimeter possibilities correctly and shows some evidence of a plan
- develops an incorrect solution for the question related to area

Application

- demonstrates some ability to apply knowledge of perimeter to solve a problem



Performance Task: Determining Length (page 1)

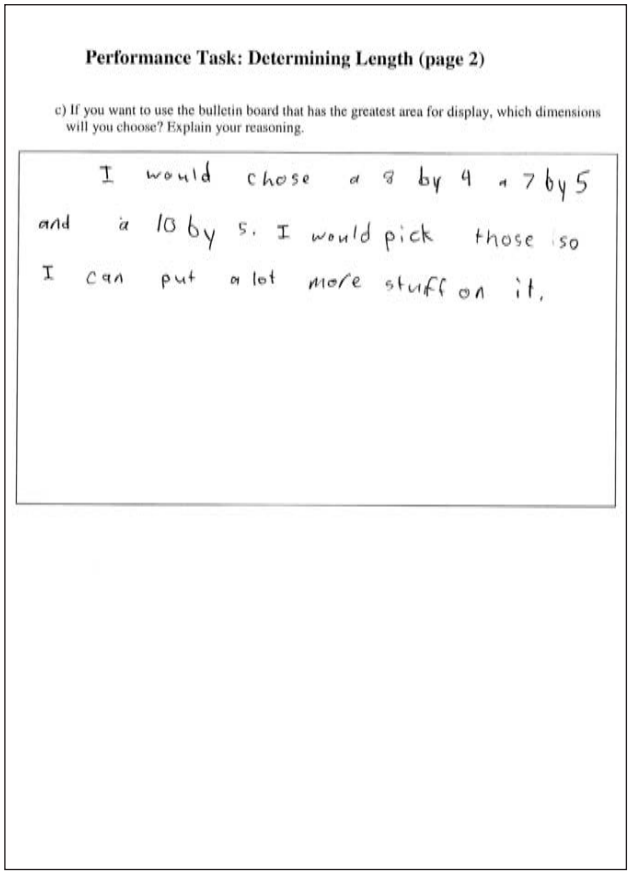
Alyssa has a piece of blue ribbon that is 18 m in length. She wants to use the ribbon to make a border for a rectangular bulletin board. The length and the width of the bulletin board are whole numbers of metres.

a) If Alyssa uses all of the ribbon, what are all the possible dimensions of the rectangular bulletin board? List them below.

7,7,2,2
8,8,1,1
5,5,4,4
6,6,3,3

b) How do you know you have found all the possible combinations?

I know I found all possible combinations because I started at one and thought what would two ones add up to 18 metres in length. Then I went to two three four five six seven eight and nine. That is why I think I found all the possible combinations



Performance Task: Determining Length (page 2)

c) If you want to use the bulletin board that has the greatest area for display, which dimensions will you choose? Explain your reasoning.

I would chose a 8 by 4 a 7 by 5 and a 10 by 5. I would pick those so I can put a lot more stuff on it.

Performance Task 1: Determining Dimensions LEVEL 2 (Anchor 2)

Knowledge and Understanding

- articulates some understanding of area and perimeter (correctly identifies two possible rectangles given a specific perimeter but is not able to identify the area)
- demonstrates some knowledge of specific concepts and correctly identifies units used to measure perimeter and area

Communication

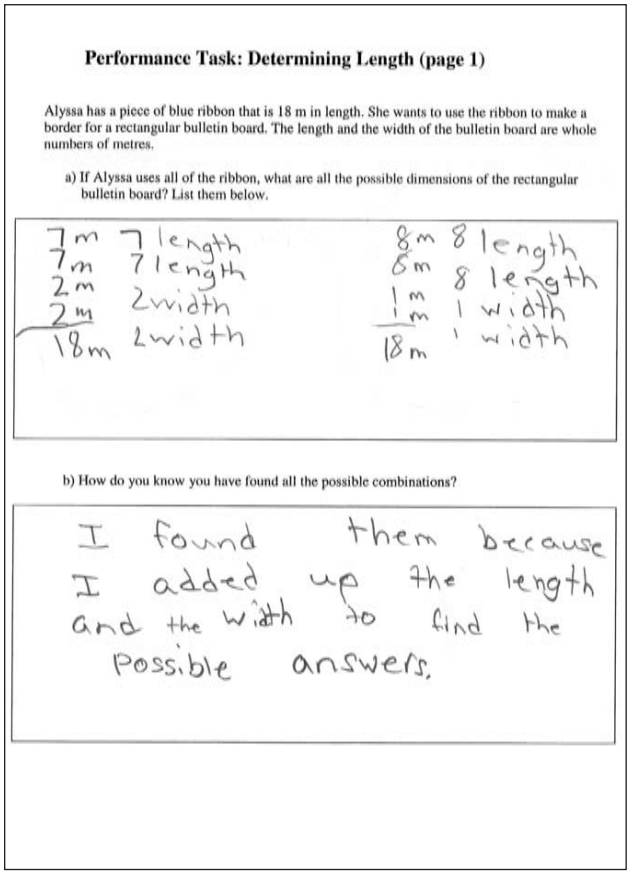
- provides a partial explanation using both numbers and words with some effectiveness

Thinking

- indicates some understanding of the problem (develops a partial solution related to perimeter)

Application

- employs some ability to apply understanding of perimeter to solve the problem incompletely
- demonstrates confusion about the procedure used to determine area, which leads to an incorrect response, although the largest area of these two samples was selected in 1 c)



Performance Task: Determining Length (page 1)

Alyssa has a piece of blue ribbon that is 18 m in length. She wants to use the ribbon to make a border for a rectangular bulletin board. The length and the width of the bulletin board are whole numbers of metres.

