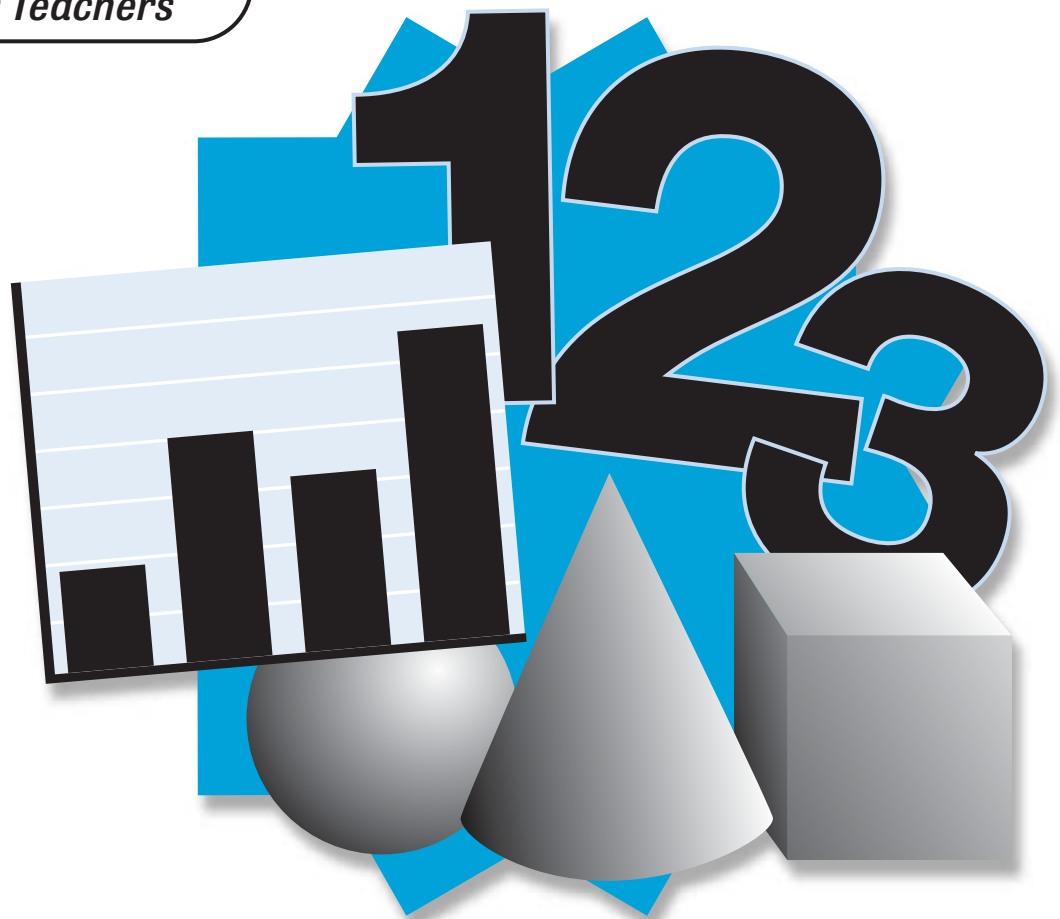


Ministry of Education

The Ontario Curriculum – Exemplars
Grade 1

Mathematics

*Samples of Student Work:
A Resource for Teachers*



2002

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Introduction

In 1997, the Ministry of Education and Training published a new mathematics curriculum policy document for Ontario elementary students entitled *The Ontario Curriculum, Grades 1–8: Mathematics, 1997*. The new curriculum is more specific than previous curricula with respect to both the knowledge and the skills that students are expected to develop and demonstrate in each grade. The document contains the curriculum expectations for each grade and an achievement chart that describes four levels of student achievement to be used in assessing and evaluating student work.

The present document is part of a set of eight documents – one for each grade – that contain samples (“exemplars”) of student work in mathematics at each of the four levels of achievement described in the achievement chart. The exemplar documents are intended to provide assistance to teachers in their assessment of student achievement of the curriculum expectations. The samples represent work produced at the end of the school year in each grade.

Ontario school boards were invited by the Ministry of Education to participate in the development of the exemplars. Teams of teachers and administrators from across the province were involved in developing the assessment materials. They designed the performance tasks and scoring scales (“rubrics”) on the basis of selected Ontario curriculum expectations, field-tested them in classrooms, suggested changes, administered the final tasks, marked the student work, and selected the exemplars used in this document. During each stage of the process, external validation teams and Ministry of Education staff reviewed the tasks and rubrics to ensure that they reflected the expectations in the curriculum policy documents and that they were appropriate for all students. External validation teams and ministry staff also reviewed the samples of student work.

The selection of student samples that appears in this document reflects the professional judgement of teachers who participated in the project. No students, teachers, or schools have been identified.

The procedures followed during the development and implementation of this project will serve as a model for boards, schools, and teachers in designing assessment tasks within the context of regular classroom work, developing rubrics, assessing the achievement of their own students, and planning for the improvement of students’ learning.

The samples in this document will provide parents¹ with examples of student work to help them monitor their children's progress. They also provide a basis for communication with teachers.

Use of the exemplar materials will be supported initially through provincial in-service training.

Purpose of This Document

This document was developed to:

- show the characteristics of student work at each of the four levels of achievement for Grade 1;
- promote greater consistency in the assessment of student work across the province;
- provide an approach to improving student learning by demonstrating the use of clear criteria applied to student work in response to clearly defined assessment tasks;
- show the connections between what students are expected to learn (the curriculum expectations) and how their work can be assessed using the levels of achievement described in the curriculum policy document for the subject.

Teachers, parents, and students should examine the student samples in this document and consider them along with the information in the Teacher's Notes and Comments/Next Steps sections. They are encouraged to examine the samples in order to develop an understanding of the characteristics of work at each level of achievement and the ways in which the levels of achievement reflect progression in the quality of knowledge and skills demonstrated by the student.

The samples in this document represent examples of student achievement obtained using only one method of assessment, called performance assessment. Teachers will also make use of a variety of other assessment methods and strategies in evaluating student achievement over a school year.

Features of This Document

This document contains the following:

- a description of each of three performance tasks (each task focuses on a particular strand or combination of strands), as well as a listing of the curriculum expectations related to the task
- a task-specific assessment chart ("rubric") for each task
- two samples of student work for each of the four levels of achievement for each task
- Teacher's Notes, which provide some details on the level of achievement for each sample

1. In this document, *parent(s)* refers to parent(s) and guardian(s).

- Comments/Next Steps, which offer suggestions for improving achievement
- the Teacher Package that was used by teachers in administering each task

It should be noted that *each sample* for a specific level of achievement represents the characteristics of work at that level of achievement.

The Tasks

The performance tasks were based directly on curriculum expectations selected from *The Ontario Curriculum, Grades 1–8: Mathematics, 1997*. The tasks encompassed the four categories of knowledge and skills (i.e., problem solving; understanding of concepts; application of mathematical procedures; communication of required knowledge related to concepts, procedures, and problem solving), requiring students to integrate their knowledge and skills in meaningful learning experiences. The tasks gave students an opportunity to demonstrate how well they could use their knowledge and skills in a specific context.

Teachers were required to explain the scoring criteria and descriptions of the levels of achievement (i.e., the information in the task rubric) to the students before they began the assignment.

The Rubrics

In this document, the term *rubric* refers to a scoring scale that consists of a set of achievement criteria and descriptions of the levels of achievement for a particular task. The scale is used to assess students' work; this assessment is intended to help students improve their performance level. The rubric identifies key criteria by which students' work is to be assessed, and it provides descriptions that indicate the degree to which the key criteria have been met. The teacher uses the descriptions of the different levels of achievement given in the rubric to assess student achievement on a particular task.

The rubric for a specific performance task is intended to provide teachers and students with an overview of the expected product with regard to the knowledge and skills being assessed as a whole.

The achievement chart in the curriculum policy document for mathematics provides a standard province-wide tool for teachers to use in assessing and evaluating their students' achievement over a period of time. While the chart is broad in scope and general in nature, it provides a reference point for all assessment practice and a framework within which to assess and evaluate student achievement. The descriptions associated with each level of achievement serve as a guide for gathering and tracking assessment information, enabling teachers to make consistent judgements about the quality of student work while providing clear and specific feedback to students and parents.

For the purposes of the exemplar project, a single rubric was developed for each performance task. This task-specific rubric was developed in relation to the achievement chart in the curriculum policy document.

The differences between the achievement chart and the task-specific rubric may be summarized as follows:

- The achievement chart contains broad descriptions of achievement. Teachers use it to assess student achievement over time, making a summative evaluation that is based on the total body of evidence gathered through using a variety of assessment methods and strategies.
- The rubric contains criteria and descriptions of achievement that relate to a specific task. The rubric uses some terms that are similar to those in the achievement chart but focuses on aspects of the specific task. Teachers use the rubric to assess student achievement on a single task.

The rubric contains the following components:

- an identification (by number) of the expectations on which student achievement in the task was assessed
- the four categories of knowledge and skills
- the relevant criteria for evaluating performance of the task
- descriptions of student performance at the four levels of achievement (level 3 on the achievement chart is considered to be the provincial standard)

As stated earlier, the focus of performance assessment using a rubric is to improve students' learning. In order to improve their work, students need to be provided with useful feedback. Students find that feedback on the strengths of their achievement and on areas in need of improvement is more helpful when the specific category of knowledge or skills is identified and specific suggestions are provided than when they receive only an overall mark or general comments. Student achievement should be considered in relation to the criteria for assessment stated in the rubric for each category, and feedback should be provided for each category. Through the use of a rubric, students' strengths and weaknesses are identified and this information can then be used as a basis for planning the next steps for learning. In this document, the Teacher's Notes indicate the reasons for assessing a student's performance at a specific level of achievement, and the Comments/Next Steps give suggestions for improvement.

In the exemplar project, a single rubric encompassing the four categories of knowledge and skills was used to provide an effective means of assessing the particular level of student performance in each performance task, to allow for consistent scoring of student performance, and to provide information to students on how to improve their work. However, in the classroom, teachers may find it helpful to make use of additional rubrics if they need to assess student achievement on a specific task in greater detail for one or more of the four categories. For example, it may be desirable in evaluating a written report on an investigation to use separate rubrics for assessing understanding of concepts, problem-solving skills, ability to apply mathematical procedures, and communication skills.

The rubrics for the tasks in the exemplar project are similar to the scales used by the Education Quality and Accountability Office (EQAO) for the Grade 3, Grade 6, and Grade 9 provincial assessments in that both the rubrics and the EQAO scales are based on the Ontario curriculum expectations and the achievement charts. The rubrics differ from the EQAO scales in that they were developed to be used only in the context of classroom instruction to assess achievement in a particular assignment.

Although rubrics were used effectively in this exemplar project to assess responses related to the performance tasks, they are only one way of assessing student achievement. Other means of assessing achievement include observational checklists, tests, marking schemes, or portfolios. Teachers may make use of rubrics to assess students' achievement on, for example, essays, reports, exhibitions, debates, conferences, interviews, oral presentations, recitals, two- and three-dimensional representations, journals or logs, and research projects.

Development of the Tasks

The performance tasks for the exemplar project were developed by teams of educators in the following way:

- The teams selected a cluster of curriculum expectations that focused on the knowledge and skills that are considered to be of central importance in the subject area. Teams were encouraged to select a manageable number of expectations. The particular selection of expectations ensured that all students would have the opportunity to demonstrate their knowledge and skills in each category of the achievement chart in the curriculum policy document for the subject.
- The teams drafted three tasks for each grade that would encompass all of the selected expectations and that could be used to assess the work of all students.
- The teams established clear, appropriate, and concrete criteria for assessment, and wrote the descriptions for each level of achievement in the task-specific rubric, using the achievement chart for the subject as a guide.
- The teams prepared detailed instructions for both teachers and students participating in the assessment project.
- The tasks were field-tested in classrooms across the province by teachers who had volunteered to participate in the field test. Student work was scored by teams of educators. In addition, classroom teachers, students, and board contacts provided feedback on the task itself and on the instructions that accompanied the task. Suggestions for improvement were taken into consideration in the revision of the tasks, and the feedback helped to finalize the tasks, which were then administered in the spring of 2001.

In developing the tasks, the teams ensured that the resources needed for completing the tasks – that is, all the worksheets and support materials – were available.

Prior to both the field tests and the final administration of the tasks, a team of validators – including research specialists, gender and equity specialists, and subject experts – reviewed the instructions in the teacher and student packages, making further suggestions for improvement.

Assessment and Selection of the Samples

After the final administration of the tasks, student work was scored at the district school board level by teachers of the subject who had been provided with training in the scoring. These teachers evaluated and discussed the student work until they were able to reach a consensus regarding the level to be assigned for achievement in each category. This evaluation was done to ensure that the student work being selected clearly illustrated that level of performance. All of the student samples were then forwarded to the ministry. A team of teachers from across the province, who had been trained by the ministry to assess achievement on the tasks, rescored the student samples. They chose samples of work that demonstrated the same level of achievement in all four categories and then, through consensus, selected the samples that best represented the characteristics of work at each level of achievement. The rubrics were the primary tools used to evaluate student work at both the school board level and the provincial level.

The following points should be noted:

- Two samples of student work are included for each of the four achievement levels. The use of two samples is intended to show that the characteristics of an achievement level can be exemplified in different ways.
- Although the samples of student work in this document were selected to show a level of achievement that was largely consistent in the four categories (i.e., problem solving; understanding of concepts; application of mathematical procedures; communication of required knowledge), teachers using rubrics to assess student work will notice that students' achievement frequently varies across the categories (e.g., a student may be achieving at level 3 in understanding of concepts but at level 4 in communication of required knowledge).
- Although the student samples show responses to most questions, students achieving at level 1 and level 2 will often omit answers or will provide incomplete responses or incomplete demonstrations.
- Students' effort was not evaluated. Effort is evaluated separately by teachers as part of the "learning skills" component of the Provincial Report Card.
- The document does not provide any student samples that were assessed using the rubrics and judged to be below level 1. Teachers are expected to work with students whose achievement is below level 1, as well as with their parents, to help the students improve their performance.

Use of the Student Samples

Teachers and Administrators

The samples of student work included in the exemplar documents will help teachers and administrators by:

- providing student samples and criteria for assessment that will enable them to help students improve their achievement;
- providing a basis for conversations among teachers, parents, and students about the criteria used for assessment and evaluation of student achievement;

- facilitating communication with parents regarding the curriculum expectations and levels of achievement for each subject;
- promoting fair and consistent assessment within and across grade levels.

Teachers may choose to:

- use the teaching/learning activities outlined in the performance tasks;
- use the performance tasks and rubrics in the document in designing comparable performance tasks;
- use the samples of student work at each level as reference points when assessing student work;
- use the rubrics to clarify what is expected of the students and to discuss the criteria and standards for high-quality performance;
- review the samples of work with students and discuss how the performances reflect the levels of achievement;
- adapt the language of the rubrics to make it more “student friendly”;
- develop other assessment rubrics with colleagues and students;
- help students describe their own strengths and weaknesses and plan their next steps for learning;
- share student work with colleagues for consensus marking;
- partner with another school to design tasks and rubrics, and to select samples for other performance tasks.

Administrators may choose to:

- encourage and facilitate teacher collaboration regarding standards and assessment;
- provide training to ensure that teachers understand the role of the exemplars in assessment, evaluation, and reporting;
- establish an external reference point for schools in planning student programs and for school improvement;
- facilitate sessions for parents and school councils using this document as a basis for discussion of curriculum expectations, levels of achievement, and standards.

Parents

The performance tasks in this document exemplify a range of meaningful and relevant learning activities related to the curriculum expectations. In addition, this document invites the involvement and support of parents as they work with their children to improve their achievement. Parents may use the samples of student work and the rubrics as:

- resources to help them understand the levels of achievement;
- models to help monitor their children’s progress from level to level;
- a basis for communication with teachers about their children’s achievement;
- a source of information to help their children monitor achievement and improve their performance;
- models to illustrate the application of the levels of achievement.

Students

Students are asked to participate in performance assessments in all curriculum areas. When students are given clear expectations for learning, clear criteria for assessment, and immediate and helpful feedback, their performance improves. Students' performance improves as they are encouraged to take responsibility for their own achievement and to reflect on their own progress and "next steps".

It is anticipated that the contents of this document will help students in the following ways:

- Students will be introduced to a model of one type of task that will be used to assess their learning, and will discover how rubrics can be used to improve their product or performance on an assessment task.
- The performance tasks and the exemplars will help clarify the curriculum expectations for learning.
- The rubrics and the information given in the Teacher's Notes section will help clarify the assessment criteria.
- The information given under Comments/Next Steps will support the improvement of achievement by focusing attention on two or three suggestions for improvement.
- With an increased awareness of the performance tasks and rubrics, students will be more likely to communicate effectively about their achievement with their teachers and parents, and to ask relevant questions about their own progress.
- Students can use the criteria and the range of student samples to help them see the differences in the levels of achievement. By analysing and discussing these differences, students will gain an understanding of ways in which they can assess their own responses and performances in related assignments and identify the qualities needed to improve their achievement.

