

Teacher Package

Mathematics Exemplar Task Grade 1 – Measurement / Patterning and Algebra Teacher Package

Title: How Much Space Do You Need to Work?

Time Requirements: 145 minutes (total)

- 25 minutes to complete Pre-task 1
- 10 minutes to complete Pre-task 2
- 20 minutes to complete Pre-task 3
- two periods of 45 minutes each to complete the exemplar task

Give students ample time to explore each of the three pre-tasks. The length of time spent on each activity will depend on the discussions and investigations that come out of the original prompts.

Description of the Task

This task will require students to:

- measure how much table-top space they need to work comfortably;
- use that information to estimate how many people in total can work at a given number of tables.

Students will select an appropriate material for measuring the area of a table top, and will show how they measured the space of the selected table top and what they found out. They will then use the data to determine how many people can work at the table with them and how many people can work at two, three, four, and five tables of the same size. Finally, they will show how they arrived at their answers.

Expectations Addressed in the Exemplar Task

Note that the codes that follow the expectations are from the Ministry of Education's *Curriculum Unit Planner* (CD-ROM).

Measurement

Students will:

1. solve problems related to their day-to-day environment using concrete experiences of measurement and estimation (1m39);
2. represent the results of measurement activities using concrete materials and drawings (1m43);
3. demonstrate that a non-standard unit is used repeatedly to measure (1m44);
4. estimate and count the number of uniform and non-uniform shapes that will cover a surface (1m60).

Patterning and Algebra

Students will:

5. explore patterns and pattern rules (1m82);
6. describe, draw, and make models of patterns using actions, objects, diagrams, and words (1m84);
7. talk about a pattern rule (1m89).

Teacher Instructions

Prior Knowledge and Skills Required

To complete this task, students should have some knowledge or skills related to the following:

- exploring the concept of area or surface
- using concrete materials ("manipulatives") for non-standard measurement
- estimating how many non-standard units are needed to cover an area
- using a benchmark or reference when estimating area (e.g., choosing a non-standard unit such as a piece of letter-size paper)
- exploring and identifying number patterns

The Rubric*

The rubric provided with this exemplar task is to be used to assess students' work. The rubric is based on the achievement chart given on page 9 of *The Ontario Curriculum, Grades 1–8: Mathematics, 1997*.

*The rubric is reproduced on page 38 of this document.

Before asking students to do the task outlined in this package, review with them the concept of a rubric. Rephrase the rubric so that students can understand the different levels of achievement.

Accommodations

Accommodations that are normally provided in the regular classroom for students with special needs should be provided in the administration of the exemplar task.

Classroom Set-up

For the investigation of the assigned tasks, the following classroom organization is recommended:

- a meeting area for a large group
- meeting areas for small groups and partner activities
- individual workspaces
- chair designated as the mathematician's chair

Materials and Resources Required

Before students attempt a particular task, provide them with the appropriate materials from among the following:

- copies of the student package for each student
- classroom table of any shape or size
- non-standard measurement materials or manipulatives (e.g., interlocking cubes, geoboards, colour tiles, congruent pieces of pattern blocks, congruent counters, bingo chips, dominoes, playing cards, links, glass blobs)
- paper to use as a measurable surface and paper for recording their discoveries (50 sheets of paper)
- writing instruments (pencils, erasers)
- class pictures or work that is to be displayed (of a uniform size)
- class bulletin board or display board

Have a tape recorder and audiotape available for recording students' communication of their learning.

General Instructions

Setting the Stage

All the student work is to be completed in its entirety at school.

Students are to work in small groups or with partners to complete the pre-task activities. Students are to work individually and independently to complete the exemplar task.

Observing the Process

As students are working on the tasks, have them explain what they are doing. Having students explain their work orally reveals deep mathematical thinking that cannot always be seen in the written work of primary students. Where students do provide written work and it cannot be easily

read, transcribe that work at the side of the student's page. In this space also, record any observations or comments the student makes that will be helpful in assessing the level of the student work.