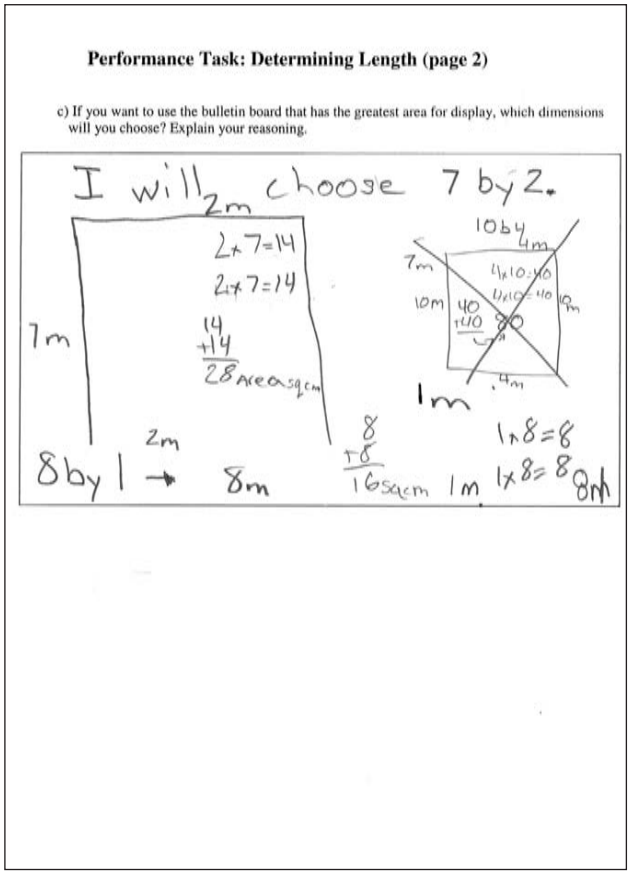
a) If Alyssa uses all of the ribbon, what are all the possible dimensions of the rectangular bulletin board? List them below.

7m 7 length
7m 7 length
2m 2 width
2m 2 width
18m

8m 8 length
8m 8 length
1m 1 width
1m 1 width
18m

b) How do you know you have found all the possible combinations?

I found them because I added up the length and the width to find the possible answers.



Performance Task: Determining Length (page 2)

c) If you want to use the bulletin board that has the greatest area for display, which dimensions will you choose? Explain your reasoning.

I will choose 7 by 2.

2m
7m
2×7=14
2×7=14
14
+14
28 area sq cm

10 by 4
4m
7m
10m
4×10=40
4×10=40
40
+40
80
4m
1m

8 by 1 → 8m
2m
8
+8
16 sq cm
1m
1×8=8
1×8=8 8m

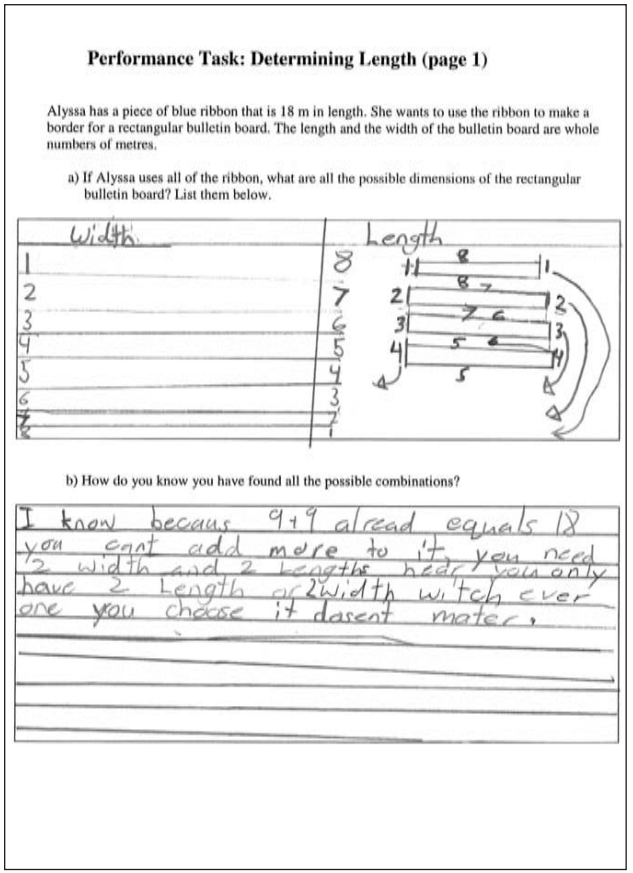
Performance Task 1: Determining Dimensions LEVEL 3 (Anchor 1)

Knowledge and Understanding
- demonstrates considerable understanding of procedures for determining the perimeter and area of rectangles
- understands that perimeter is additive and area is multiplicative

Communication
- provides a logical explanation
- communicates effectively using mathematical language and diagrams

Thinking
- articulates considerable understanding of the problem
- selects an appropriate strategy—organized list

Application
- indicates considerable ability to apply knowledge of perimeter and area to solve a problem
- sees beyond procedures and is able to articulate a relationship between area and perimeter



Performance Task: Determining Length (page 1)

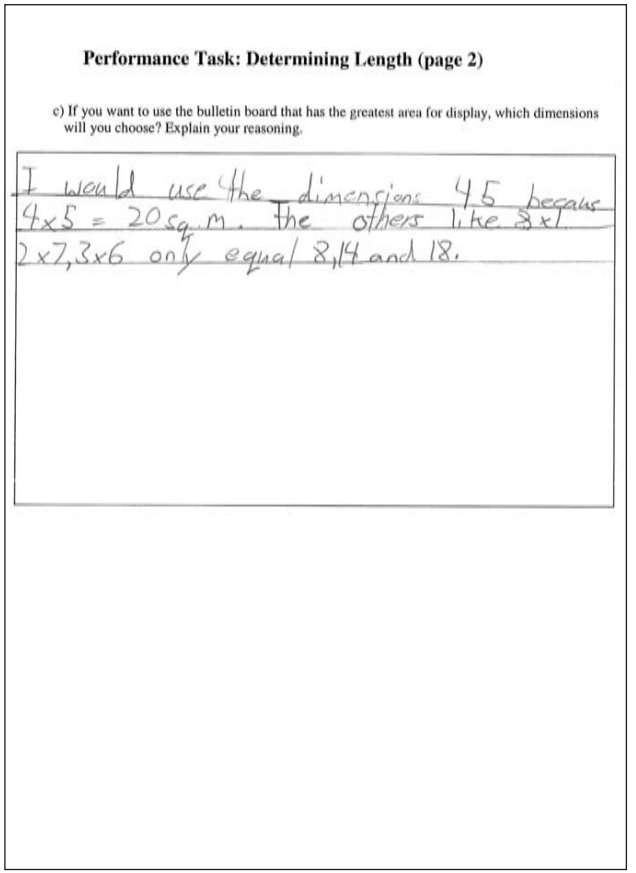
Alyssa has a piece of blue ribbon that is 18 m in length. She wants to use the ribbon to make a border for a rectangular bulletin board. The length and the width of the bulletin board are whole numbers of metres.

a) If Alyssa uses all of the ribbon, what are all the possible dimensions of the rectangular bulletin board? List them below.

Width	Length
1	8
2	7
3	6
4	5
5	4
6	3
7	2
8	1

b) How do you know you have found all the possible combinations?