Number Sense and Numeration

Going to the Zoo

The Task

This task required students to determine the number of possible combinations in which 16 people could be organized in cars and vans for transportation to the zoo. Students were told that a van could hold a maximum of 6 people and a car could hold a maximum of 4 people. Students were asked to explain how they solved the problem.

Expectations

This task gave students the opportunity to demonstrate achievement of all or part of each of the following selected expectations from the Number Sense and Numeration strand. Note that the codes that follow the expectations are from the Ministry of Education's *Curriculum Unit Planner* (CD-ROM).

Students will:

1. understand and explain basic operations (addition and subtraction) of whole numbers by modelling and discussing a variety of problem situations (1m6);
2. solve simple problems involving counting, joining, and taking one group away from another, and describe and explain the strategies used (1m8);
3. represent addition and subtraction sentences (e.g., $5 + 6 = 11$) using concrete materials (e.g., counters) (1m30);
4. use concrete materials to help in solving simple number problems (1m35);
5. describe their thinking as they solve problems (1m36).

Prior Knowledge and Skills

To complete this task, students were expected to have some knowledge or skills relating to the following:

- solving problems that involve multiple combinations or solutions
- solving problems using manipulative objects
- exploring addition and subtraction concepts
- communicating their problem-solving strategies and mathematical learning, both orally and in writing

For information on the process used to prepare students for the task and on the materials and equipment required, see the Teacher Package reproduced on pages 31–34 of this document.

Task Rubric – Going to the Zoo

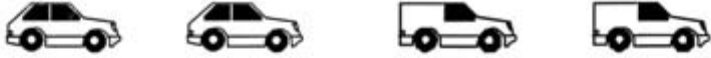
Expectations*	Level 1	Level 2	Level 3	Level 4
Problem solving				
The student:				
2	– selects and applies a problem-solving strategy that leads to an incomplete or inaccurate solution	– selects and applies an appropriate problem-solving strategy that leads to a partially complete and/or partially accurate solution	– selects and applies an appropriate problem-solving strategy that leads to a generally complete and accurate solution	– selects and applies an appropriate problem-solving strategy that leads to a thorough and accurate solution
Understanding of concepts				
The student:				
1	– demonstrates a limited understanding of combining numbers to obtain the sum of 16	– demonstrates some understanding of combining numbers to obtain the sum of 16	– demonstrates a clear understanding of combining numbers to obtain the sum of 16	– demonstrates a thorough understanding of combining numbers to obtain the sum of 16
Application of mathematical procedures				
The student:				
4	– uses concrete materials and mathematical procedures, making many errors and/or omissions and arriving at an incomplete or a limited solution	– uses concrete materials and mathematical procedures, making some errors and/or omissions and arriving at a partial or an unclear solution	– uses concrete materials and mathematical procedures, making few errors and/or omissions and arriving at a clear solution	– uses concrete materials and mathematical procedures, making few, if any, minor errors and/or omissions and arriving at a clear and thorough solution
Communication of required knowledge				
The student:				
3, 5	– uses pictures, words, or numbers to describe and illustrate with limited clarity the methods chosen for investigating the cars-and-vans problem – describes with limited clarity the strategy used	– uses pictures, words, or numbers to describe and illustrate with some clarity the methods chosen for investigating the cars-and-vans problem – describes with some clarity the strategy used	– uses pictures, words, or numbers to describe and illustrate clearly the methods chosen for investigating the cars-and-vans problem – clearly describes the strategy used	– uses pictures, words, or numbers to describe and illustrate clearly and precisely the methods chosen for investigating the cars-and-vans problem – clearly and precisely describes the strategy used

*The expectations that correspond to the numbers given in this chart are listed on page 12.

Note: This rubric does not include criteria for assessing student performance that falls below level 1.

Going to the Zoo Level 1, Sample 1

A



16 people are going to the zoo.

Vans and cars can be used to drive everyone to the zoo.

The most a van can hold is 6 people.

The most a car can hold is 4 people.

How many cars and vans could be used? Show as many ways as you can to organize the 16 people in cars and vans.



B

Explain how you solved the problem.

I learned ABC.
I used cubes.
I learned 1 2 3.

Teacher's Notes

Problem Solving

- The student selects and applies a problem-solving strategy that leads to an incomplete or inaccurate solution (e.g., uses only full cars and vans to find combinations).

Understanding of Concepts

- The student demonstrates a limited understanding of combining numbers to obtain the sum of 16 (e.g., of the two combinations offered, the first has a total of 16 and the second, a total of 20).

Application of Mathematical Procedures

- The student uses concrete materials and mathematical procedures, making many errors and omissions and arriving at an incomplete or a limited solution (e.g., in this limited solution, the second combination does not satisfy one of the conditions of the problem, which is to organize 16 people, not 20, in cars and vans).

Communication of Required Knowledge

- The student uses pictures, words, or numbers to describe and illustrate with limited clarity the methods chosen for investigating the cars-and-vans problem (e.g., draws vans and cars and writes above the vehicle the numeral representing the number of people in each car or van; does not include addition sentences to show solutions).
- The student describes with limited clarity the strategy used (e.g., “I learned ABC. I used cubes. I learned 123”).

Comments/Next Steps

- The student needs to practise counting and computational skills, using concrete materials, in order to develop an understanding of the correlation between the concrete materials and the symbols of mathematics.
- The student needs to work with concrete materials to find combinations for given sums.
- The student should discuss problem-solving experiences in order to strengthen communication skills.
- The student needs to read questions carefully and to think about or even rephrase what is being asked.

Going to the Zoo Level 1, Sample 2

A



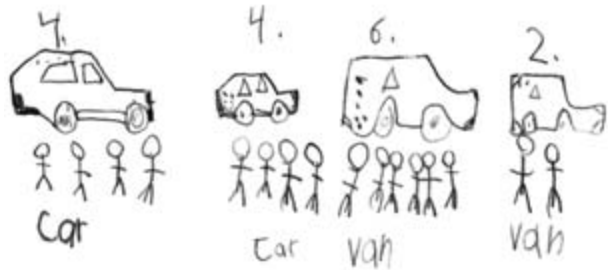
16 people are going to the zoo.

Vans and cars can be used to drive everyone to the zoo.

The most a van can hold is 6 people.

The most a car can hold is 4 people.

How many cars and vans could be used? Show as many ways as you can to organize the 16 people in cars and vans.



there are 4. people in a car.
and there are 6. people and there are 2. people
in a van.

B



There are 2. people in the
There are 4. people in the car.
and 6. people in a van.
and 4. people in a car.

C

Explain how you solved the problem. I p~~ut~~e 6. p e o p l e i n a v a h
 a n d I p u t e d i n t h e l t r 6. i n a v a h
 a n d I p u t e 4 i n a c a r.
 a n d I p u t e 4 i n a c a r.

Teacher's Notes

Problem Solving

- The student selects and applies a problem-solving strategy that leads to an incomplete or inaccurate solution (e.g., gives one combination, then records the same combination again).

Understanding of Concepts

- The student demonstrates a limited understanding of combining numbers to obtain the sum of 16 (e.g., gives only one combination).

Application of Mathematical Procedures

- The student uses concrete materials and mathematical procedures, making many errors and/or omissions and arriving at an incomplete or a limited solution (e.g., shows a combination that has been accurately computed, but shows only one combination; does not include an addition sentence in the solution).

Communication of Required Knowledge

- The student uses pictures, words, or numbers to describe and illustrate with limited clarity the methods chosen for investigating the cars-and-vans problem (e.g., uses a labelled picture to show the number of people in vans and cars and attempts to use words that summarize the picture).
- The student describes with limited clarity the strategy used (e.g., attempts to explain how the problem was solved but states only, "I p~~ut~~e 6 people in a van. and I p~~ut~~e a in the ltr 6 in a van and I p~~ut~~e 4 in a car. and I p~~ut~~e 4 in a car").

Comments/Next Steps

- The student needs to work with concrete materials to find combinations for given sums.
- The student should orally rehearse answers before writing them to improve the clarity of his or her written work.

Going to the Zoo Level 2, Sample 1

A



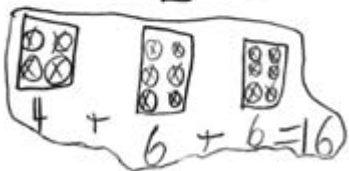
16 people are going to the zoo.

Vans and cars can be used to drive everyone to the zoo.

The most a van can hold is 6 people.

The most a car can hold is 4 people.

How many cars and vans could be used? Show as many ways as you can to organize the 16 people in cars and vans.



B

Explain how you solved the problem.

I used counters. The most a car can hold is 4. the most a van can hold is 6.

Teacher's Notes

Problem Solving

- The student selects and applies an appropriate problem-solving strategy that leads to a partially complete and/or partially accurate solution (e.g., in using counters, finds two combinations for 16 that are correct and that relate directly to the problem).

Understanding of Concepts

- The student demonstrates some understanding of combining numbers to obtain the sum of 16 (e.g., shows three combinations for 16, two of which are more appropriate for the cars-and-vans problem).

Application of Mathematical Procedures

- The student uses concrete materials and mathematical procedures, making some errors and/or omissions and arriving at a partial or an unclear solution (e.g., two of the solutions include illustrations and addition sentences; no direct reference is made to the number of cars and vans required).

Communication of Required Knowledge


- The student uses pictures, words, or numbers to describe and illustrate with some clarity the methods chosen for investigating the cars-and-vans problem (e.g., although illustrations are included for two solutions, cars and vans are not identified, making the response unclear).
- The student describes with some clarity the strategy used (e.g., gives a partial explanation of how the problem was solved with reference to the original problem: "I used counters. The most a car can hold is 4. the most a van can hold is 6").

Comments/Next Steps

- The student should solve other problems where there are multiple combinations to be found and find as many combinations as possible.
- The student needs to develop strategies for ensuring that the work being completed leads to a solution for the given problem.
- The student needs to talk about combinations in relation to the context of a problem (e.g., in this problem, needs to consider whether it would be realistic to take 16 cars or vans, each holding only one passenger).

Going to the Zoo Level 2, Sample 2

A



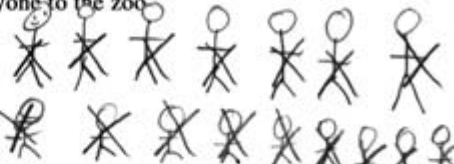
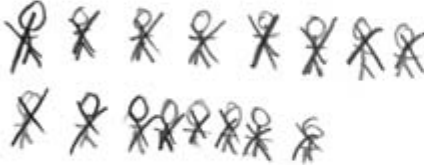
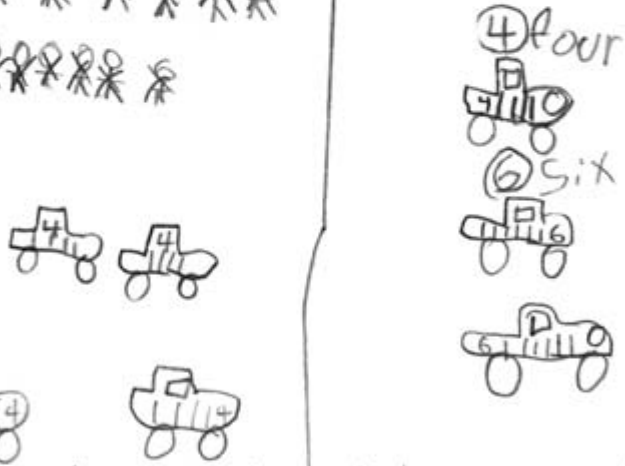
16 people are going to the zoo.

Vans and cars can be used to drive everyone to the zoo.

The most a van can hold is 6 people.

The most a car can hold is 4 people.

How many cars and vans could be used? Show as many ways as you can to organize the 16 people in cars and vans.

We need 4 cars to fit the people.

We need two vans and one car.

B

Explain how you solved the problem.

First we draw cars and vans then second we cross the people and we put the people then we put the number and words.

Teacher's Notes

Problem Solving

- The student selects and applies an appropriate problem-solving strategy that leads to a partially complete and/or partially accurate solution (e.g., uses illustrations as “counters” and an elimination strategy to find two combinations).

Understanding of Concepts

- The student demonstrates some understanding of combining numbers to obtain the sum of 16 (e.g., in the combinations presented, does not recognize that the cars and vans can have empty seats, but does explore the possibility of different combinations: $6 + 6 + 4 = 16$, $4 + 4 + 4 + 4 = 16$).

Application of Mathematical Procedures

- The student uses concrete materials and mathematical procedures, making some errors and/or omissions and arriving at a partial or an unclear solution (e.g., in the two combinations shown, the computations are correct but are not recorded).

Communication of Required Knowledge

- The student uses pictures, words, or numbers to describe and illustrate with some clarity the methods chosen for investigating the cars-and-vans problem (e.g., draws 16 people and then crosses them out as a van or car is filled; shows the total number of people in each car or van and provides the appropriate numeral and concluding sentences).
- The student describes with some clarity the strategy used (e.g., explains the elimination strategy: “First we draw cars and vans then second we cross the people and we put the people then we put the number and words”).

Comments/Next Steps

- The student needs to reread his or her responses to make sure that they are complete.
- The student should use concrete materials to solve problems.
- The student needs to solve similar problems, where multiple combinations need to be found, and to find as many combinations as possible.

Going to the Zoo Level 3, Sample 1

A



16 people are going to the zoo.

Vans and cars can be used to drive everyone to the zoo.

The most a van can hold is 6 people.

The most a car can hold is 4 people.

How many cars and vans could be used? Show as many ways as you can to organize the 16 people in cars and vans.

Handwritten student work:

We need 2 vans and we need 1 car.

6 Six

4 four

2 two

4 four

6

4 four

4 four

Our peoples need 2 vans and we need 2 cars.

Our peoples need 2 vans and we need 2 cars.



B

Explain how you solved the problem.

There are sixteen people.

They need to go to the zoo. First we need to cross the people. I put them in the car. I run out of people. Then I get the answer.

Teacher's Notes

Problem Solving

- The student selects and applies an appropriate problem-solving strategy that leads to a generally complete and accurate solution (e.g., uses illustrations as “counters” and an elimination strategy to find three complete solutions).

Understanding of Concepts

- The student demonstrates a clear understanding of combining numbers to obtain the sum of 16 (e.g., finds two combinations where the cars and vans are full and one where the vans are full but the cars are not).

Application of Mathematical Procedures

- The student uses concrete materials and mathematical procedures, making few errors and/or omissions and arriving at a clear solution (e.g., the numbers presented in each example total 16).

Communication of Required Knowledge

- The student uses pictures, words, or numbers to describe and illustrate clearly the methods chosen for investigating the cars-and-vans problem (e.g., shows the cars and vans in pictures, clearly indicates beside each van or car the number of people in it, numbers each combination, and draws separation lines between the combinations).
- The student clearly describes the strategy used (e.g., explains the elimination strategy: “First we need to cross the people. I put them in the car. I run out of people. then I get the answer”).

Comments/Next Steps

- The student should explore all possible solutions to this kind of a problem.
- The student needs to reread his or her responses to make sure that they are complete.

Going to the Zoo Level 3, Sample 2

A



16 people are going to the zoo.

Vans and cars can be used to drive everyone to the zoo.

The most a van can hold is 6 people.

The most a car can hold is 4 people.

How many cars and vans could be used? Show as many ways as you can to organize the 16 people in cars and vans.

c and v means
 car van
 c is car and
 v is van

Handwritten solutions for organizing 16 people:

- $6 + 6 + 4 = 16$ (with 2 vans and 1 car above the numbers)
- $5 + 5 + 6 = 16$ (with 1 van above the first 5)
- $5 + 5 + 5 + 1 = 16$ (with 2 vans above the first two 5s and 1 car above the 1)
- $4 + 4 + 4 + 4 = 16$ (with 4 cars above the numbers)
- $4 + 4 + 4 + 5 = 16$ (with 3 cars above the first three 4s and 1 van above the 5)
- $1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 = 16$ (with 16 small robot icons above the numbers)

B

Explain how you solved the problem.

I used counters*

*Teacher's Comment: "The student used dishes for the vans, cups for the cars, and robots for the people."

Teacher's Notes

Problem Solving

- The student selects and applies an appropriate problem-solving strategy that leads to a generally complete and accurate solution (e.g., finds six possible solutions by using addition sentences in which the numbers are labelled “c is car and v is van”).

Understanding of Concepts

- The student demonstrates a clear understanding of combining numbers to obtain the sum of 16 (e.g., finds several ways to group 16 people in vans and cars; recognizes that vans and cars do not have to be full).

Application of Mathematical Procedures

- The student uses concrete materials and mathematical procedures, making few errors and/or omissions and arriving at a clear solution (e.g., all the combinations recorded in the addition sentences total 16 [one combination is repeated]).