You may also choose to use the mathematician's chair to assist in the assessment process. A mathematician's chair is similar to an author's chair, except that a student sits in a designated chair and shares with classmates mathematics problems and solutions rather than stories or books. Expect students, while in the mathematician's chair, to use effective speaking skills and to communicate their thoughts clearly and completely. Also, expect classmates to use effective listening skills and to give the speaker useful feedback. To elicit feedback, you may use the following prompts:

- “What did you like about the problem?”
- “Do you agree or disagree with the solution?”
- “How could the speaker improve the problem or solution?”
- “How could the speaker change the problem to create a new problem or change the solution to arrive at a new way to solve the problem?”

See Appendix 2 for an example of a form to use in evaluating a student's statements and performance while in the mathematician's chair.

Posting a Word List

It would be useful to post a chart listing mathematical language that is currently being developed or used during the task. Such a chart will provide the students with a resource to use when communicating their mathematical learning. Words you may include for this task are: *measuring, unit, surface, strategy, pattern, manipulative, area, and space.*

The Pre-tasks

The pre-tasks are designed to review and reinforce the skills and concepts that students will be using in the exemplar task and to model strategies useful in completing the task.

Task Instructions

Introductory Activities

These pre-task activities are designed to provide students with the opportunity to try different non-standard measuring manipulatives and to discover that some manipulatives work better than others when measuring particular objects. There are several manipulatives that will work effectively and several that will not. It is important for the students to make these discoveries on their own by using a variety of tools to measure objects.

These pre-task activities are to be completed in small groups, with time provided for sharing and discussion with the whole class. The sharing and discussion time is valuable, as the students will present a wide variety of attempted strategies. Students will learn from the range of strategies and may apply new learning to future situations.

As students work on the first activity, reinforce prior learning about measurement (e.g., when you measure linear dimensions, there are no spaces between the units).

During sharing time it is important to talk about what objects were most appropriate as non-standard measuring tools and why.

Pre-task 1: Non-standard Measurement (25 minutes)

Organize the students into small groups. Give each group a piece of paper. Then present the students with the following activity:

1. Your group has been given a piece of paper.
2. Select three sets of non-standard measurement manipulatives to use in measuring the surface of your paper. For this task, use materials that are flat, rather than materials like cubes or boxes.
3. Measure the surface of the paper.
4. Record your measurements.
5. Share with the other students what you learned when you were measuring.

Students may provide responses such as the following:

- “The cards did not work very well because they were too big.”
- “The buttons left spaces.”
- “It only took 12 cards to cover the paper but it took 88 coloured squares!”

Use various prompts to continue the discussion, for example:

- “Why did it take more squares than cards?”
- “What if we were to use ...? Would it take more or fewer?”

Pre-task 2: Estimating Area (10 minutes)

In the second pre-task, students are asked to determine how many pieces of work can fit on the bulletin board. The strategies they will use may produce different valid answers, depending on how they envision the arrangement of the class work. Students need not necessarily measure the entire bulletin board; they could focus on the bottom portion and then estimate how many other pieces would fit on the rest of the bulletin board. This process of working with a uniform non-standard unit is referred to as working with a benchmark or a reference.

Organize the students into teams of two and present them with the following situation:

1. We have some of our class pictures to put up on the bulletin board.
2. With your partner, look at the pictures and the bulletin board.
3. Think about a way that you can estimate how many pictures we will be able to hang on the bulletin board so that the surface is covered.

4. You and your partner will be asked to share how you estimated the number of pictures that would cover the bulletin board.
5. Now estimate the number of pictures needed to fit on the bulletin board.
6. Share your findings with the class.

Pre-task 3: Exploring Number Patterns (20 minutes)

Make sure that each small group or pair of students has enough manipulatives or non-standard measurement materials (e.g., 20 geoboards, 20 colour tiles, 20 congruent pieces of pattern blocks, 20 interlocking cubes, or 20 congruent counters) to complete this pre-task.

Present the following activity, which is designed to have students explore a number pattern:

1. Choose the type of math manipulative that you would like to use to make a pattern.
2. Start with two of these manipulatives. Place them side by side.
3. Leave a space and put two of the same manipulatives down and add two more manipulatives to them.
4. Leave a space and put four manipulatives down and add two more to them.
5. Continue your pattern until you have put down a total of 20 manipulatives in your pattern.
6. How would you describe your pattern? Use numbers to show what happened each time you added to your pattern.