I know becaus 9+9 alread equals 18 you cant add more to it you need 2 width and 2 Lengths beac you only have 2 Length or 2 Width witch ever one you choose it dasent mater.



Performance Task: Determining Length (page 2)

c) If you want to use the bulletin board that has the greatest area for display, which dimensions will you choose? Explain your reasoning.

I would use the dimensions 4 5 becaus 4x5 = 20 sq m. The others like 8x1 2x7, 3x6 only equal 8, 14 and 18.

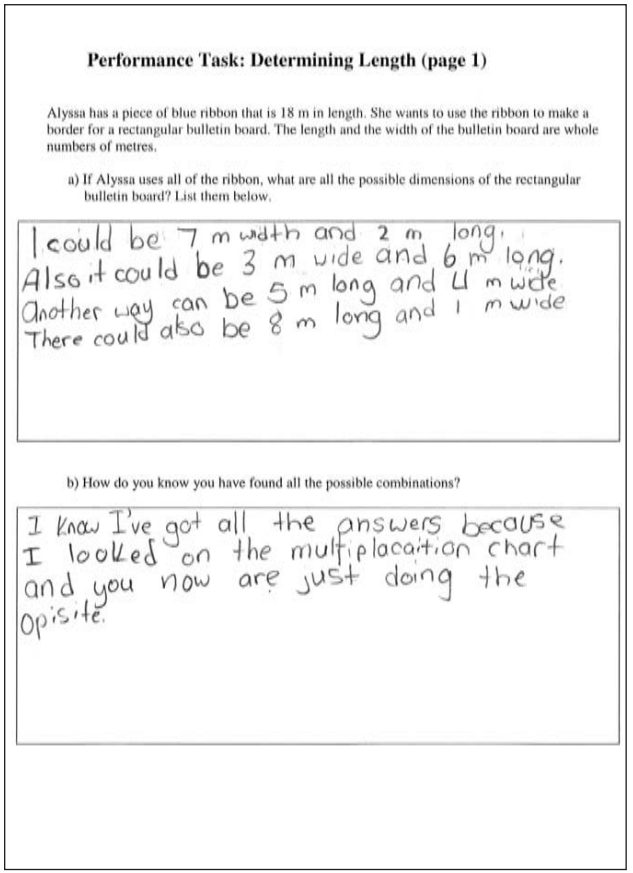
Performance Task 1: Determining Dimensions LEVEL 3 (Anchor 2)

Knowledge and Understanding
- demonstrates considerable understanding of perimeter and area

Communication
- provides a complete explanation
- provides justifications that could be more clearly articulated; there is evidence of confusion about procedures for determining perimeter and area in the explanation of 1 b)

Thinking
- indicates considerable understanding of the problem
- shows evidence of an appropriate plan for determining all of the possible dimensions as the answer is correct; however, the reasoning is flawed

Application
- demonstrates considerable ability to apply knowledge of perimeter and area to solve a problem
- applies understanding of procedures to identify a relationship between area and perimeter



Performance Task: Determining Length (page 1)

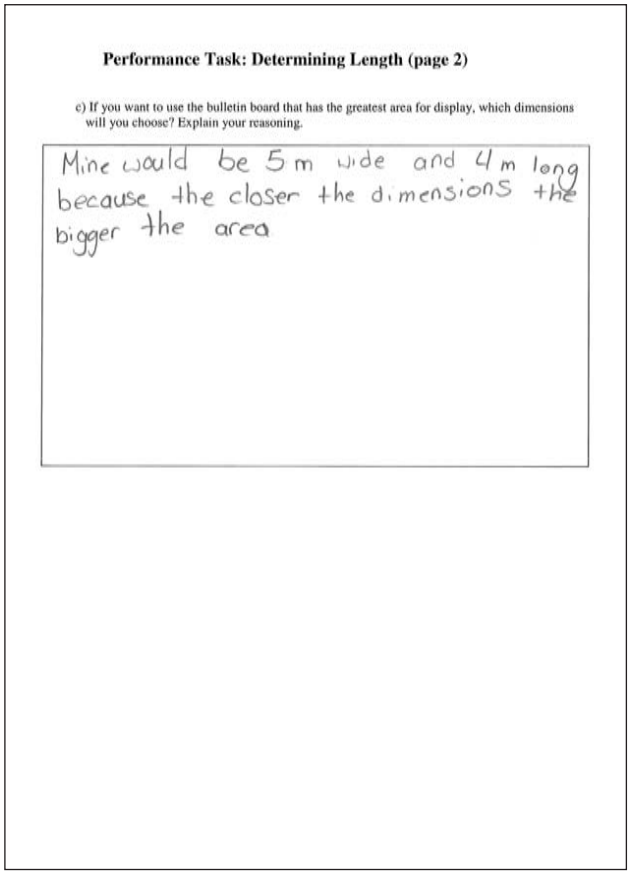
Alyssa has a piece of blue ribbon that is 18 m in length. She wants to use the ribbon to make a border for a rectangular bulletin board. The length and the width of the bulletin board are whole numbers of metres.

a) If Alyssa uses all of the ribbon, what are all the possible dimensions of the rectangular bulletin board? List them below.

I could be 7 m width and 2 m long.
Also it could be 3 m wide and 6 m long.
Another way can be 5 m long and 4 m wide
There could also be 8 m long and 1 m wide

b) How do you know you have found all the possible combinations?

I know I've got all the answers because I looked on the multiplacation chart and you now are just doing the opisite.



Performance Task: Determining Length (page 2)

c) If you want to use the bulletin board that has the greatest area for display, which dimensions will you choose? Explain your reasoning.