Communication of Required Knowledge

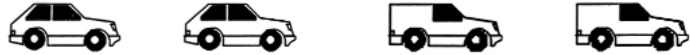
- The student uses pictures, words, or numbers to describe and illustrate clearly the methods chosen for investigating the cars-and-vans problem (e.g., uses numbers and labels – “c and v means car van c is car and v is van” – to present six combinations clearly).
- The student clearly describes the strategy used (e.g., the explanation “c is car and v is van”, along with the statement “I used counters”, although brief, provides a clear picture of the strategy used).

Comments/Next Steps

- The student needs to add more detail to written explanations.
- Although the communication of ideas in written form is brief, more like a level 2 performance, the explanation of the labels makes it clear what strategy was used, and the student's overall performance of procedures, understanding of concepts, and use of an appropriate problem-solving strategy are representative of a level 3.

Going to the Zoo Level 4, Sample 1

A



16 people are going to the zoo.

Vans and cars can be used to drive everyone to the zoo.

The most a van can hold is 6 people.

The most a car can hold is 4 people.

How many cars and vans could be used? Show as many ways as you can to organize the 16 people in cars and vans.

Handwritten solutions for problem A:

- $6^v + 6^v + 4^c = 16$
- $2^c + 2^c + 6^v + 6^v = 16$
- $1^c + 3^c + 6^v + 6^v$
- $2^c + 2^c + 2^c + 2^c + 2^c + 2^c + 2^c + 2^c = 16$
- $2^c + 4^c + 5^v + 5^v = 16$
- $5^v + 5^v + 6^v = 16$
- $2^c + 4^c + 5^v + 5^v = 16$
- $1^c + 5^v + 5^v + 5^v$
- $1^c + 1^c + 1^c + 1^c + 1^c + 1^c + 1^c + 1^c + 1^c + 1^c + 1^c + 1^c + 1^c + 1^c + 1^c + 1^c = 16$
- $6^v + 5^v + 5^v = 16$
- $4^c + 3^c + 3^c + 3^c + 3^c = 16$
- $4^c + 4^c + 4^c + 4^c = 16$
- $6^v + 6^v + 2^c + 2^c$
- $6^v + 4^c + 4^c + 2^c = 16$
- $6^v + 4^c + 3^c + 3^c = 16$
- $2^c + 2^c + 3^c + 3^c + 3^c + 3^c = 16$
- $5^v + 5^v + 6^v = 16$

B

Explain how you solved the problem.

I use symbols v for vans and c for car. I use Bingo chips. When I added them up I otherwise got 16.

Teacher's Notes

Problem Solving

- The student selects and applies an appropriate problem-solving strategy that leads to a thorough and accurate solution (e.g., finds thirteen combinations; uses numbers and clear symbols to illustrate).

Understanding of Concepts

- The student demonstrates a thorough understanding of combining numbers to obtain the sum of 16 (e.g., finds many combinations for 16, most of which are realistic in the context of the problem; recognizes that the vehicles need not be full).

Application of Mathematical Procedures

- The student uses concrete materials and mathematical procedures, making few, if any, minor errors and/or omissions and arriving at a clear and thorough solution (e.g., writes completely accurate, specific addition sentences for each combination).

Communication of Required Knowledge

- The student uses pictures, words, or numbers to describe and illustrate clearly and precisely the methods chosen for investigating the cars-and-vans problem (e.g., shows letter symbols above the numbers in the addition sentences to denote vans and cars).
- The student clearly and precisely describes the strategy used (e.g., “I use Symbols v for vans and c for car”; “when I added then up I owise got 16”).

Comments/Next Steps

- The student should investigate whether number combinations such as $6 + 5 + 5$ and $5 + 5 + 6$ are the same or different.

Going to the Zoo Level 4, Sample 2

A



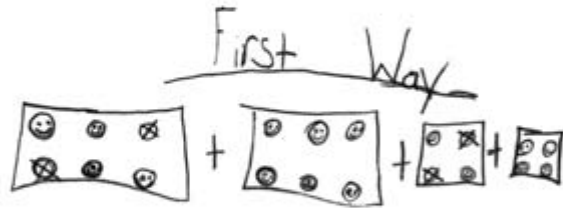
16 people are going to the zoo.

Vans and cars can be used to drive everyone to the zoo.

The most a van can hold is 6 people.

The most a car can hold is 4 people.

How many cars and vans could be used? Show as many ways as you can to organize the 16 people in cars and vans.



B



V	C	Equation
2	2	$5 + 5 + 2 + 4 = 16$
3	0	$4 + 6 + 6 = 16$
1	4	$6 + 3 + 3 + 2 + 2 = 16$
4	0	$4 + 4 + 4 + 4 = 16$
0	4	$4 + 4 + 4 + 4 = 16$
4	4	$2 + 2 + 2 + 2 + 2 + 2 + 2 = 16$

C

Explain how you solved the problem.

I used counters to
be the people.
I made a different way
to arrange the cars, vans and
people. At the most a car
can hold 4 people the most a
Van can hold is 6 people.
A happy face means a person.
A X means a empty place!

Teacher's Notes

Problem Solving

- The student selects and applies an appropriate problem-solving strategy that leads to a thorough and accurate solution (e.g., uses counters to explore the problem and finds several combinations for 16, then switches to using a chart and addition sentences to explore combinations).

Understanding of Concepts

- The student demonstrates a thorough understanding of combining numbers to obtain the sum of 16 (e.g., recognizes that the vehicles do not need to be filled to capacity and is therefore able to find several combinations for 16).

Application of Mathematical Procedures

- The student uses computations and mathematical procedures, making few, if any, minor errors and/or omissions and arriving at a clear and thorough solution (e.g., indicates numbers of vans and cars in the chart and shows matching addition sentences).

Communication of Required Knowledge

- The student uses pictures, words, or numbers to describe and illustrate clearly and precisely the methods chosen for investigating the cars-and-vans problem (e.g., begins by using pictures to represent the vans and cars, showing the appropriate number of seats for each vehicle and an empty seat as an X, then represents other combinations by using a chart and addition sentences).
- The student clearly and precisely describes the strategy used (e.g., names the manipulatives used to solve the problem, states the maximum number of people that each type of vehicle can hold, and explains what the happy face and X symbols represent).

Comments/Next Steps

- The student creates a unique and complex chart to explore the combinations for 16.
- The student should explore other problems where making a chart would be an appropriate problem-solving strategy.
- The student needs to explore systematic methods for finding the combinations for a given number.

Teacher Package

Mathematics Exemplar Task Grade 1 – Number Sense and Numeration Teacher Package

Title: Going to the Zoo

Time Requirements: 70–100 minutes (total)

- 20–30 minutes to complete Pre-task 1
- 20–30 minutes to complete Pre-task 2
- 30–40 minutes to complete the exemplar task

The pre-task activities will take several classroom periods to complete and should be done on different days.

Make large blocks of time available in order to facilitate the students' learning. You could present one task per day to the students. Alternatively, any one of the tasks may be spread out over a series of days, to allow the students time to consider the concepts, internalize them, and then apply them to the actual exemplar task. Note that it may take some students longer than others to complete the exemplar task.

Description of the Task

This task will require students to determine the number of possible combinations in which 16 people can be organized in cars and vans for transportation to the zoo. Students are told that a van can hold a maximum of 6 people and a car can hold a maximum of 4 people. Students are asked to explain how they solved the problem.

1

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).

Students will:

1. understand and explain basic operations (addition and subtraction) of whole numbers by modelling and discussing a variety of problem situations (1m6);
2. solve simple problems involving counting, joining, and taking one group away from another, and describe and explain the strategies used (1m8);
3. represent addition and subtraction sentences (e.g., $5 + 6 = 11$) using concrete materials (e.g., counters) (1m30);
4. use concrete materials to help in solving simple number problems (1m35);
5. describe their thinking as they solve problems (1m36).

Teacher Instructions

Prior Knowledge and Skills Required

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

- solving problems that involve multiple combinations or solutions
- solving problems using manipulative objects
- exploring addition and subtraction concepts
- communicating their problem-solving strategies and mathematical learning, both orally and in writing

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*.

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.

2

*The rubric is reproduced on page 13 of this document.

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 or 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
- egg cartons as an option for children to choose to make a van or car
- three fishbowls or similar large containers
- writing instruments (pencils, erasers)
- paper
- counters (e.g., coloured tiles, small blocks, buttons, beans, centicubes, interlocking cubes)
- crayons

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 is not 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 in the classroom. 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: *sort, count, arrange, order, add, group, set, explain, describe, number, combination, strategy, and equals*.

Remind the students to use pictures, numbers, and words when solving their problem(s).

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*****Pre-task 1: Number of Different Ways of Arranging Crayons (20–30 minutes)***

The students can do this activity independently, working in pairs or small groups. Each pair or small group should choose a recorder to record their discoveries.

1. Provide the pairs or small groups of students with crayons and interlocking cubes to use as manipulatives.

Present the students with the following problem:

Choose three different colours of crayons or interlocking cubes. If you arrange the crayons or cubes side by side and in a straight line inside a box – for example, red, blue, yellow – how many different colour combinations can you make?

This problem should be posted on a chart or the chalkboard and read aloud several times to the students.

2. Have the students discuss as a class what the key points are in the problem. The students need to have practice in identifying the important information in the problem and the strategies they will use to solve the problem.

You may use the following prompts:

- “Tell in your own words what you have to do.”
 - “How can you show your work using pictures, numbers, and/or words?”
3. When the students have had sufficient time to complete the task, bring the class together to have a group sharing time. This opportunity to share is essential, as students will see that there are many different ways to make combinations and solve problems. They should also discuss the different types of materials that were used to solve the problem.

Pre-task 2: Number of Ways of Placing Fish in Bowls (20–30 minutes)

Have the students do this activity in pairs. One student should record the discoveries that the pair makes.

Present the students with the following problems:

1. Your class has 12 fish and 2 bowls. Find as many different ways as you can to put the fish in the bowls. Show how you solved the problem.
2. Your class has 12 fish and 3 bowls. Find as many different ways as you can to put the fish in the bowls. Show how you solved the problem.

These problems should be posted on a chart or the chalkboard and read to the students several times.

Have the students discuss as a class what the key points are in the problems. The students need many opportunities to discuss what are the important points of information within the problems, and to discuss how the problems are alike and how they are different. Discuss the solutions with the class and ask them how they could vary the problems and what would happen if they were to vary them.

Exemplar Task (30–40 minutes)

1. Distribute a copy of the student package to each student.
2. Present the exemplar task problem in the same format as the pre-tasks. However, there will be no class discussion about key points of information in this problem. The students will have to determine on their own what those points are. Provide a variety of materials for the students to use when solving the problem (see the materials list). Inform the students that extra paper is available if they need it.
3. The problem that the students will solve independently is printed in the worksheets in Appendix 1.

Appendix 1: Student Worksheets



16 people are going to the zoo.

Vans and cars can be used to drive everyone to the zoo.

The most a van can hold is 6 people.

The most a car can hold is 4 people.

How many cars and vans could be used? Show as many ways as you can to organize the 16 people in cars and vans.

Explain how you solved the problem.

Appendix 2: Evaluation – Mathematician’s Chair

Name of Student:	
Date:	
Expectation	Comments:
– solve simple problems involving counting, joining, and taking one group away from another, and describe and explain the strategies used (1m8)	
– use concrete materials to help in solving simple number problems (1m35)	
– describe their thinking as they solve problems (1m36)	

Measurement / Patterning and Algebra

How Much Space Do You Need to Work?

The Task

This task required 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 selected an appropriate material for measuring the area of a table top, and showed how they measured the space of the selected table top and what they found out. They then used the data to determine how many people could work at the table with them and how many people could work at two, three, four, and five tables of the same size. Finally, they showed how they had arrived at their answers.

Expectations

This task gave students the opportunity to demonstrate achievement of all or part of each of the following selected expectations from two strands – Measurement, and Patterning and Algebra. 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).

Prior Knowledge and Skills

To complete this task, students were expected to have some knowledge or skills relating 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

For information on the process used to prepare students for the task and on the materials and equipment required, see the Teacher Package reproduced on pages 63–68 of this document.

Task Rubric – How Much Space Do You Need to Work?

Expectations*	Level 1	Level 2	Level 3	Level 4
Problem solving				
	The student:			
1, 3	– selects and applies a problem-solving strategy to measure a workspace, applies the findings, and extends a number pattern, arriving at an incomplete or inaccurate solution	– selects and applies an appropriate problem-solving strategy to measure a workspace, applies the findings, and extends a number pattern, arriving at a partially complete and/or partially accurate solution	– selects and applies an appropriate problem-solving strategy to measure a workspace, applies the findings, and extends a number pattern, arriving at a generally complete and accurate solution	– selects and applies an appropriate problem-solving strategy to measure a workspace, applies the findings, and extends a number pattern, arriving at a thorough and accurate solution
Understanding of concepts				
	The student:			
5	– demonstrates a limited understanding of number patterns through incomplete and unclear explanations and procedures	– demonstrates some understanding of number patterns through appropriate and partially complete explanations and procedures	– demonstrates a general understanding of number patterns through complete and appropriate explanations and procedures	– demonstrates a thorough understanding of number patterns through detailed explanations and procedures
Application of mathematical procedures				
	The student:			
4	– estimates and counts, and adds non-standard units to measure, using mathematical procedures that lead to an incomplete or unclear solution and making many errors and/or omissions	– estimates and counts, and adds non-standard units to measure, using mathematical procedures that lead to a partially complete solution and making some errors and omissions	– estimates and counts, and adds non-standard units to measure, using mathematical procedures that lead to a clear solution and making few errors and/or omissions	– estimates and counts, and adds non-standard units to measure, using mathematical procedures that lead to a complete solution and making few, if any, minor errors and/or omissions
Communication of required knowledge				
	The student:			
2, 6, 7	– uses pictures, words, or numbers to explain the pattern partially and with limited clarity – describes an incomplete patterning rule, using limited mathematical language	– uses pictures, words, or numbers to explain the pattern with some clarity – describes a patterning rule, using some mathematical language	– uses pictures, words, or numbers to explain the pattern clearly – clearly describes a patterning rule, using appropriate mathematical language	– uses pictures, words, or numbers to explain the pattern clearly and precisely – clearly describes and justifies a patterning rule, using precise mathematical language

*The expectations that correspond to the numbers given in this chart are listed on page 36.

Note: This rubric does not include criteria for assessing student performance that falls below level 1.

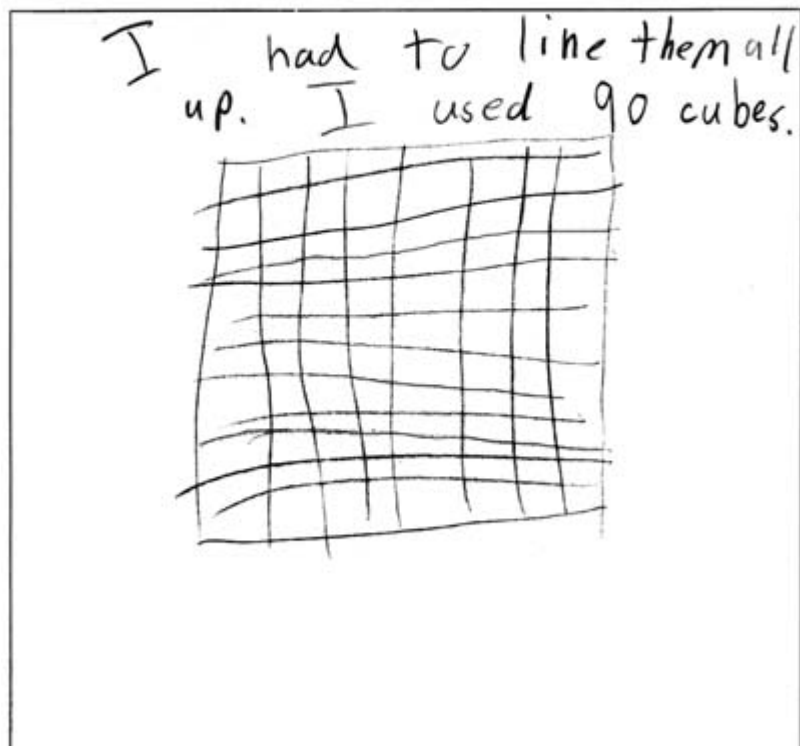
How Much Space Do You Need to Work?

Level 1, Sample 1

A

How much space do you need to do your work?