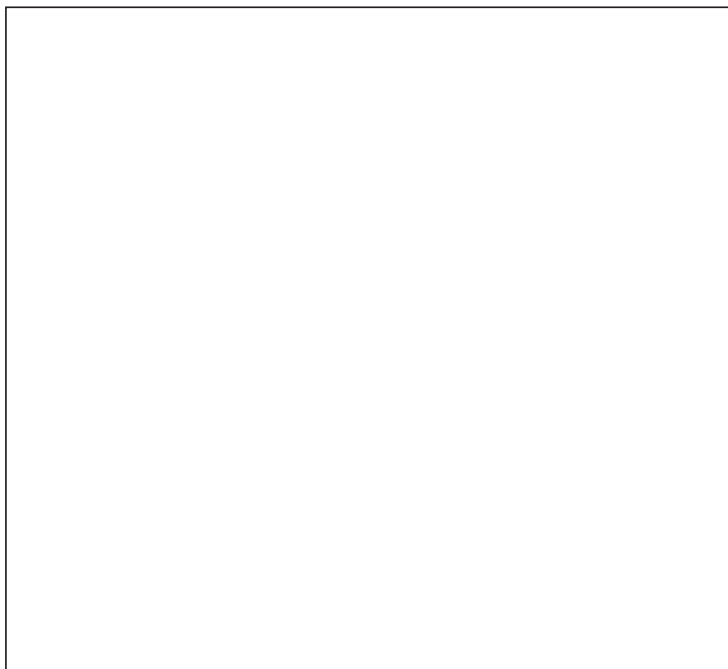
Exemplar Task (90 minutes)

1. Distribute a copy of the student package to each student.
2. Tell the students that they will be working independently to determine how much space they need to work, and how many students could work at their table. They will then use the information from this task to make predictions based on the observed pattern. (A space like the library may allow the whole class to complete the activity at one time if there are insufficient tables in the classroom. The tables do not have to be the same size or shape.) The students should show the table they used in their explanation.
3. Instruct students to make sketches whenever possible.
4. The problem that the students will solve independently is provided in the worksheets in Appendix 1.

Appendix 1: Student Worksheets

How much space do you need to do your work?

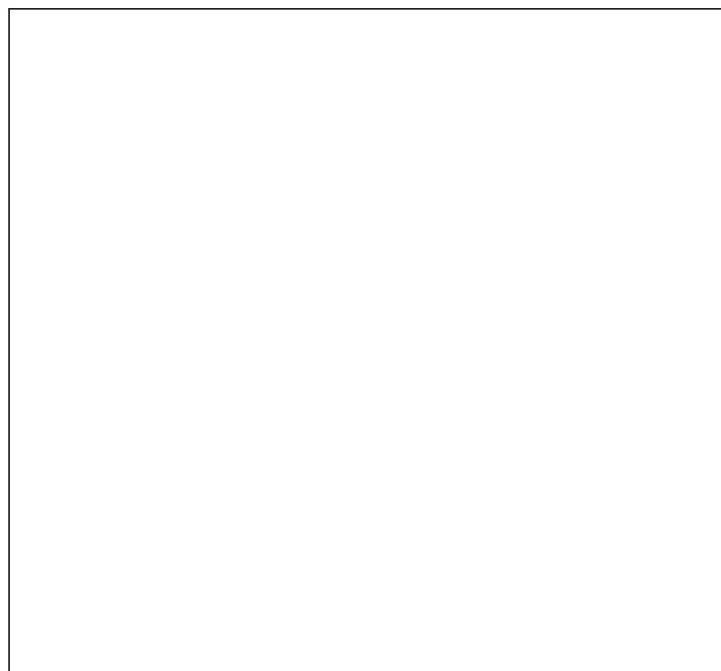
Show how you measured your space and what you found out.



Think about your working space.

Estimate how many people could work at the table with you.

Show how you estimated.



How many people could work at:

- two tables
- three tables
- four tables
- five tables

Show your work.

How do the numbers change as you add more tables? Explain.

Appendix 2: Evaluation – Mathematician’s Chair

Name of Student:	
Date:	
Expectation	Comments:
– explore patterns and pattern rules (1m82)	
– describe, draw, and make models of patterns using actions, objects, diagrams, and words (1m84)	
– talk about a pattern rule (1m89)	