Mine would be 5 m wide and 4 m long because the closer the dimensions the bigger the area

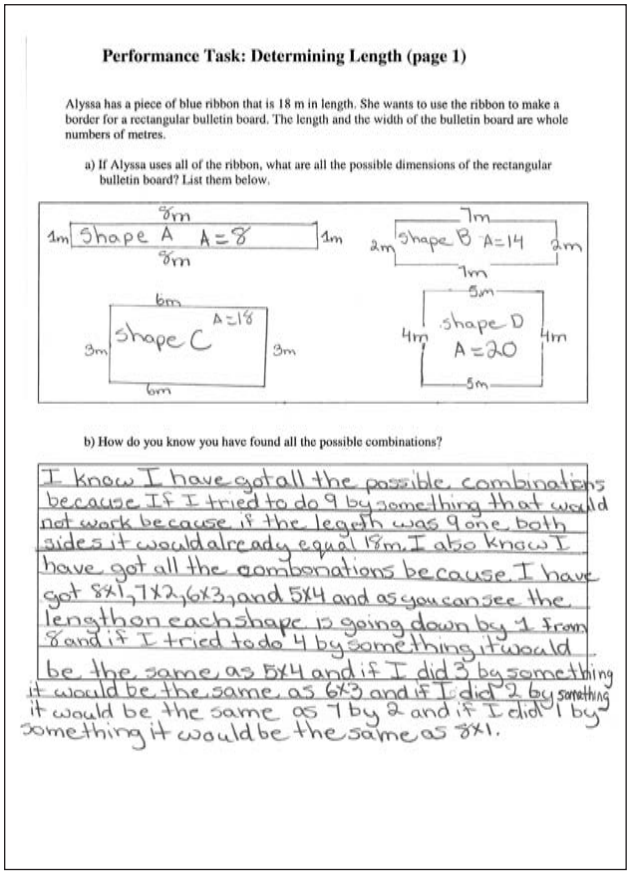
Performance Task 1: Determining Dimensions LEVEL 4 (Anchor 1)

Knowledge and Understanding
- demonstrates a thorough understanding of perimeter and area

Communication
- provides a thorough and clear explanation
- supplies effective explanations that are supported by clear and labelled diagrams

Thinking
- demonstrates the ability to think with flexibility about the problem
- applies a plan that is thorough and incorporates several strategies

Application
- displays a sophisticated ability to apply understanding of area and perimeter to solve a problem
- applies an understanding of congruence to justify premise that all possible dimension combinations had been identified



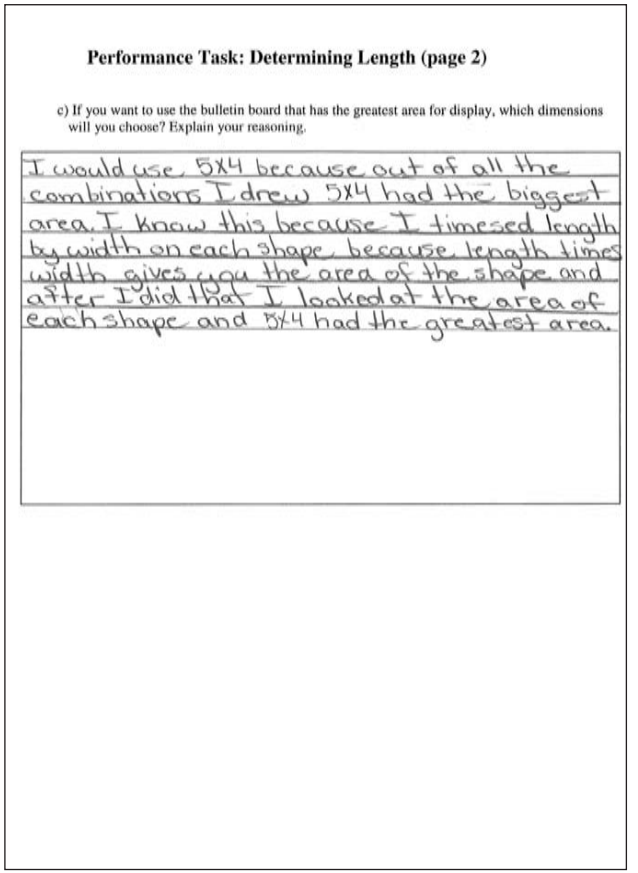
Performance Task: Determining Length (page 1)

Alyssa has a piece of blue ribbon that is 18 m in length. She wants to use the ribbon to make a border for a rectangular bulletin board. The length and the width of the bulletin board are whole numbers of metres.

a) If Alyssa uses all of the ribbon, what are all the possible dimensions of the rectangular bulletin board? List them below.

b) How do you know you have found all the possible combinations?

I know I have got all the possible combinations because If I tried to do 9 by something that would not work because if the legeth was 9 one both sides it would already equal 18m. I also know I have got all the combonations because I have got 8x1, 7x2, 6x3, and 5x4 and as you can see the length on each shape is going down by 1 from 8 and if I tried to do 4 by something it would be the same as 5x4 and if I did 3 by something it would be the same as 6x3 and if I did 2 by something it would be the same as 7 by 2 and if I did 1 by something it would be the same as 8x1.



Performance Task: Determining Length (page 2)

c) If you want to use the bulletin board that has the greatest area for display, which dimensions will you choose? Explain your reasoning.

I would use 5x4 because out of all the combinations I drew 5x4 had the bigest area. I know this because I timesed length by width on each shape because length times width gives you the area of the shape and after I did that I looked at the area of each shape and 5x4 had the greatest area.

Performance Task 1: Determining Dimensions LEVEL 4 (Anchor 2)

Knowledge and Understanding
- demonstrates a thorough understanding of perimeter and area
- articulates a clear understanding of the concept of maximizing area with respect to perimeter

Communication
- communicates with a high degree of effectiveness using multiple representations

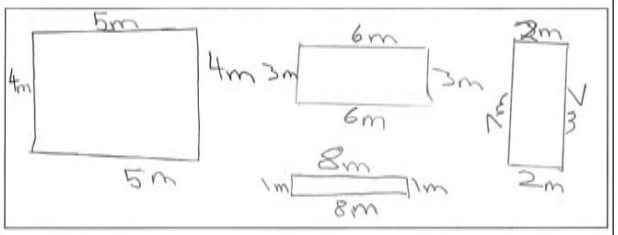
Thinking
- demonstrates a thorough understanding of the problem
- uses an appropriate strategy for ensuring that all length and width combinations are identified

Application
- provides a clearly articulated rationale for area dimensions based on a sophisticated understanding of maximizing area

Performance Task: Determining Length (page 1)

Alyssa has a piece of blue ribbon that is 18 m in length. She wants to use the ribbon to make a border for a rectangular bulletin board. The length and the width of the bulletin board are whole numbers of metres.

a) If Alyssa uses all of the ribbon, what are all the possible dimensions of the rectangular bulletin board? List them below.



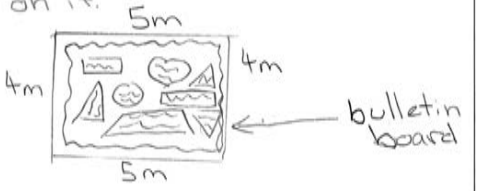
b) How do you know you have found all the possible combinations?

I know I have found all the posible combinations because I started at 5m x4m and every time I made a combination I added 1 to the biggest number and subtracted 1 to the lowest number until I got to 8mx1m and I couldn't go any more or it would go over 18m.