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

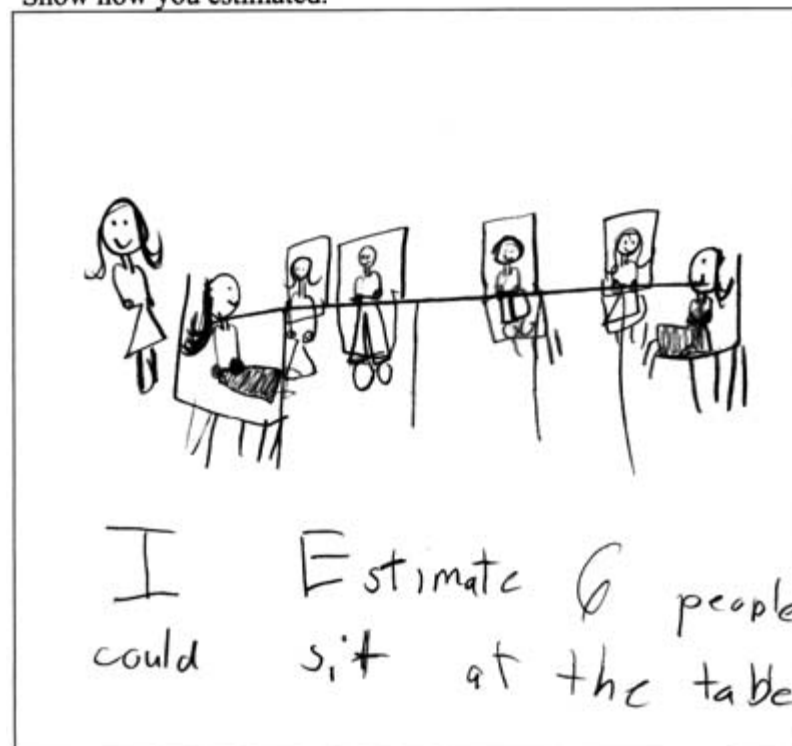


B

Think about your working space.

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

Show how you estimated.

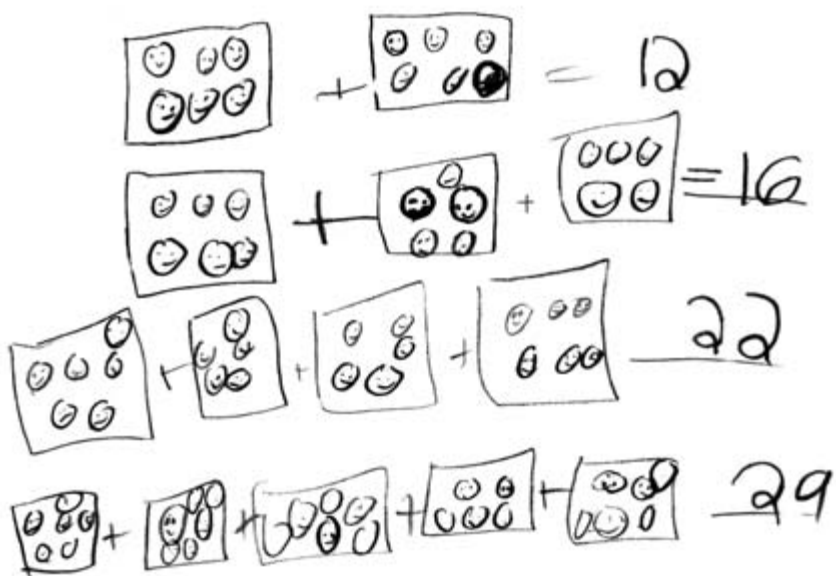


C

How many people could work at:

- Two tables
- Three tables
- Four tables
- Five tables

Show your work.



D

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

If there were more table then there would be a bigger number.

Teacher's Notes

Problem Solving

- The student selects and applies a problem-solving strategy to measure a workspace, applies the findings, and extends a number pattern, arriving at an incomplete or inaccurate solution (e.g., shows on page A the approach used to measure a personal workspace, but makes no connection between its size and the estimate on page B).

Understanding of Concepts

- The student demonstrates a limited understanding of number patterns through incomplete and unclear explanations and procedures (e.g., recognizes that more tables would accommodate more people, but because of errors in procedure is not able to state a clear pattern).

Application of Mathematical Procedures

- The student estimates and counts, and adds non-standard units to measure, using mathematical procedures that lead to an incomplete or unclear solution and making many errors and/or omissions (e.g., the illustration on page B shows six students sitting at a table but does not indicate how the estimate was determined).

Communication of Required Knowledge

- The student uses pictures, words, or numbers to explain the pattern partially and with limited clarity (e.g., the number of tables is accurately shown, but the numbers of people drawn at the tables on page C do not represent the appropriate pattern of counting by 6).
- The student describes an incomplete patterning rule, using limited mathematical language (e.g., “If there were more table then there would be a bigger number”).

Comments/Next Steps

- The student should respond to each question completely (e.g., show all the work needed to support conclusions).
- The student needs to listen to and discuss the solutions of others, in order to gain an understanding of mathematical vocabulary and the ability to use it in creating clearer and more complete explanations.
- The student needs to use concrete materials for help in developing patterning skills.

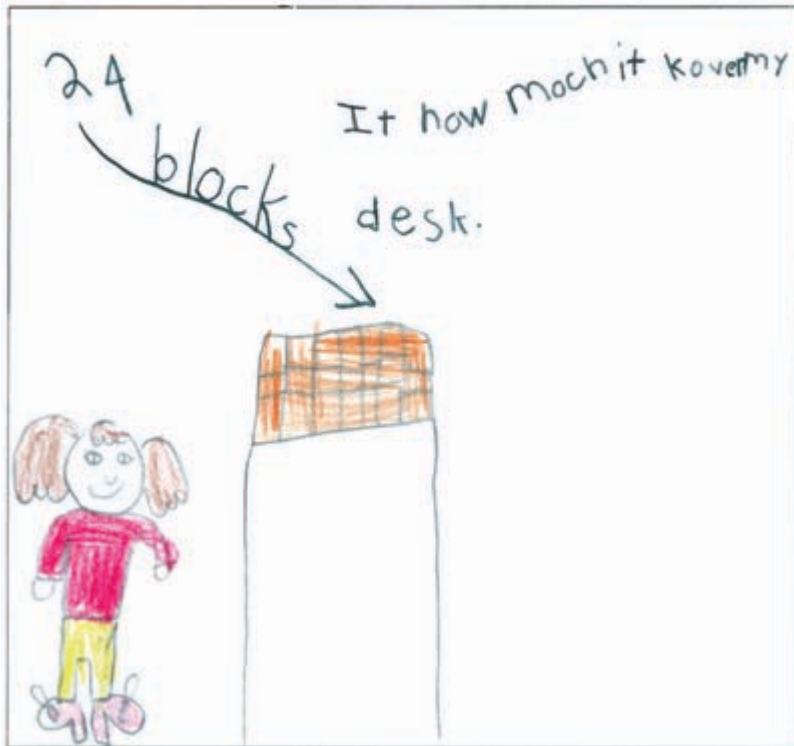
How Much Space Do You Need to Work?

Level 1, Sample 2

A

How much space do you need to do your work?

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



B

Think about your working space.

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

Show how you estimated.

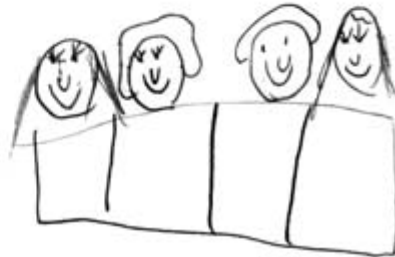


C

How many people could work at:

- Two tables $2 + 2 = 4$
- Three tables $3 + 3 = 12$
- Four tables $4 + 4 = 8$
- Five tables $5 + 5 = 20$

Show your work.

**D**

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

I add four

Teacher's Notes

Problem Solving

- The student selects and applies a problem-solving strategy to measure a workspace, applies the findings, and extends a number pattern, arriving at an incomplete or inaccurate solution (e.g., covers the desk with “24 blocks”, yet makes no reference to how the estimate of four people is determined).

Understanding of Concepts

- The student demonstrates a limited understanding of number patterns through incomplete and unclear explanations and procedures (e.g., on page C shows diagrams of 4 students per table, yet in the addition sentence for two tables shows $2 + 2 = 4$ and for three tables shows $3 + 3 = 12$ – information that is not connected to the solution or to the identification of a pattern).

Application of Mathematical Procedures

- The student estimates and counts, and adds non-standard units to measure, using mathematical procedures that lead to an incomplete or unclear solution and making many errors and/or omissions (e.g., states on page A that 24 blocks are used to cover the desk area but shows 21 blocks in the illustration).

Communication of Required Knowledge

- The student uses pictures, words, or numbers to explain patterns partially and with limited clarity (e.g., the pictures, numbers, and few words presented do not connect with each other, as in the addition sentence showing $5 + 5 = 20$ that probably means 5 tables of 4 equals 20).
- The student describes an incomplete patterning rule, using limited mathematical language (e.g., provides “I add four” as the total explanation, but does not reflect that rule in the addition sentences or identify it in the pictures).

Comments/Next Steps

- The student should match illustrations with notations to ensure accurate responses.
- The student needs to use concrete materials for help in developing addition and patterning skills.
- The student needs to listen to and discuss solutions to gain greater understanding of mathematical vocabulary and the ability to use it in creating clearer and more complete explanations.

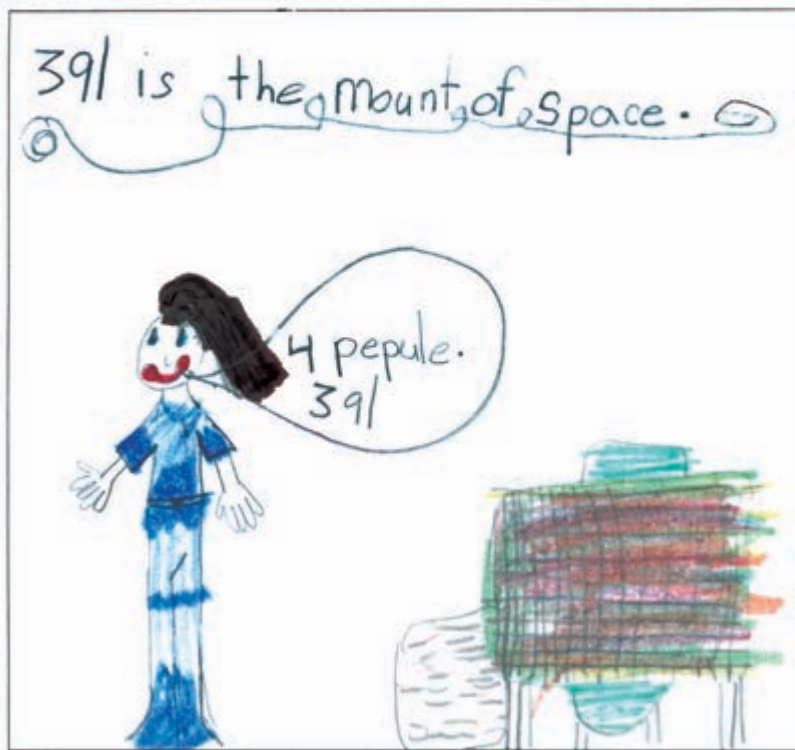
How Much Space Do You Need to Work?

Level 2, Sample 1

A

How much space do you need to do your work?

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



B

Think about your working space.

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

Show how you estimated.



C

How many people could work at:

- Two tables 8.
- Three tables 12
- Four tables 16
- Five tables 20

Show your work.



D

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

Adding 4. peopl

Teacher's Notes

Problem Solving

- The student selects and applies an appropriate problem-solving strategy to measure a workspace, applies the findings, and extends a number pattern, arriving at a partially complete and/or partially accurate solution (e.g., uses a non-standard measurement to cover the whole workspace, then uses the workspace size to estimate that four people could work at a table).

Understanding of Concepts

- The student demonstrates some understanding of number patterns through appropriate and partially complete explanations and procedures (e.g., is able to count by 4's to discover how many people could fit at 5 tables; does not clearly express the number of tables, except in the first example, $4 + 4 = 8$).

Application of Mathematical Procedures

- The student estimates and counts, and adds non-standard units to measure, using mathematical procedures that lead to a partially complete solution and making some errors and omissions (e.g., on page A, gives a partial solution to the measurement using non-standard units: "391 is the mount of space").

Communication of Required Knowledge

- The student uses pictures, words, or numbers to explain the pattern with some clarity (e.g., on page C, does not clearly connect the addition sentences and pictures with the question, and this lack of connection results in a solution that is only somewhat clear).
- The student describes a patterning rule, using some mathematical language (e.g., "Adding 4 pepl").

Comments/Next Steps

- The student needs to make connections between diagrams and the numbers used in solutions to achieve clarity and completeness.
- The student needs to listen to and discuss the solutions of others to gain an understanding of mathematical vocabulary and the ability to use it in creating clearer and more complete explanations.
- The student needs to use concrete materials for help in developing addition and patterning skills.

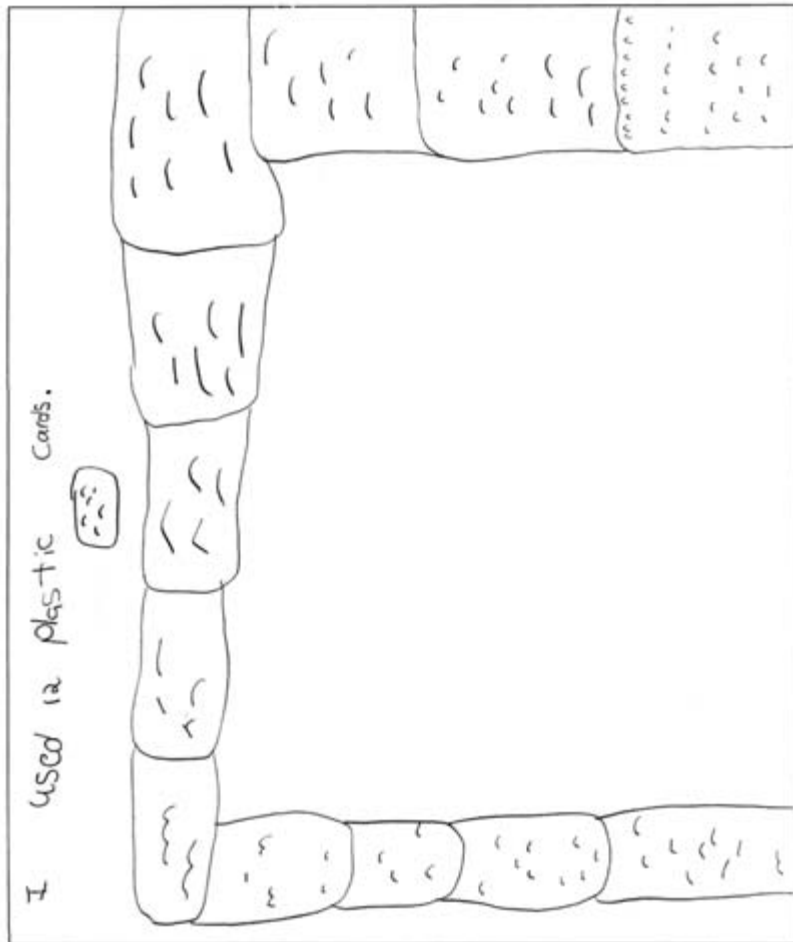
How Much Space Do You Need to Work?

Level 2, Sample 2

A

How much space do you need to do your work?

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

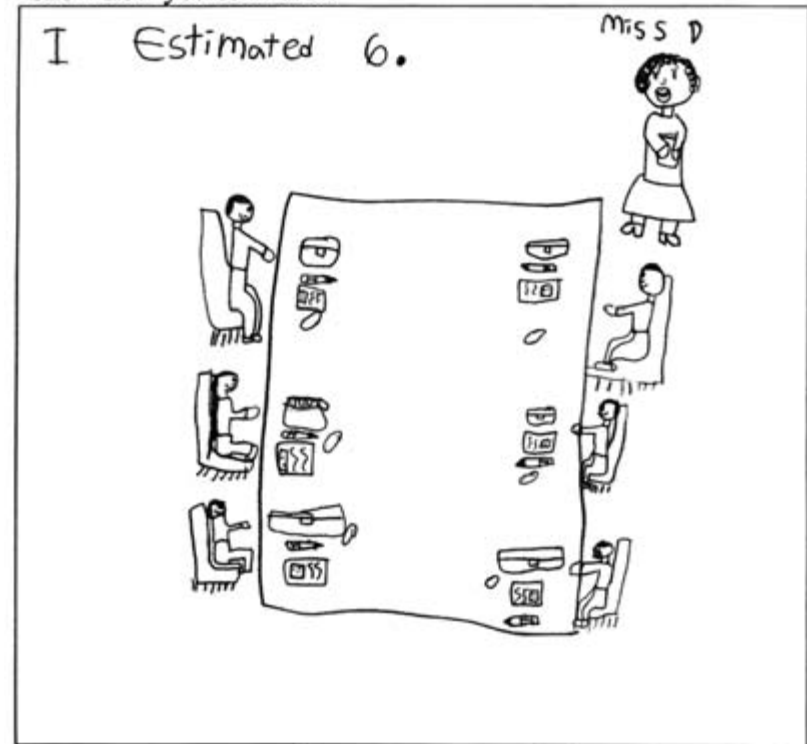


B

Think about your working space.

Estimate how many people could work at the table with you. 6

Show how you estimated.