Performance Task: Determining Length (page 2)

c) If you want to use the bulletin board that has the greatest area for display, which dimensions will you choose? Explain your reasoning.

I would use the 5x4 because 5x4 is the closest to a square and a square alows you to put lots of objects on it.



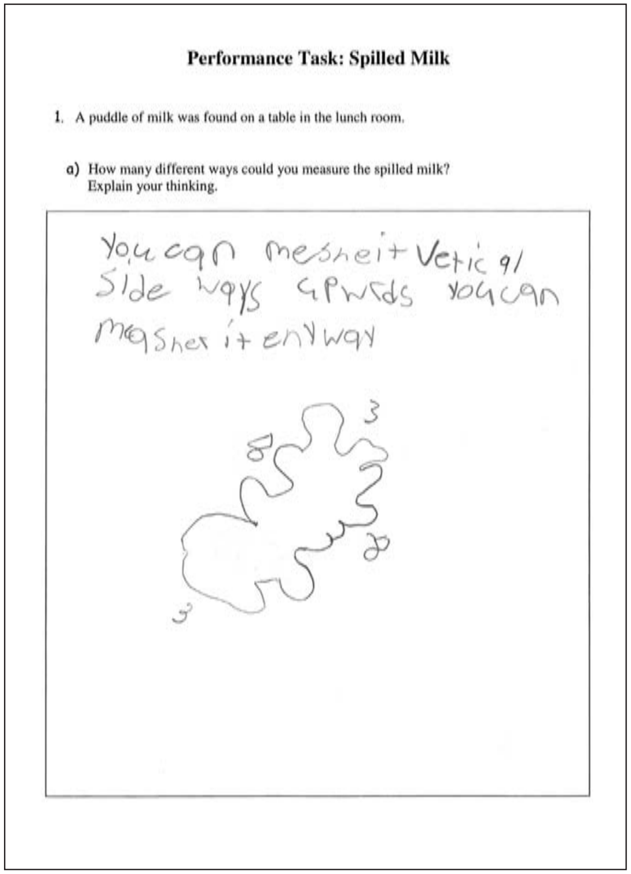
Performance Task 2: Spilled Milk LEVEL 1 (Anchor 1)

Knowledge and Understanding
- demonstrates a very limited and inaccurate understanding of measurement concepts
- supplies numbers on the diagram that indicate some understanding of relative size

Communication
- provides a limited and largely irrelevant explanation

Thinking
- demonstrates a limited understanding of the problem by attempting to list different ways spilled milk could be measured
- uses a strategy that does not connect measurable attributes or units to the problem

Application
- displays a limited ability to apply knowledge of measurement to solve the problem



Performance Task: Spilled Milk

1. A puddle of milk was found on a table in the lunch room.

a) How many different ways could you measure the spilled milk? Explain your thinking.

You can mesheit Vetic al
Side ways upwrds you can
measher it enyway

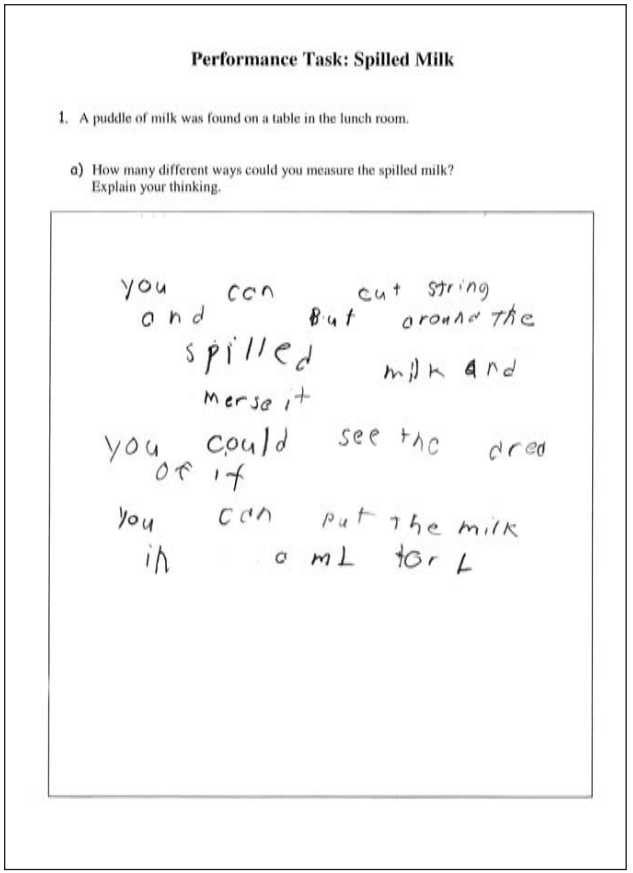
Performance Task 2: Spilled Milk LEVEL 1 (Anchor 2)

Knowledge and Understanding
- demonstrates a limited understanding of measurement concepts

Communication
- provides explanations that are both limited and inaccurate

Thinking
- indicates a limited understanding of the problem as three different ways to measure the milk are listed
- shows little evidence of a plan

Application
- demonstrates a limited ability to apply measurement concepts to solve a problem
- indicates that a string could be used but does not connect measurement to perimeter, identifies that area could be measured but does not indicate how



Performance Task: Spilled Milk

1. A puddle of milk was found on a table in the lunch room.

a) How many different ways could you measure the spilled milk? Explain your thinking.

you can cut string and But around the spilled milk and mese it you could see the dred of if you can put the milk in a mL or L

Performance Task 2: Spilled Milk LEVEL 2 (Anchor 1)

Knowledge and Understanding

- demonstrates an understanding of some measurement concepts but lacks the ability to differentiate between measurable attributes and related units

Communication

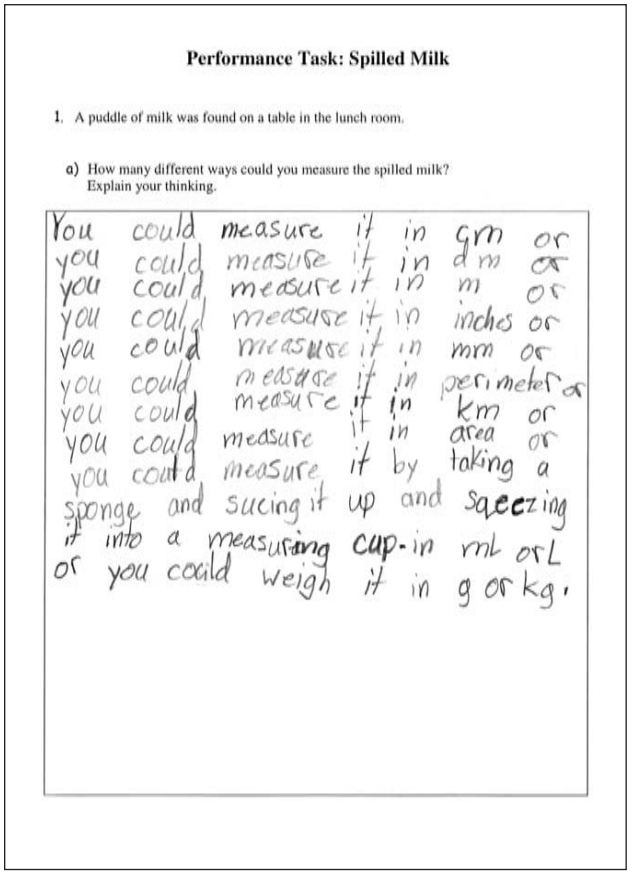
- communicates with some effectiveness
- provides a list that lacks organization

Thinking

- indicates some understanding of the problem in that there is a definite attempt to list many ways
- identifies a strategy that leads to a list that is somewhat elaborate but also imprecise and random

Application

- demonstrates some ability to apply mathematical knowledge of measurement attributes and units
- provides a response that reflects some confusion between measurement attributes and units



Performance Task: Spilled Milk

1. A puddle of milk was found on a table in the lunch room.

a) How many different ways could you measure the spilled milk? Explain your thinking.

You could measure it in grm or
you could measure it in dm or
you could measure it in m or
you could measure it in inches or
you could measure it in mm or
you could measure it in perimeter or
you could measure it in km or
you could measure it in area or
you could measure it by taking a
sponge and sucing it up and squeezing
it into a measuring cup in mL or L
or you could weigh it in g or kg.

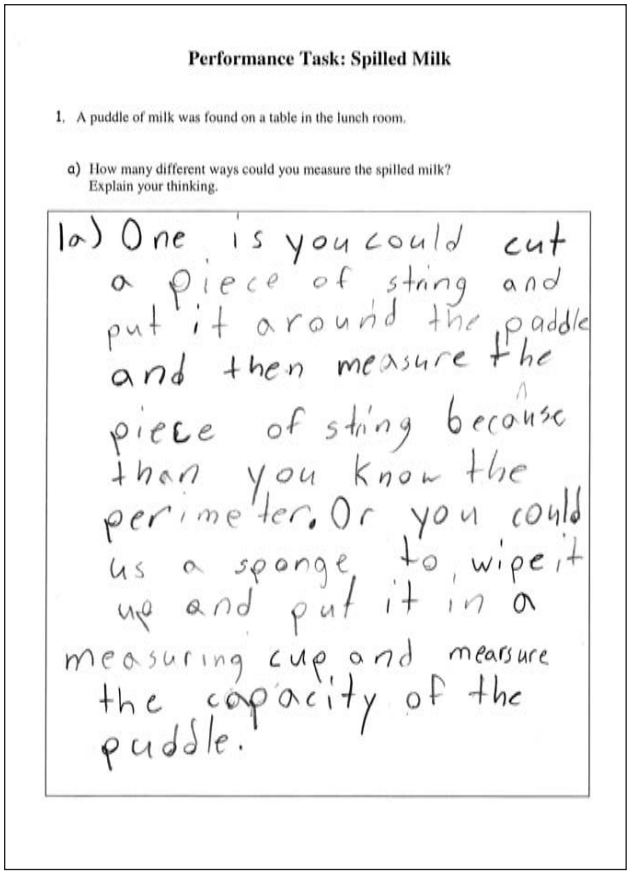
Performance Task 2: Spilled Milk LEVEL 2 (Anchor 2)

Knowledge and Understanding
- demonstrates an understanding of some measurement concepts

Communication
- provides a partial explanation
- offers an explanation related to determining capacity that is confusing and inexact

Thinking
- indicates some understanding of the problem
- develops a partial solution that is partially inaccurate

Application
- applies some understanding of only two measurable attributes



Performance Task: Spilled Milk

1. A puddle of milk was found on a table in the lunch room.

a) How many different ways could you measure the spilled milk? Explain your thinking.

1a) One is you could cut a piece of string and put it around the paddle and then measure the piece of sting because than you know the perimeter. Or you could us a sponge to wipe it up and put it in a measuring cup and mearsure the capacity of the puddle.

Performance Task 2: Spilled Milk LEVEL 3 (Anchor 1)

Knowledge and Understanding

- demonstrates considerable understanding of measurement concepts
- indicates an understanding of attributes that are measurable with some confusion between capacity and volume

Communication

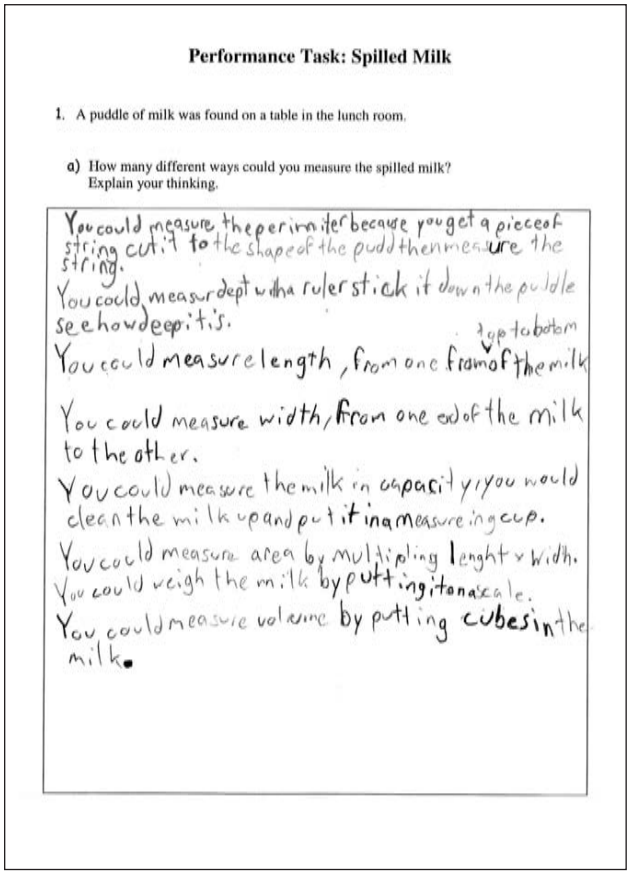
- provides a clear explanation but communication would have benefited from the inclusion of appropriate units

Thinking

- articulates considerable understanding of the problem by identifying many measurable attributes

Application

- demonstrates considerable ability to apply general understanding of measurement with flexibility



Performance Task: Spilled Milk

1. A puddle of milk was found on a table in the lunch room.

a) How many different ways could you measure the spilled milk? Explain your thinking.