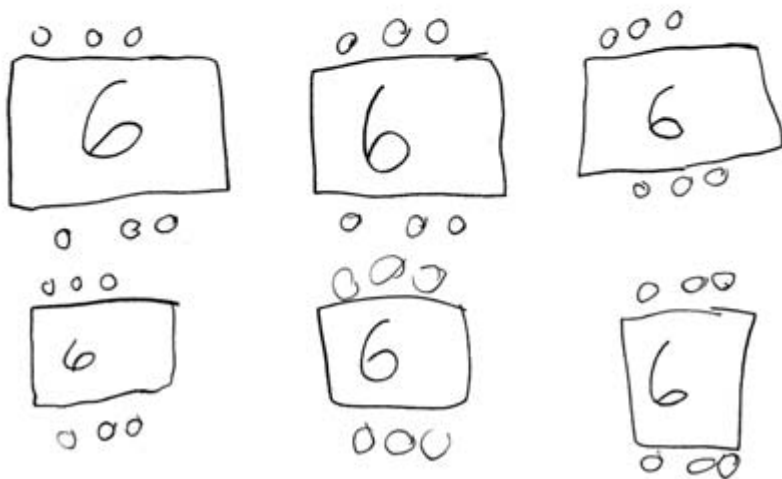


C

How many people could work at:

- Two tables 12
- Three tables 18
- Four tables 24
- Five tables 30

Show your work.

**D**

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

I keep Adding by six.



Teacher's Notes**Problem Solving**

- The student selects and applies an appropriate problem-solving strategy to measure a workspace, applies the findings, and extends a number pattern, arriving at a partially complete and/or partially accurate solution (e.g., uses plastic cards to measure the perimeter instead of the area).

Understanding of Concepts

- The student demonstrates some understanding of number patterns through appropriate and partially complete explanations and procedures (e.g., the pattern, 6 people can fit at each table, is illustrated on page C, but a written explanation is lacking).

Application of Mathematical Procedures

- The student estimates and counts, and adds non-standard units to measure, using mathematical procedures that lead to a partially complete solution and making some errors and/or omissions (e.g., no addition sentences are included, although calculations are made, with some calculation errors: “Two tables 12, Three tables 18, Four tables 21, Five tables 28”).

Communication of Required Knowledge

- The student uses pictures, words, or numbers to explain the pattern with some clarity (e.g., minimal interpretations are presented with diagrams of tables holding 6 people; no real connection is made to the pattern in the question on page C).
- The student describes a patterning rule, using some mathematical language (e.g., “I keep Adding by six”).

Comments/Next Steps

- The student needs to use non-standard measuring units involving area, to distinguish area from perimeter.
- The student needs to use concrete materials for help in developing addition and patterning skills.
- The student should make connections from previous learning that would assist in recognizing patterns more clearly and completely.
- The student needs to listen to and discuss the solutions of others to gain an understanding of mathematical vocabulary and the ability to use it in creating clearer and more complete explanations.

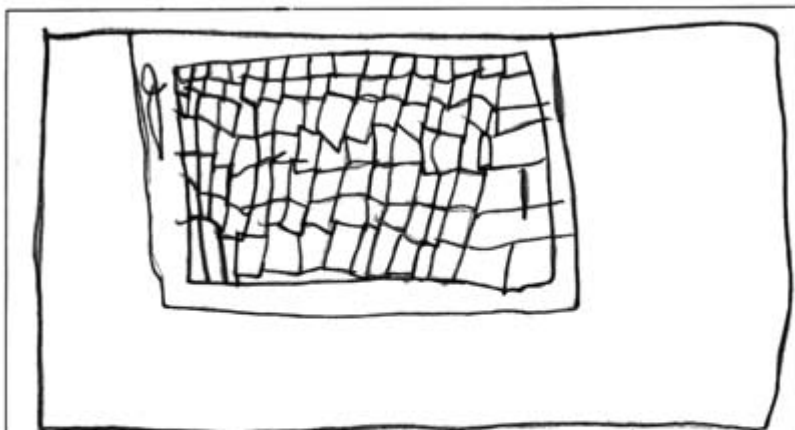
How Much Space Do You Need to Work?

Level 3, Sample 1

A

How much space do you need to do your work?

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



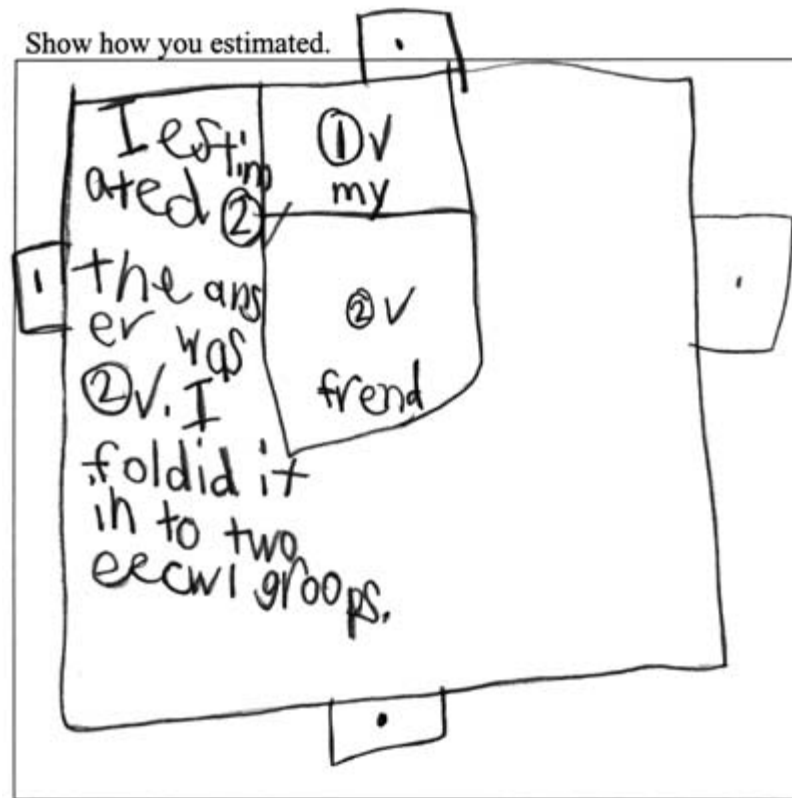
I used 209 pattern blocks
to cover my area on the
library table

B

Think about your working space.

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

Show how you estimated.



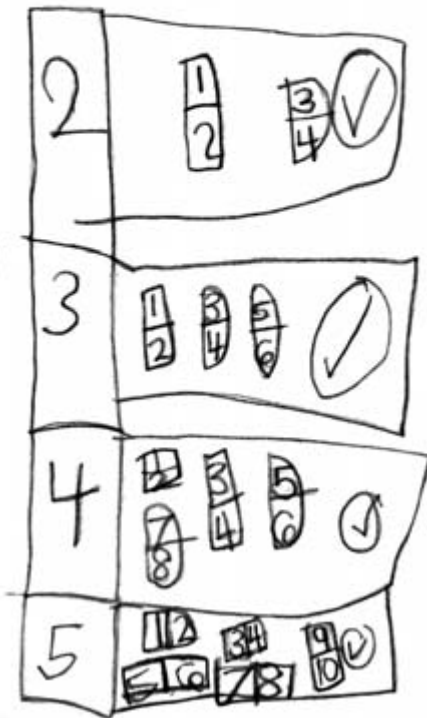
C

How many people could work at:

- Two tables $2+2=4$ ✓
- Three tables $2+2+2=6$ ✓
- Four tables $2+2+2+2=8$ ✓
- Five tables $2+2+2+2+2=10$ ✓

Show your work.

The rule is counting by 2

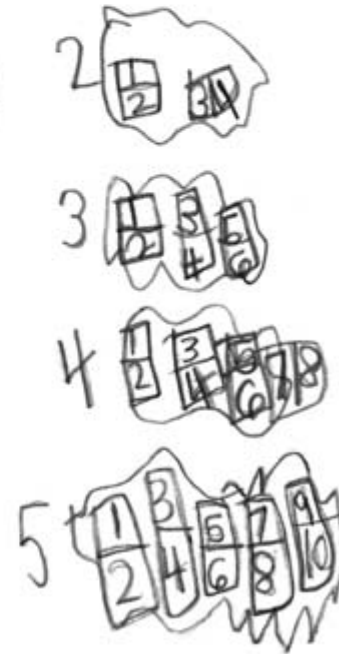



D

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



my pattern rule is counting by two.



Teacher's Notes

Problem Solving

- The student selects and applies an appropriate problem-solving strategy to measure a workspace, applies the findings, and extends a number pattern, arriving at a generally complete and accurate solution (e.g., uses information from page A to estimate the answer for page B, as seen in the illustration of the table divided into 2 parts, saying “I estimated the answer was 2. I folded [folded] it in to two equal [equal] groups”).

Understanding of Concepts

- The student demonstrates a general understanding of number patterns through complete and appropriate explanations and procedures (e.g., on page C, uses addition sentences such as $2 + 2 = 4$ in a clear table to show the pattern, and uses words to explain the rule: “The rule is counting [counting] by 2”).

Application of Mathematical Procedures

- The student estimates and counts, and adds non-standard units to measure, using mathematical procedures that lead to a clear solution and making few errors and/or omissions (e.g., uses the information from page A to estimate approximately the same space for each other person, as illustrated in the diagram on page B).

Communication of Required Knowledge

- The student uses pictures, words, or numbers to explain the pattern clearly (e.g., on page C, includes addition sentences, diagrams of the tables, and a written patterning rule).
- The student clearly describes a patterning rule, using appropriate mathematical language (e.g., “my pattern rule is counting by two”).

Comments/Next Steps

- The student illustrates the solution clearly and completely.
- The student should continue to use pictures, words, and numbers clearly to communicate responses.
- The student should refer to word charts or a personal dictionary for the correct spelling of words.

How Much Space Do You Need to Work?

Level 3, Sample 2

A

How much space do you need to do your work?

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

The area of my space on the library table is 160 square pattern blocks. I used a ruler to measure it. I found out that it was hard covering the area of my table because the squares kept over lapping.



B

Think about your working space.

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

Show how you estimated.

When I estimated I used my eyes to look at the table and I used my Brain to count and my estimate is 9 people could work at my table.

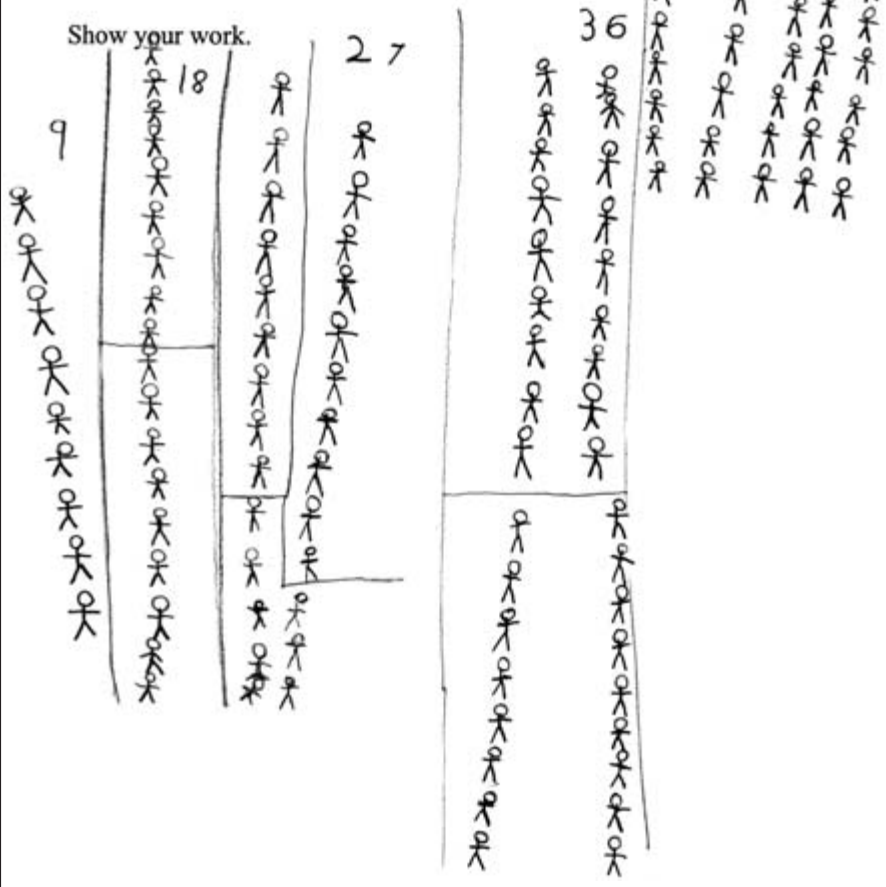


C

How many people could work at:

- Two tables 18
- Three tables 27
- Four tables 36
- Five tables 45

Show your work.

**D**

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

The pattern is the numbers
Keep increasing by 9.

Two tables 18 people
Three tables 27 people
four tables 36 people

$9 + 9 = 18$
$9 + 9 + 9 = 27$
$9 + 9 + 9 + 9 = 36$

Teacher’s Notes**Problem Solving**

- The student selects and applies an appropriate problem-solving strategy to measure a workspace, applies the findings, and extends a number pattern, arriving at a generally complete and accurate solution (e.g., “When I estimated I used my eyes to look at the table and I used my Brain to count and my estimate is 9”).

Understanding of Concepts

- The student demonstrates a general understanding of number patterns through complete and appropriate explanations and procedures (e.g., “Two tables 18 people, Three tables 28 people, four tables 36 people” [*note that “28” is a copying error*]).

Application of Mathematical Procedures

- The student estimates and counts, and adds non-standard units to measure, using mathematical procedures that lead to a clear solution and making few errors and/or omissions (e.g., the illustration on page B shows that each of the 9 people has an area of the table top related to the area discovered by the student on page A).

Communication of Required Knowledge

- The student uses pictures, words, or numbers to explain the pattern clearly (e.g., through each step of the task, utilizes a combination of written explanations, addition sentences, and pictures to explain the pattern of counting by 9’s).
- The student clearly describes a patterning rule, using appropriate mathematical language (e.g., “The pattern is the numbers Keep increasing by 9”; the addition sentences add clarity to the explanation of the patterning rule).

Comments/Next Steps

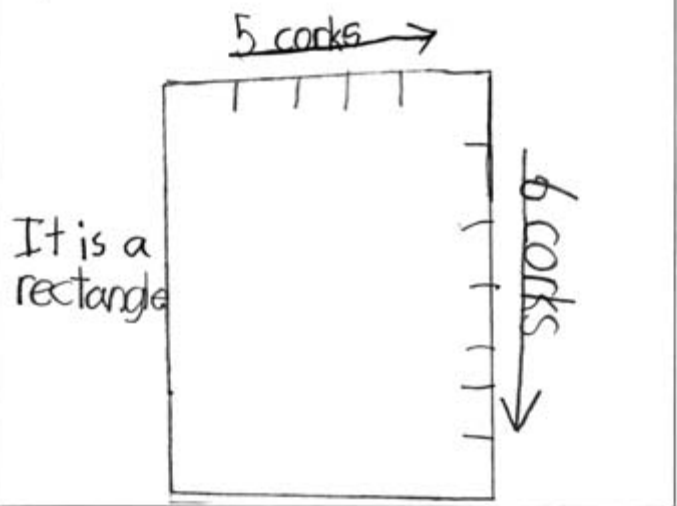
- The student clearly understands the use of non-standard units of measure and is able to apply this knowledge to recognize and extend patterns clearly and completely, although the addition of more mathematical vocabulary would enhance the detail of explanations.
- The student should check his or her work to make sure that the solutions are recorded accurately.

A

How much space do you need to do your work?

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

My paper was 5 corks across and 6 corks down. That is 30 corks.



B

Think about your working space.

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

Show how you estimated.

I think 2 people could work at the table.



I estimate 2 papers will fit on the table.

C

How many people could work at:

- Two tables 4
- Three tables 6
- Four tables 8
- Five tables 10

Show your work.

Four people could work at 2 desk.

6 people could work at 3 desk.

8 people could work at 4 desk.

ten people could work 5 desk.

D

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

Each time I add a table 2 more can work.

I started with 1 table and 2 people.

Five tables hold ten people.

My number pattern is

2 4 6 8 10

Teacher's Notes

Problem Solving

- The student selects and applies an appropriate problem-solving strategy to measure a workspace, applies the findings, and extends a number pattern, arriving at a thorough and accurate solution (e.g., measures the length and width of the exemplar booklet [see the marks around the outside of the page], places the booklet on the table, and estimates that two people could work at the table).

Understanding of Concepts

- The student demonstrates a thorough understanding of number patterns through detailed explanations and procedures (e.g., states, “Each time I add a table 2 more can work”; determines the choice of the number pattern, counting by twos, by the size of the desk).

Application of Mathematical Procedures

- The student estimates and counts, and adds non-standard units to measure, using mathematical procedures that lead to a complete solution and making few, if any, minor errors and/or omissions (e.g., effectively uses a cork as a non-standard unit to measure the length and width of the page – “5 corks across and 6 corks down” – and determines that “2 people could work at the table”).

Communication of Required Knowledge

- The student uses pictures, words, or numbers to explain the pattern clearly and precisely (e.g., uses clear pictures, words, and numbers to explain, as in “Four people could work at 2 desk. ... ten people could work 5 desk”, though the inclusion of addition sentences would have made the response more thorough).
- The student clearly describes and justifies a patterning rule, using precise mathematical language, (e.g., “I started with 1 table and 2 people. Five tables hold ten people. My number pattern is 2 4 6 8 10 ...”).