You could measure the perimiter because you get a piece of string cut it to the shape of the pudd then measure the string.
You could measur dept with a ruler stick it down the puddle see how deep it is.
You could measure length, from one from of the milk to the bottom
You could measure width, from one end of the milk to the other.
You could measure the milk in capasity, you would clean the milk up and put it in a measureing cup.
You could measure area by multiplying lenght x width.
You could weigh the milk by putting it on a scale.
You could measure volume by putting cubes in the milk.

Performance Task 2: Spilled Milk LEVEL 3 (Anchor 2)

Knowledge and Understanding

- demonstrates considerable understanding of measurement concepts
- indicates an understanding of measurable attributes but does not link these to units

Communication

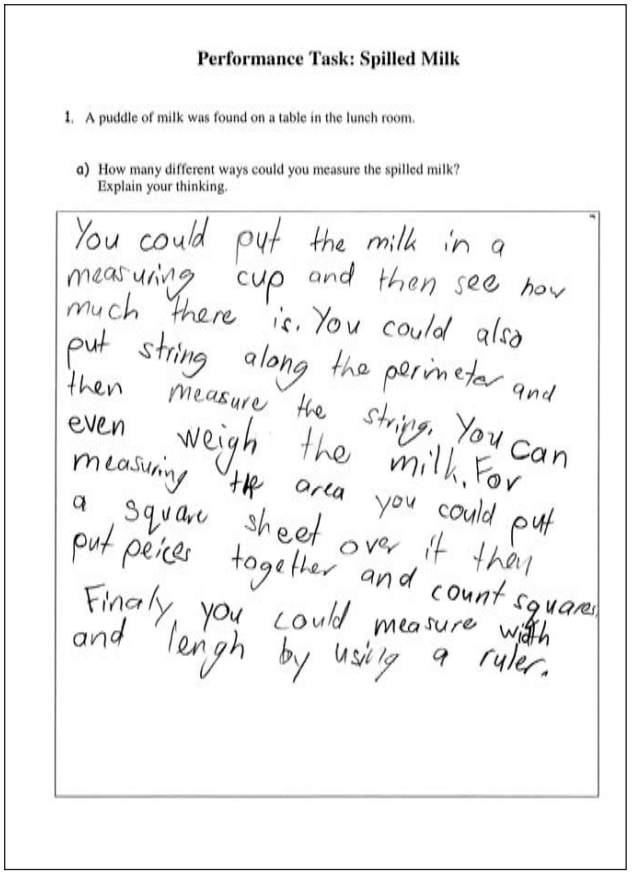
- provides a logical explanation but communication would have benefited from the inclusion of appropriate units

Thinking

- demonstrates considerable understanding of the problem by identifying multiple and appropriate measurable attributes

Application

- shows considerable ability to apply knowledge of measurement to solve a problem



Performance Task: Spilled Milk

1. A puddle of milk was found on a table in the lunch room.

a) How many different ways could you measure the spilled milk? Explain your thinking.

You could put the milk in a measuring cup and then see how much there is. You could also put string along the perimeter and then measure the string. You can even weigh the milk. For measuring the area you could put a square sheet over it then put peices together and count squares. Finaly you could measure width and lengh by using a ruler.

Performance Task 2: Spilled Milk LEVEL 4 (Anchor 1)

Knowledge and Understanding
- demonstrates a thorough understanding of measurement concepts needed to solve the problem
- indicates a thorough knowledge of specific measurement concepts; includes an interesting distinction between mass and weight, but while there is evidence of understanding of both volume and capacity, the use of volume in this context is not appropriate

Communication
- provides a clear and comprehensive explanation

Thinking
- demonstrates a thorough understanding of the problem

Application
- adapts measurement knowledge to solve the problem effectively

Performance Task: Spilled Milk

1. A puddle of milk was found on a table in the lunch room.

a) How many different ways could you measure the spilled milk? Explain your thinking.

You could measure the perimeter by a piece of string
You could measure the volume by putting cubes in the milk, or You could put the milk in a jar and measure the capacity
You could measure the height by a rular.
You could measure the mass by putting the milk in a scale on one side and put grams on the other side.
You could measure the weight by putting it on a scale and reading the numbers.
You could measure the length by a piece of string agenst the side. You could measure the width by putting a rular through the milk.
You could measure the area by putting different shapes in the milk that are the same size.

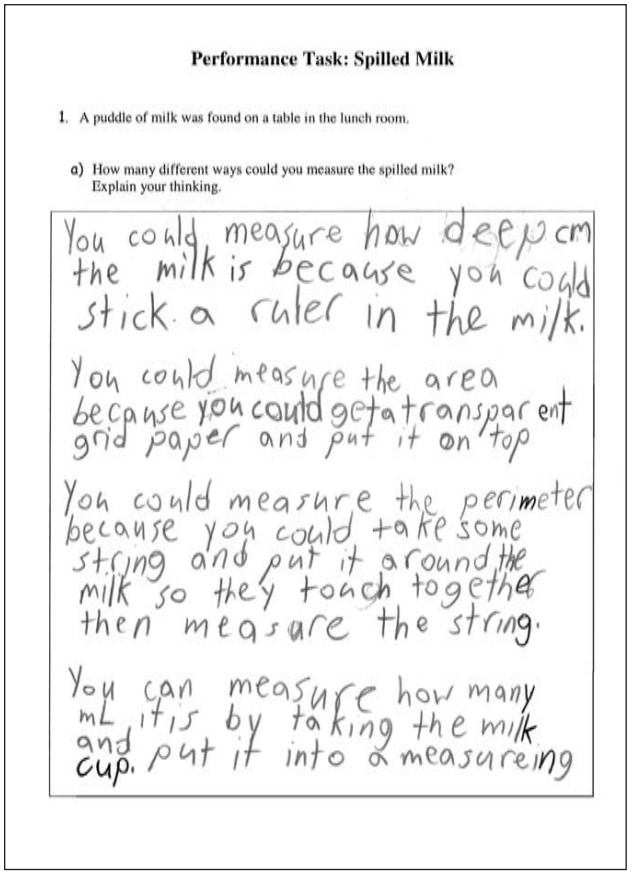
Performance Task 2: Spilled Milk LEVEL 4 (Anchor 2)

Knowledge and Understanding
- demonstrates a clear understanding of measurement concepts
- connects measurement methods to appropriate attributes with accuracy

Communication
- provides a clear and organized explanation
- includes some units that provide specific attribute detail

Thinking
- demonstrates an accurate understanding of the problem

Application
- applies understanding of measurement concepts to identify a good range of responses



Performance Task: Spilled Milk

1. A puddle of milk was found on a table in the lunch room.

a) How many different ways could you measure the spilled milk? Explain your thinking.

You could measure how deep cm the milk is because you could stick a ruler in the milk.

You could measure the area because you could get a transparent grid paper and put it on top

You could measure the perimeter because you could take some string and put it around the milk so they touch together then measure the string.

You can measure how many mL it is by taking the milk and put it into a measureing cup.

Next Steps for Measurement

Instructional Next Steps for Overall Expectations

After summarizing individual and class performance on each overall expectation, you may find that there are areas that could be retaught to some students. The following suggestions have been provided to assist you in preparing tasks for individuals or small groups of students.

Overall Expectation 4m38 (Attributes, Units, and Measurement Sense)
Estimate, measure, and record length, perimeter, area, mass, capacity, volume, and elapsed time, using a variety of strategies.

Background

This overall expectation is about strategies for estimating, measuring, and recording measurements. Inherent in this expectation are several foundational understandings in measurement. Students need to learn the attributes that they will measure; understand the structure and use of systems of measurement; select appropriate units and tools to measure to the degree of accuracy required in a particular situation; understand how to measure; and, more importantly, what it means to measure.

For further explanation, please see Baroody, Arthur. *Fostering Children's Mathematical Power: An Investigative Approach to K–8 Mathematics Instruction*. Mahwah, New Jersey: Lawrence Erlbaum Associates, 1998. pp. 15-4–15-5.

Strategies

The Concept of Measuring

Students need to understand what measurement is. Objects have many characteristics (attributes) that can be measured. When asked to measure, students must first decide what attribute needs to be measured. Does the object need to be matched to a unit of length, covered with a unit of area, or filled using a unit of capacity? Students learn to estimate by becoming familiar with benchmark measurements.

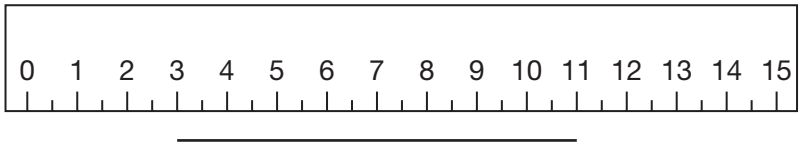
Students begin to understand the attributes of objects that can be measured (length, mass, capacity, etc.) by working with non-standard units. By the end of Grade 4, students will be familiar with standard metric units of length, mass, and capacity. They will have used non-standard units of volume. Students need many measurement opportunities to understand that the perimeter of a field is linear and therefore measured in units such as metres, which have the attribute of length. The area of the same field is measured in units such as square metres, which have the attribute of area.

Measuring Length

Students need to be able to measure length using standard metric measurement tools. It is important that they understand that it is the spaces between the marks on the measurement device that are being compared and counted. Activities such as the one following will help to reinforce this concept. Accurate measurement requires that

students become skilled at using measurement instruments. Skills are developed through experience and practice.

How long is this line?



Give students many opportunities to measure. Have them measure a length in more than one unit (centimetres and millimetres). Have students measure length using combined units (1 metre 35 cm). Use manipulatives such as tiles and geoboards when investigating area. When measuring the areas of rectangles, relate multiplication arrays to grids so that students connect a 5×7 grid with a 5×7 array and 5 rows of 7 tiles with a rectangle measuring 5×7.

Measuring Time

Measuring time and determining elapsed time can be challenging for students. There are 60 minutes in an hour, 24 hours in a day, 7 days in a week, etc. Relationships are no longer based on 10. Each unit of time has its own interval and unit of measurement. The numbers are no longer as friendly. Emphasize that with time, as with all measurement, a comparison is being made to a standard unit based on an attribute. Sixty minutes of time takes as long as one hour of time. The space between each number on a clock represents the length of five minutes.

When determining elapsed time, students are often confronted with two units of measure: hours and minutes. Allow students to develop and share strategies for determining elapsed time in a way that makes sense to them. Their calculation of elapsed time should rely on logic rather than an application of a procedure.

The skill of reading a clock or telling time is quite distinct from the measurement of time. Students need opportunities both to read and measure time.

Overall Expectation 4m39 (Measurement Relationships)
Determine the relationships among units and measurable attributes, including the area and perimeter of rectangles.

Background

This expectation is about the relationship between units in our base ten system of metric measurements as well as relationships between different attributes used to measure the same object, for example, area and perimeter.

Strategies

Metric Measurements

Provide students with many opportunities to measure lengths using metric measuring tools. Students need to "see" the 100 cm in a metre and the 10 mm in a cm. Use

benchmark lengths to help students estimate (a door is about 2 metres high, your small finger is about 1 cm in width).

Repetitive conversion questions do little to enhance measurement sense. Although the centimetre and metre are more commonly used than the decimetre as a measure of length, the difference in length between the two is significant and an intermediary reference point is beneficial.

Measuring Area and Perimeter

Relationships between linear units and area units and between area and perimeter can be very challenging for many students. Make the connection between attributes of the object and the unit used to measure the attribute explicit. Have students measure length with string and rulers (matching) and measure area with tiles (covering). Measure an object several ways. Measure the area of a desktop, measure the perimeter of a desktop, measure the height. Ask how could the mass of a desk be measured? Make connections between attributes, measuring devices, and units explicit. Give students many opportunities to investigate measurement.

Encourage students to explore the numerical patterns that underlie the formula for calculating perimeter and area. Students need to develop foundational understanding that will allow them to apply formulas with reason rather than rote memorization. Understanding is critical to avoid common student errors such as confusing the formulas for perimeter and area. By allowing students to investigate measurement relationships through a problem-solving approach prior to presenting formulas, the formulas are less likely to be forgotten, will be used flexibly, and are more likely to be expanded and adapted appropriately.

Measuring Time

Use number lines to help students visualize time. Students need to see the connection between linear measurement and the passage of time. Periods of time greater than a year have a base of 10 (10 years in a decade, 10 decades in a century, 100 years in a century). This base of 10 means students often grasp the relationships among years, decades, and centuries more quickly than the relationships among minutes, hours, days, and years.