Comments/Next Steps

- The student needs to explore similar problems that provide opportunities for more complex number patterns.
- The student should include number sentences when describing patterns.

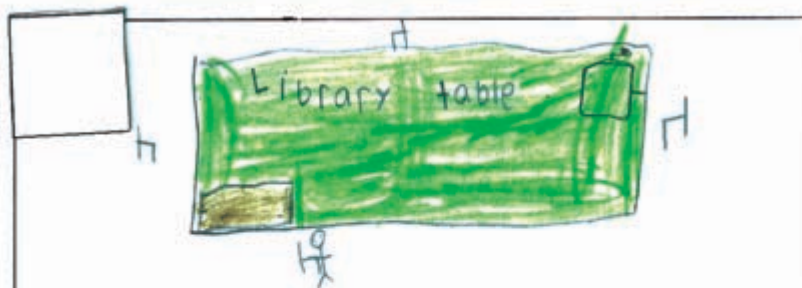
How Much Space Do You Need to Work?

Level 4, Sample 2

A

How much space do you need to do your work?

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



I used square pattern blocks:

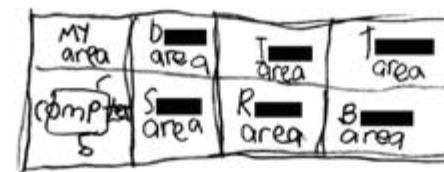
I measured that 146 square pattern blocks were needed to cover the area of my space that I measured:

B

Think about your working space.

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

Show how you estimated.



I estimated seven people could work at my table. I used my area as a benchmark.

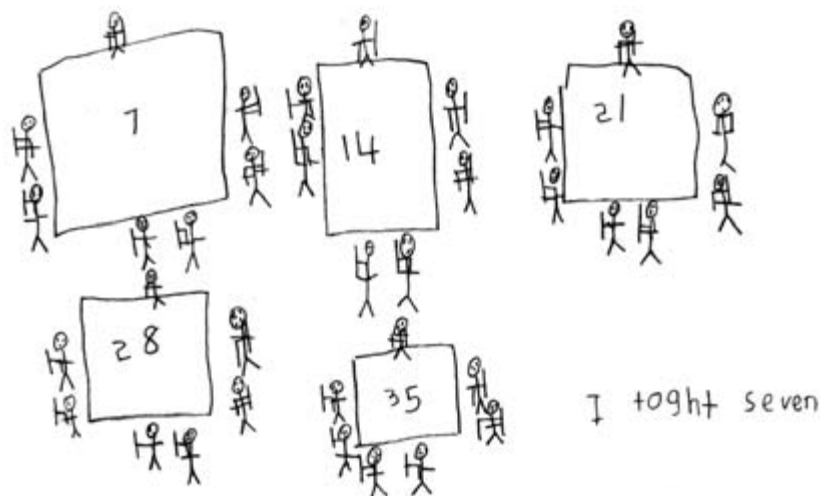
Note: In the top left-hand corner, the student has pasted in the cut-out square pattern block that he or she used.

C

How many people could work at:

- Two tables $7+7=14$
- Three tables $7+7+7=21$
- Four tables $7+7+7+7=28$
- Five tables $7+7+7+7+7=35$

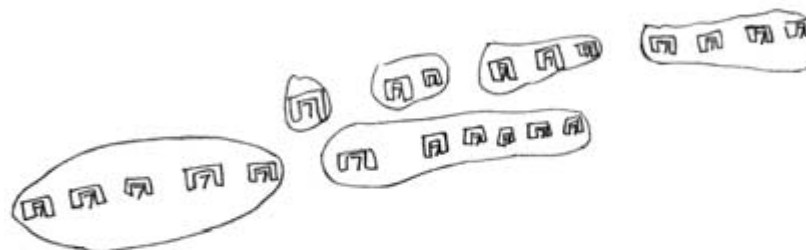
Show your work.



people could work at my table. Two tables 14
 people could work at my table. Three tables 21
 people could work at my table. four tables 28
 people could work at my table. five tables 35
 people could work at my table. I
 think it is a growing pattern
 by 7's

D

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



The pattern increases by 7's each time I add more
 tables. The pattern keeps increasing till it stops. I
 think it is a growing pattern.

Teacher’s Notes**Problem Solving**

- The student selects and applies an appropriate problem-solving strategy to measure a workspace, applies the findings, and extends a number pattern, arriving at a thorough and accurate solution (e.g., determines that 146 square pattern blocks are needed to cover the area of the workspace, then uses this workspace area as a benchmark in estimating that seven people could work at a table if space is left at each table for a computer; provides a cut-out of the square pattern block used to measure, gluing it to the top left corner of the exemplar booklet page).

Understanding of Concepts

- The student demonstrates a thorough understanding of number patterns through detailed explanations and procedures (e.g., on page D, gives illustrations and an explanation: “The pattern increases by 7’s each time I add more tables. ... I think it is a growing pattern”).

Application of Mathematical Procedures

- The student estimates and counts, and adds non-standard units to measure, using mathematical procedures that lead to a complete solution and making few, if any, minor errors and/or omissions (e.g., the picture on page A, which shows the full table marked with space for the computer and for the student’s measured workspace, provides an effective spatial representation of the basis for the estimate made on page B).

Communication of Required Knowledge

- The student uses pictures, words, or numbers to explain the pattern clearly and precisely (e.g., on page C, seven people are shown at each table, the multiples of 7 are printed inside the tables to show the pattern, the addition sentences are given, and written explanations are supplied).
- The student clearly describes and justifies a patterning rule, using precise mathematical language (e.g., “The pattern increases by 7’s each time I add more tables. The pattern keeps increasing till it stops. I think it is a growing pattern”).

Comments/Next Steps

- The student should continue to provide detailed illustrations, detailed mathematical notation, and clear mathematical language in written responses.

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.

1

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*.

2

*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.

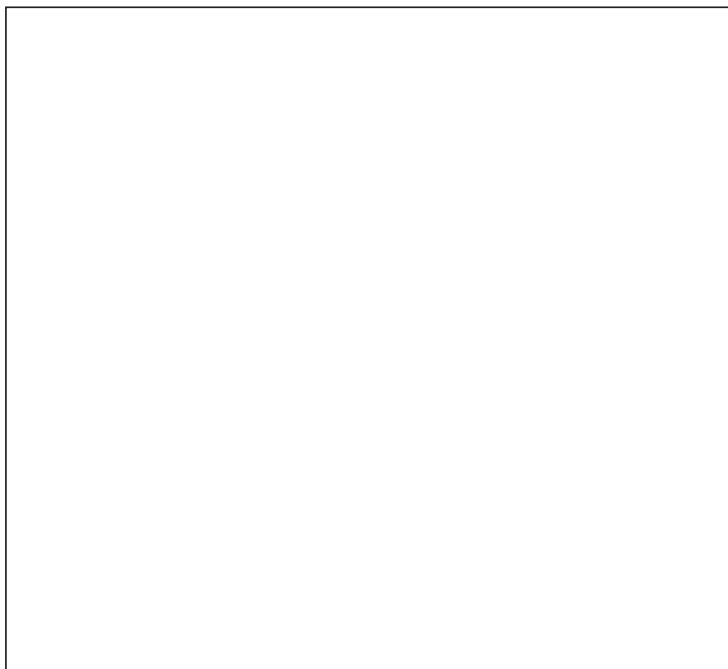
Exemplar Task (90 minutes)

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?

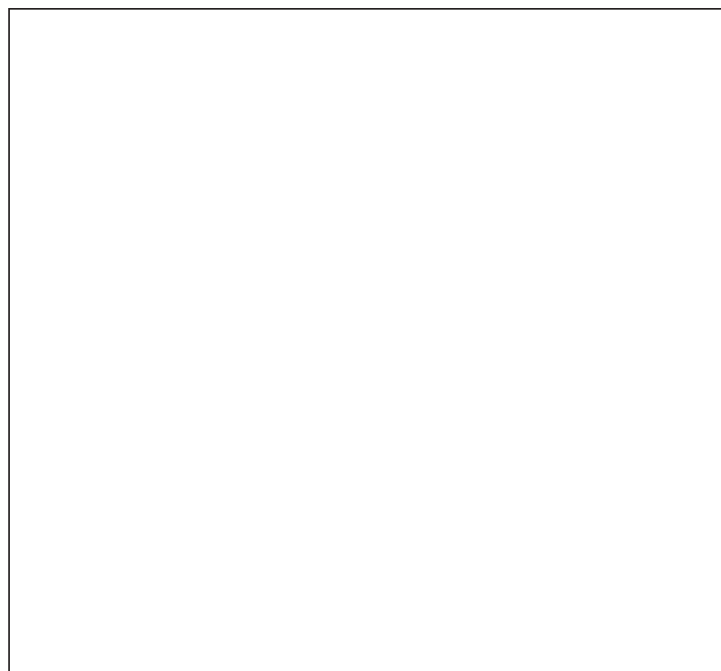
Show how you measured your space and what you found out.



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)	

Data Management and Probability

Planning a Celebration

The Task

This task required students to:

- engage in whole-class discussions to brainstorm a list of things that they could have at a celebration;
- engage in whole-class activity to sort the data, identify the categories, and label the categories;
- work individually to:
 - select one category to explore further by creating a survey question;
 - ask ten students their survey question, record the responses, and create a graph, using the software program Graphers;
 - share with the class their graph and their recommendation for the celebration.

Students selected a category for the celebration, recorded the survey question they would ask about the category, posed the question to ten classmates, and recorded the responses made. They then displayed the data in a graph and reported their findings to the class.

Expectations

This task gave students the opportunity to demonstrate achievement of all or part of each of the following selected expectations from the Data Management and Probability strand. Note that the codes that follow the expectations are from the Ministry of Education's *Curriculum Unit Planner* (CD-ROM).

Students will:

1. collect, organize, and describe data using concrete materials and drawings (1m92);
2. interpret displays of data using concrete materials, and discuss the data (1m93);
3. conduct an inquiry using appropriate methods (1m95);
4. collect first-hand data by counting objects, conducting surveys, measuring, and performing simple experiments (1m100).

Prior Knowledge and Skills

To complete this task, students were expected to have some knowledge or skills relating to the following:

- sorting and classifying objects, pictures, and so forth, into different categories and labelling each category
- collecting survey data by using check marks or other techniques
- posing survey questions and collecting data based on the questions posed
- analysing data collected from survey questions
- using the software program Graphers

For information on the process used to prepare students for the task and on the materials and equipment required, see the Teacher Package reproduced on pages 89–94 of this document.

Task Rubric – Planning a Celebration

Expectations*	Level 1	Level 2	Level 3	Level 4
Problem solving				
	The student:			
3	– selects and applies a problem-solving strategy when conducting an inquiry, arriving at an incomplete or inaccurate solution	– selects and applies an appropriate problem-solving strategy when conducting an inquiry, arriving at a partially complete and/or partially accurate solution	– selects and applies an appropriate problem-solving strategy when conducting an inquiry, arriving at a generally complete and accurate solution	– selects and applies an appropriate problem-solving strategy when conducting an inquiry, arriving at a thorough and accurate solution
Understanding of concepts				
	The student:			
2	– demonstrates a limited understanding of data management and interpretation through limited explanations and illustrations	– demonstrates some understanding of data management and interpretation through partial explanations and illustrations	– demonstrates a clear understanding of data management and interpretation through appropriate and complete explanations and illustrations	– demonstrates a thorough understanding of data management and interpretation through appropriate and detailed explanations and illustrations
Application of mathematical procedures				
	The student:			
1	– records survey data and creates a graph, making many errors and/or omissions and arriving at an incomplete or inaccurate solution	– records survey data and creates a graph, making some errors and/or omissions and arriving at a partially complete or partially accurate solution	– records survey data and creates a graph, making few errors and/or omissions and arriving at a complete and accurate solution	– records survey data and creates a graph, making few, if any, minor errors and/or omissions and arriving at a thorough and accurate solution
Communication of required knowledge				
	The student:			
2	– interprets and explains with limited clarity the graph created	– partially interprets the graph created and/or explains the interpretation with some clarity	– clearly interprets and explains the graph created	– clearly and thoroughly interprets and explains the graph created

* The expectations that correspond to the numbers given in this chart are listed on page 70. Note that, although all of the expectations listed there were addressed through instruction relating to the task, student achievement of expectation 4 was not assessed in the final product.

Note: This rubric does not include criteria for assessing student performance that falls below level 1.

Planning a Celebration Level 1, Sample 1

A

Planning A Celebration

Your class is planning a celebration.

Create a survey question.

Ask ten people your question.

Record their choices. *Balloons*

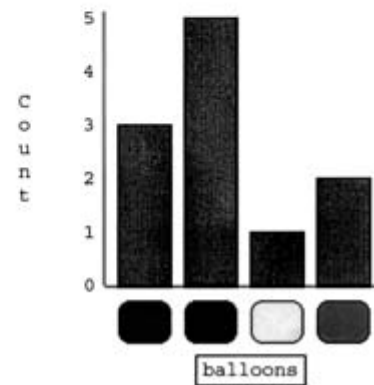
My Survey Question and My Data

What balloons would you like?

<i>red</i>	<i>red</i>	<i>blue</i>	<i>yellow</i>	<i>green</i>
<i>blue</i>	<i>yellow</i>	<i>green</i>		
<i>yellow</i>				
<i>green</i>				

B

Here is my graph of the data I collected:



n = 11

Things I will say about my graph when I share in the Mathematician's Chair:

most peopel look blue.
 Ball 66ns The bast?
 5 peopel look blue
 4 peopel look red
 1 peopel look yellow
 3 peopel look green



Teacher's Notes

Problem Solving

- The student selects and applies a problem-solving strategy when conducting an inquiry, arriving at an incomplete or inaccurate solution (e.g., is able to create a survey question but does not have a strategy for using the survey data when interpreting the graph).

Understanding of Concepts

- The student demonstrates a limited understanding of data management and interpretation through limited explanations and illustrations (e.g., states, “4 peopel look red”, yet the survey list and graph seem to show that three people selected red).

Application of Mathematical Procedures

- The student records survey data and creates a graph, making many errors and/or omissions and arriving at an incomplete or inaccurate solution (e.g., uses check marks to record the choices of 11 classmates, but the check marks are crowded and difficult to count; represents different colours of balloons in the graph, although it is difficult to identify the colours without labels that name them).

Communication of Required Knowledge

- The student interprets and explains with limited clarity the graph created (e.g., correctly states that blue is the most popular colour but also states that red was selected 4 times, while the graph seems to indicate that it was selected 3 times. Similarly, green seems to be shown in the graph as 2 choices but in the student's explanation it is given as 3).

Comments/Next Steps

- The student needs to use the conventions of graphs (e.g., titles, labels).
- The student needs to ensure the accurate use of graph data when discussing a graph.
- The student needs more experience in creating and interpreting graphs in order to develop a better understanding of how graphs are used to communicate information.

Planning a Celebration Level 1, Sample 2

A

Planning A Celebration

Your class is planning a celebration.

Create a survey question.

Ask ten people your question.

Record their choices.

My Survey Question and My Data

what is your fav kind of ice cream?

Chocolate.
 chocolate chip.
 vanilla.
 Strawberry.

S 1 D 2 J 3

C 4 S 5

B 7 miss H. 6

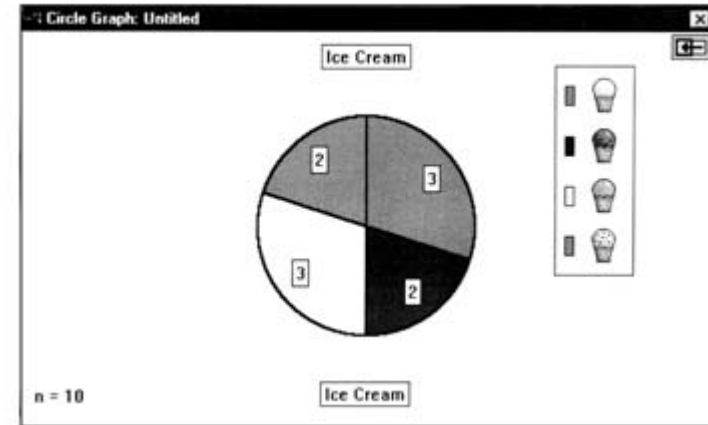
T 9 D 10

The student has drawn a survey titled "My Survey Question and My Data" with the question "what is your fav kind of ice cream?". The responses are listed as follows: Chocolate (1), chocolate chip (1), vanilla (2), Strawberry (3), C (4), S (5), B (7), miss H. (6), T (9), and D (10). There are also two hand-drawn ice cream cones.

B

Here is my graph of the data I collected:

The screenshot shows a software window titled "Data Maker" with a sub-window "Ice Cream". It contains four ice cream icons and four buttons: "Make One", "All", "Clear", and "Done".



C

Things I will say about my graph when I share in the Mathematician's Chair:

~~* MY FRTF kind of iakm
is Sa box be kiz I like IT~~

3 pebl likeT Sob@my
3 pebl likeT vhlv
2 pebl likeT can IT cot
2 pebl likeT can IT

* My favourite kind of ice cream is strawberry because I like it. 3 people liked strawberry; 3 people liked vanilla; 2 people liked chocolate chip; 2 people liked chocolate.

Teacher's Notes

Problem Solving

- The student selects and applies a problem-solving strategy when conducting an inquiry, arriving at an incomplete or inaccurate solution (e.g., attempts to make a chart recording four flavours of ice cream and the names of only nine people [Miss H. is counted twice to make ten]; fails to identify what flavour was chosen by each person surveyed).

Understanding of Concepts

- The student demonstrates a limited understanding of data management and interpretation through limited explanations and illustrations (e.g., uses no evident or clear method for recording the ice cream choices; makes a statement that is unrelated to the data, identifying his or her favourite kind of ice cream, when preparing to explain the graph).

Application of Mathematical Procedures

- The student records survey data and creates a graph, making many errors and/or omissions and arriving at an incomplete or inaccurate solution (e.g., does not collect the data in an organized manner, with the result that there is no evident relation between the data and the graph; represents the four flavours of ice cream in the graph but does not use a title for the graph or labels for the flavours).

Communication of Required Knowledge

- The student interprets and explains with limited clarity the graph created (e.g., simply recounts the results of the survey, omitting a concluding statement).

Comments/Next Steps

- The student needs to develop more organized strategies for collecting and recording data.
- The student needs to include appropriate labels and titles when creating graphs.
- The student needs to practise reading and interpreting graphs to develop an understanding of appropriate data comparisons.
- The student needs to refer to word lists (e.g., a math word wall, a personal dictionary) when writing about investigations.

Planning a Celebration Level 2, Sample 1

A

Planning A Celebration

Your class is planning a celebration.

Create a survey question.

Ask ten people your question.

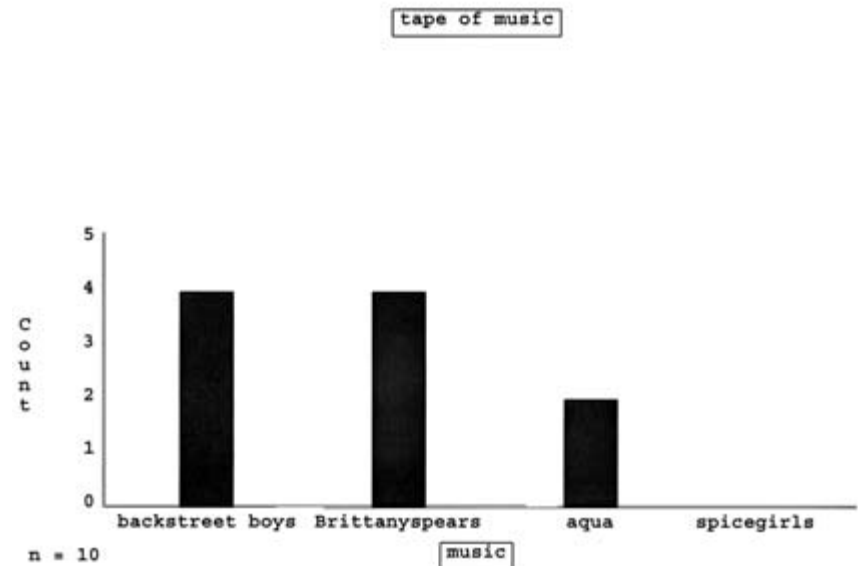
Record their choices.

My Survey Question and My Data

What kind of music do you like?
 Brittany Spears ✓✓✓
 Backstreet Boys ✓✓✓
 aqua ✓✓
 Spice girls.

B

Here is my graph of the data I collected:



C

Things I will say about my graph when I share in the Mathematician's Chair:

my graph tells me how many people like music. This is how many people like Brittany Spears. Four people like Brittany Spears. I am going to play the hole entire CD of Brittany Spears.

Teacher's Notes

Problem Solving

- The student selects and applies an appropriate problem-solving strategy when conducting an inquiry, arriving at a partially complete and/or partially accurate solution (e.g., makes a list showing four choices of music on the recording sheet and uses check marks to indicate the 11 selections).

Understanding of Concepts

- The student demonstrates some understanding of data management and interpretation through partial explanations and illustrations (e.g., makes a graph that incorrectly represents the data gathered and displayed in the preference list; in the interpretation of the data looks only at one category, "Brittany Spears").

Application of Mathematical Procedures

- The student records survey data and creates a graph, making some errors and/or omissions and arriving at a partially complete or partially accurate solution (e.g., surveys 11 people, creates a graph in which the data do not match the data in the list of music preferences).

Communication of Required Knowledge

- The student partially interprets the graph created and/or explains the interpretation with some clarity (e.g., states in conclusion, "I am going to play the hole entire CD of Brittany Spears", even though the same number of people chose the Backstreet Boys).

Comments/Next Steps

- The student could improve the clarity of lists or charts and avoid errors in creating graphs by adding totals to each row of a list.
- The student needs to be more thorough in the interpretation of data presented in graphs (e.g., should discuss more than one category; should compare the categories).
- The student could improve the quality of explanations by including mathematical terminology found on a word wall or in a personal dictionary.

Planning a Celebration **Level 2, Sample 2**

A

Planning A Celebration

Your class is planning a celebration.

Create a survey question.

Ask ten people your question.

Record their choices.

My Survey Question and My Data

What kind of food do you like

1. pizza ✓

2. cake 0

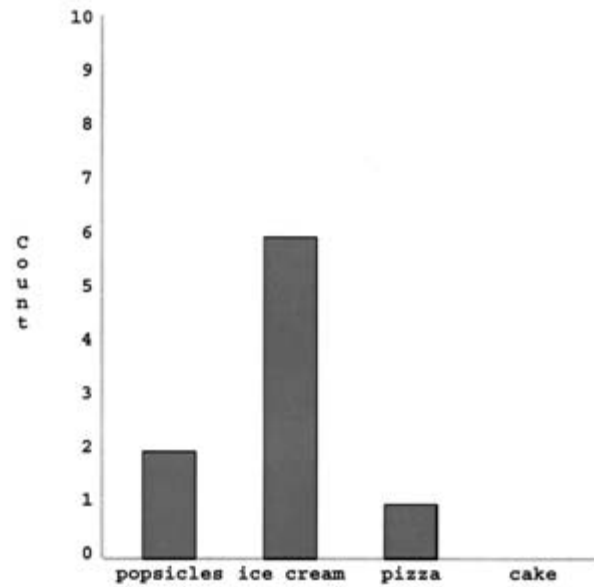
3. ice cream ✓ ✓ ✓ ✓ ✓

4. popsicles ✓ ✓

B

Here is my graph of the data I collected:

food for or pde



n = 9

foods

C

Things I will say about my graph when I share in the Mathematician's Chair:

2 PEOPLE likes Popsicles.
Six people likes ice cream.
1 person likes pizza.
0 people likes cake.

Teacher's Notes

Problem Solving

- The student selects and applies an appropriate problem-solving strategy when conducting an inquiry, arriving at a partially complete and/or partially accurate solution (e.g., creates a list of choices and uses check marks to record the students' preferences, but seems to have surveyed only nine people).

Understanding of Concepts

- The student demonstrates some understanding of data management and interpretation through partial explanations and illustrations (e.g., graphs the data correctly but only partially interprets them and does not offer a concluding statement).

Application of Mathematical Procedures

- The student records survey data and creates a graph, making some errors and/or omissions and arriving at a partially complete or partially accurate solution (e.g., creates the graph correctly, using the data that were collected and including conventions such as a title and category labels, but surveys only nine people).

Communication of Required Knowledge

- The student partially interprets the graph created and/or explains the interpretation with some clarity (e.g., simply restates the number of choices for each category ["2 people likes popsicles. Six people likes ice cream"], giving neither further explanation nor a concluding statement).

Comments/Next Steps

- The student has developed an understanding of the process of organizing and displaying data in graphs.
- The student could add number totals to charts in order to prevent errors in data collection.
- The student should participate in discussions that focus on the interpretation of information presented in graphs and charts.
- The student should begin to use more precise language in survey questions (e.g., the survey question could have been stated more specifically: "What kind of food is the **best** to have at our party?" or, "What is your **favourite** party food?").

Planning a Celebration **Level 3, Sample 1**

A

Planning A Celebration

Your class is planning a celebration.

Create a survey question.

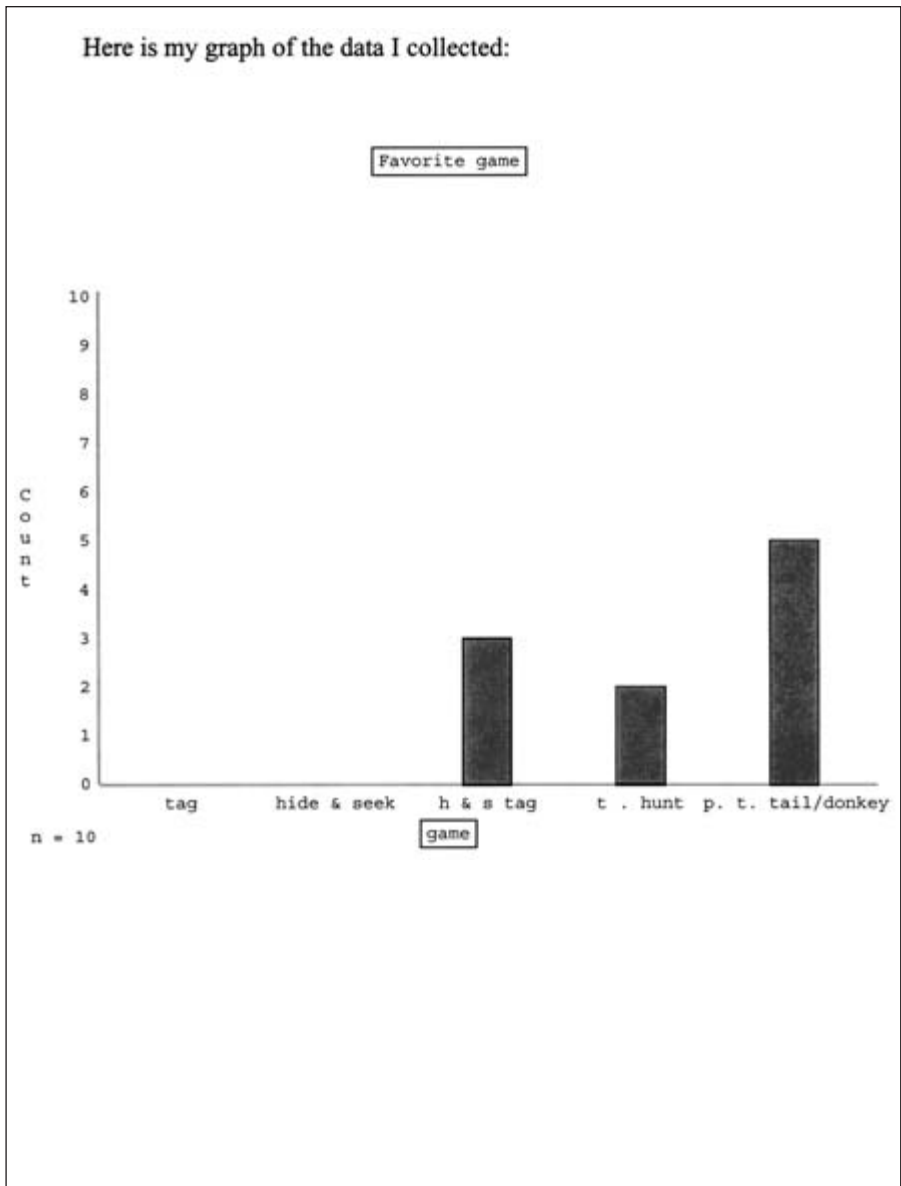
Ask ten people your question.

Record their choices.

What game wud you play at a party?

hide and seek	
tag	
hide and seek	✓✓✓
treasure hunt	✓✓
pin the tail on the donkey	✓✓✓✓

B



Things I will say about my graph when I share in the Mathematician's Chair:

choos'd pin the tall on the people
 and the best is tag and hid and seek.
 So at my next party we will
 proble play pin the tall on the
 docke evin' I have never play
 d it at my parte before.

Teacher's Notes

Problem Solving

- The student selects and applies an appropriate problem-solving strategy when conducting an inquiry, arriving at a generally complete and accurate solution (e.g., creates a chart showing five choices of games and uses check marks to indicate the students' selections).

Understanding of Concepts

- The student demonstrates a clear understanding of data management and interpretation through appropriate and complete explanations and illustrations (e.g., collects the data and correctly represents them in the graph; interprets the graph, using the relevant data).

Application of Mathematical Procedures

- The student records survey data and creates a graph, making few errors and/or omissions and arriving at a complete and accurate solution (e.g., the survey chart is easily understood, although the addition of totals for each row of data might make it clearer; the bar graph has a relevant title, is completely labelled, and accurately displays the data for each category).

Communication of Required Knowledge

- The student clearly interprets and explains the graph created (e.g., discusses most of the game choices – hide and seek, pin the tail on the donkey, and tag – in the interpretation of the data; compares the categories of data – “most of the people choos'd pin the tall on the donke ...”; and includes a summary statement – “So at my next party we will proble play pin the tall on the docke ...”).

Comments/Next Steps

- The student could add further detail to data interpretations by including numerical information in the statements (e.g., by saying of pin the tail on the donkey that five out of ten people chose it).
- The student should begin to use more specific mathematical language in writing and discussing the solutions to data-management problems (e.g., by saying, “My data show that ...” or, “In my graph you can see ...”).
- The student should refer to word charts or a personal dictionary for the correct spelling of words.

Planning a Celebration **Level 3, Sample 2**

A

Planning A Celebration

Your class is planning a celebration.

Create a survey question.

Ask ten people your question.

Record their choices.

My Survey Question and My Data

What do you like on your pizza best?

pepperoni ✓✓✓✓

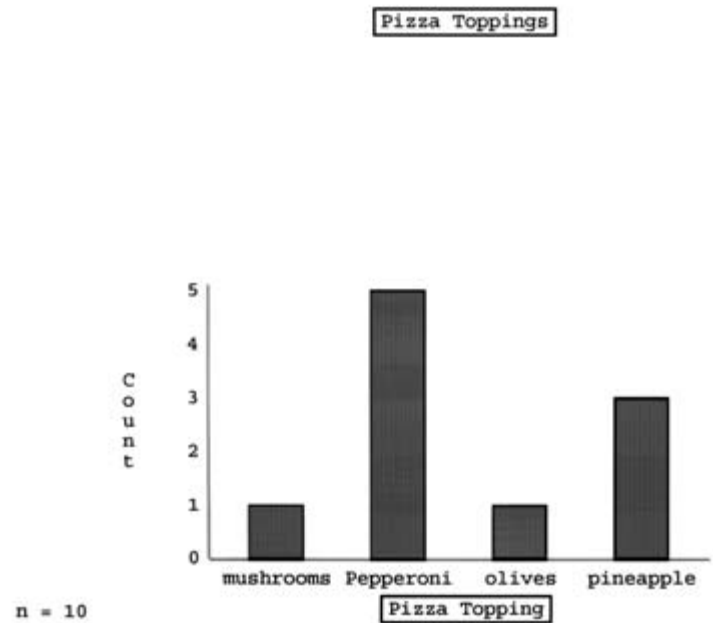
mushrooms ✓

olives ✓

Pineapple ✓✓

B

Here is my graph of the data I collected:



C

Things I will say about my graph when I share in the Mathematician's Chair:

The same liked mushrooms and olives. most like pepperoni and 3 pineapples where in the mittle. we beter have lots of pepperoni pizzas.

Teacher's Notes

Problem Solving

- The student selects and applies an appropriate problem-solving strategy when conducting an inquiry, arriving at a generally complete and accurate solution (e.g., creates a list of four pizza toppings and uses check marks to record the students' choices).

Understanding of Concepts

- The student demonstrates a clear understanding of data management and interpretation through appropriate and complete explanations and illustrations (e.g., represents the data appropriately and completely in the graph; correctly identifies pepperoni as the most popular choice in the interpretation of the data).

Application of Mathematical Procedures

- The student records survey data and creates a graph, making few errors and/or omissions and arriving at a complete and accurate solution (e.g., makes a survey list that is clear and easy to read; in the graph, uses a title and labels, and correctly represents the data in the survey list).

Communication of Required Knowledge

- The student clearly interprets and explains the graph created (e.g., discusses all of the data categories by comparing them: "The same liked mushrooms and olives. most like pepperoni"; relates the data gathered back to the original problem by stating, "we beter have lots of pepperoni pizzas").

Comments/Next Steps

- The student includes some numerical information in the data interpretation (e.g., "... 3 pineapples where in the mittle") but could include more numerical data from graphs to make interpretations more succinct.
- The student should make the titles of graphs more specific.
- The student should use more mathematical language when writing about and discussing solutions for data-management problems.

Planning a Celebration Level 4, Sample 1

A

Planning A Celebration

Your class is planning a celebration.

Create a survey question.

Ask ten people your question.

Record their choices.

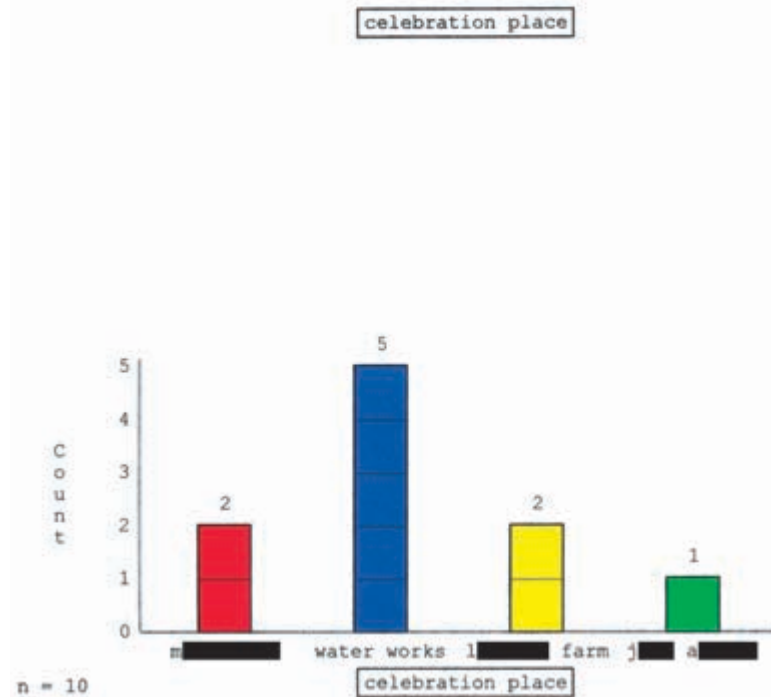
My Survey Question and My Data

were is your favourite place for a celebration?

water works	##	5
farm		2
J A		1
M		2

B

Here is my graph of the data I collected:



Things I will say about my graph when I share in the Mathematician's Chair:

most people like [redacted] water works
because it had five votes.
Least people like J [redacted]
[redacted] vote. because it had one
M [redacted] and L [redacted] farm
tied for second place.
From most to least it is water works
M [redacted] L [redacted] farm J [redacted] a [redacted]
we should go to [redacted] water
works because five out of
ten people want to go.

Teacher's Notes

Problem Solving

- The student selects and applies an appropriate problem-solving strategy when conducting an inquiry, arriving at a thorough and accurate solution (e.g., poses a clear question, creates a chart with four categories, and uses tally marks to record the respondents' choices).

Understanding of Concepts

- The student demonstrates a thorough understanding of data management and interpretation through appropriate and detailed explanations and illustrations (e.g., the bar graph accurately reflects the data gathered; the interpretation of data is based on the graph and is thorough).

Application of Mathematical Procedures

- The student records survey data and creates a graph, making few, if any, minor errors and/or omissions and arriving at a thorough and accurate solution (e.g., the tally chart is clear and shows totals for each row; the graph has a title, labels, and totals for each column; the graph data match the data in the tally chart)

Communication of Required Knowledge

- The student clearly and thoroughly interprets and explains the graph created (e.g., compares the categories in a systematic way and uses numerical data to support the statements - "Most people like [redacted] water works because it had five votes"; further describes the data in order, from the most to the least; makes a concluding statement using mathematical language - "We should go to [redacted] water works because five out of ten people want to go").

Comments/Next Steps

- The student could create a survey question and ask a larger sample of students in order to develop other data-collection techniques.
- The student should continue to develop the language of comparison when interpreting graphs (e.g., *more than*, *fewer than*, *the greatest number*).
- The student could be prompted to think about whether the results of a given survey would be similar if the survey was conducted with a larger group of people or with a different group of people.

Planning a Celebration Level 4, Sample 2

A

Planning A Celebration

Your class is planning a celebration.

Create a survey question.

Ask ten people your question.

Record their choices.

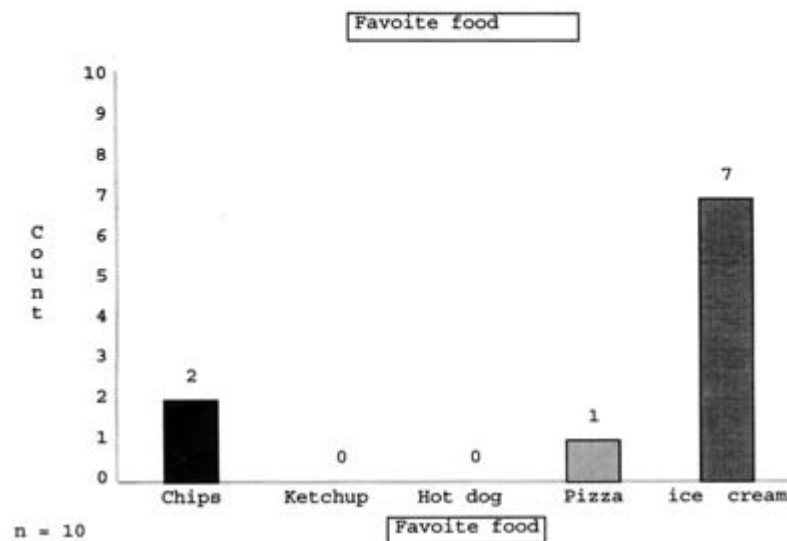
what is your favorite food at the class celebration?

My Survey Question and My Data

	<i>ketchup</i>	<i>Chips</i>	<i>Hot dog</i>	<i>pizza</i>	<i>ice cream</i>
<i>A.S</i>					✓
<i>M.A</i>					✓
<i>B.S</i>				✓	
<i>M.C</i>					✓
<i>P.F</i>					✓
<i>M.W</i>		✓			
<i>G.C</i>		✓			
<i>BA</i>					✓
<i>G.S</i>					✓
<i>Sod</i>					✓

B

Here is my graph of the data I collected:



C

Things I will say about my graph when I share in the Mathematician's Chair:

My graph tells me that two people like chips and no people like ketchup and no people like hot dogs. One person likes pizza. Seven people like ice cream. What would happen if I added chips and ice cream? What would happen if I added pizza and chips? My graph answered my survey. Hot dogs and ketchup are the least. Ice cream is the most. Here is how you go most to least: ice cream, chips, pizza, hot dog, ketchup. Ketchup, hot dog, pizza, chips, ice cream, is least to most. This is my title: favorite food but I just puted my name with it. I have 5 choices they are.... ketchup, hot dog, pizza, chips, ice cream. My total number is 10.

Teacher's Notes

Problem Solving

- The student selects and applies an appropriate problem-solving strategy when conducting an inquiry, arriving at a thorough and accurate solution (e.g., creates a clear survey question, creates a chart showing the students' initials and five food choices, and uses check marks to record the data).

Understanding of Concepts

- The student demonstrates a thorough understanding of data management and interpretation through appropriate and detailed explanations and illustrations (e.g., in the bar graph, accurately reflects the data gathered and includes categories for which there are no data; bases the data interpretation on the graph; interprets the data thoroughly).

Application of Mathematical Procedures

- The student records survey data and creates a graph, making few, if any, minor errors and/or omissions and arriving at a thorough and accurate solution (e.g., the survey chart is organized and clear; the graph has a title and labels, and totals for each column; the graph correctly represents the data in the survey chart).

Communication of Required Knowledge

- The student clearly and thoroughly interprets and explains the graph created (e.g., compares the categories, using mathematical language, and uses numerical data to support any statement – “My graph tells me that two people like chips and no people like ketchup ...”; describes the data in order from the most to the least and the least to the most; tries to think beyond the data by attempting to pose what-if questions).

Comments/Next Steps

- The student demonstrates mathematical thinking by trying to pose what-if questions, even though they are not appropriate in this case. The student should discuss what-if questions in the context of particular problems to get a sense of when they are appropriate.
- The student should consider whether all of the categories for a particular survey question are appropriate (e.g., ketchup is not generally eaten on its own, but the student may have been able to provide justification for including it as a separate food category).
- The inclusion of column totals would make the survey chart clearer.
- The student should have a concluding statement in solutions to problems.
- The student should refer to word charts or a personal dictionary for the correct spelling of words.

Teacher Package

Mathematics Exemplar Task Grade 1 – Data Management and Probability Teacher Package

Title: Planning a Celebration

- Time Requirements:** 180–240 minutes (total)
- 30–40 minutes to complete Pre-task 1
 - 30–40 minutes to complete Pre-task 2
 - 30–40 minutes to complete Pre-task 3
 - 30–40 minutes to complete Part 1
 - 30–40 minutes to complete Part 2
 - 30–40 minutes to complete Part 3

These activities will take place over several mathematics classes and may be done over several days in order for the students to build on the concepts being explored. A significant period of time is recommended to allow students to complete their investigations. The time that it takes each student to complete the exemplar task is not being assessed. Some students may take longer than others to complete the task.

Description of the Task

This task will require students to:

- engage in whole-class discussions to brainstorm a list of things that they could have at a celebration;
- engage in whole-class activity to sort the data, identify the categories, and label the categories;
- work individually to:
 - select one category to explore further by creating a survey question;
 - ask ten students their survey question, record the responses, and create a graph, using Graphers;
 - share with the class their graph and their recommendation for the celebration.

Students will select a category for the celebration, record the survey question they would ask about the category, pose the question to ten classmates, and record the responses made. They will then display the data in a graph and report their findings to the class.

1

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).

Students will:

1. collect, organize, and describe data using concrete materials and drawings (1m92);
2. interpret displays of data using concrete materials, and discuss the data (1m93);
3. conduct an inquiry using appropriate methods (1m95);
4. collect first-hand data by counting objects, conducting surveys, measuring, and performing simple experiments (1m100).

Note that, although all of the expectations listed will be addressed through instruction relating to the task, student achievement of expectation 4 will not be assessed in the final product.

Teacher Instructions

Prior Knowledge and Skills Required

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

- sorting and classifying objects, pictures, and so forth, into different categories and labelling each category
- collecting survey data by using check marks or other techniques
- posing survey questions and collecting data based on the questions posed
- analysing data collected from survey questions
- using the software program Graphers

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*.

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.

2

*The rubric is reproduced on page 71 of this document.

Classroom Set-up

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

- a meeting area for a large group
- 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
- story books or poems that highlight celebrations or parties
- clipboards or other hard surfaces for writing that students can use when collecting data
- writing instruments (pencils, erasers)
- paper
- chart paper or mural paper
- markers
- scissors
- masking tape
- pictures or graphics of items that would be found at a celebration or party (e.g., pizza, pop, cake, hats, balloons)
- sorting circles or hula hoops or string
- computer and the computer software Graphers

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 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 3 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: *most, least, recommend, more than, less than, graph, survey, data, sort, and category.*

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*****Pre-task 1: Favourite Recess Activity (30–40 minutes)***

1. Explain to the students that you are interested in finding out a favourite recess activity for the entire class. List the choices on chart paper. This is a brainstorming activity, so accept and record all of the responses you are given, including responses that are not appropriate (e.g., swimming).
2. When you have a list of activities, cut it apart and sort the activities. Some of the possible ways to sort the data include:
 - activities you can do at recess and things you cannot do at recess
 - activities you can do for indoor recess and things you can do for outdoor recess
 - activities you can do in winter at recess and things you can do in the spring at recess
 - activities you do alone and activities you do with your friends
 Your sorting categories will depend on your class list.
3. Select one of the categories and design a survey question with the class. An example might be, “What is your favourite springtime recess activity?” The choices might be using the swings, using the slide, tag, soccer, baseball, or skipping.

4. Create a labelled graph and have students sign in beside their favourite springtime recess activity.
5. Analyse the graph together with the students. Begin with a prompt such as the following:
 - “What does this graph tell us?”
 Other prompts might include the following:
 - “How many more people chose _____ than _____?”
 - “How many fewer people chose _____ than _____?”
 - “How many people altogether chose _____?”
 - “How do you know everyone in the class has his or her choice shown on the graph?”
 - “Would this graph look the same if we asked the students in Grade 2? Why or why not?”
 - “Would this graph look the same if we asked just boys? just girls?”

Pre-task 2: Planning the Celebration (30–40 minutes)

1. Read to the students from story books or poems about celebrations. After the students have been exposed to a variety of stories, the whole class can brainstorm what they would like to have at a celebration. Any suggestions during a brainstorming session are welcomed and encouraged.
2. As the students verbalize their ideas, record them on chart or mural paper. It would be beneficial to have a picture drawn or added beside each idea. Display the brainstorming list in the classroom and make reference to it whenever necessary.

Pre-task 3: Sorting the Data (30–40 minutes)

1. Cut apart the items in the brainstorming list in Pre-task 2 and put them in a large pile.
2. Discuss the ways in which the class could sort the ideas. ***It is important that the students learn to identify these categories rather than having them given to them by the teacher.*** The class may suggest a variety of ways for sorting the information.
3. After the information has been sorted in a variety of ways, the class should decide on the categories that best represent the data.
4. Display the categories. This can be done by creating, or having a student create, a label for each of the categories. The labels should be posted in a list on chart paper or on the chalkboard. The students will use the list of categories as a resource when they create their survey question and collect their survey data.
5. To assist students in creating the choices for a survey question, have them brainstorm things that might be included in the Food category (e.g., carrots, cheese, chips, crackers).
6. For the other categories in the chart, have the students contribute possible choices. Have these choices included in the chart. Students may refer to the sorted piles of brainstormed ideas from Pre-task 2.

Exemplar Task

Part 1: Designing a Survey Question (30–40 minutes)

Each student will design a survey question based on one category from the class sorting activity. The question will help students to make a decision about what choices from the selected category they would like to include in a celebration. In formulating the choices, the students designing the survey question may select items directly from the category as listed on the chart or may select some items from the chart and add other ideas (as long as the items are appropriate to the category). Students should include two to four choices on their survey. They will ask ten classmates their survey question.

Part 2: Collecting and Displaying the Data (30–40 minutes)

Students need to decide how they will collect their data (e.g., using a checklist, using the names of the students). After they have collected their data, they will use the computer program Graphers to graph the results of their data collection. Graphers is a program that has been licensed for use by the Ministry of Education. It can be found on a CD with other ministry-licensed software that was sent to every school in the province. If you are unfamiliar with Graphers, please refer to Appendix 2.

Part 3: Analysing the Data (30–40 minutes)

Students will interpret the data in their graph and write their observations on the organizer provided. They will then share their graph with the class and use the information in the graph to explain what they would include in the celebration. The method of communication for this activity will be the mathematician’s chair. 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 and 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 employ effective listening skills and to give the student in the chair useful and usable feedback. To elicit feedback, you may use prompts such as the following:

- “What did you like about the survey question?”
- “Do you agree or disagree with the choices?”
- “How could the mathematician improve the question or the choice?”
- “How could the mathematician change the question to create a new one or change the choices to arrive at a new way of having a celebration?”

See Appendix 3 for an example of the form that you will need to use in evaluating a student’s statements and performance while in the mathematician’s chair. You may find that a tape recorder is useful for this part of the activity.

Introducing the Exemplar Task

1. Distribute a copy of the student package to each student.
2. Write the following statements on a chart and read them with the students (the statements can be read as many times as necessary):
 - Choose a category from the Celebration chart.
 - Think of a survey question. Make sure you have two to four choices from the category for your survey.
 - Decide how you will collect your data.
 - Ask ten people your survey question.
 - Use Graphers to build a graph of the data that you collected.
 - Print your graph.
3. Have the students conduct their surveys. When they have finished, bring them together while you explain the next part of the task, in which they use the computer program Graphers to display the data they have gathered. Students will need to print a copy of their graph to place in the exemplar package.
4. Prepare students for their turn in the mathematician’s chair. Some students may need prompts to help them to begin their interpretation of the data. For example:
 - “Think about the things you will say about your graph when you have your turn in the mathematician’s chair. Write your ideas in the booklet to help you to remember them.”
 - “What does your graph tell you about the information you collected?”
 - “What decision would you make for the celebration from your choices?”
 - “Why did you make that recommendation?”

Encourage students to use mathematical language from the math chart. Use some of the prompts from Pre-task 1.

Record what the students say as they share their graphs and recommendations for the celebration. The recorded statements will provide assessment information to go with what the student has written in his or her exemplar booklet. See Appendix 3 for a sample recording sheet.
5. The problem that the students will solve independently is provided in the worksheets in Appendix 1.

Appendix 1: Student Worksheets

Planning a Celebration

Your class is planning a celebration.

Create a survey question.

Ask ten people your question.

Record their choices.

My Survey Question and My Data

Here is my graph of the data I collected:

Things I will say about my graph when I share in the
Mathematician's Chair:

Appendix 2: Teacher Notes for Graphers

To create a graph:

- double-click **Warm-Up**;
- choose a set of symbols (by double-clicking);
- click the **Data Maker** icon in the left margin;
- choose enough symbols to correspond with the data (e.g., four balloon symbols if four classmates wanted balloons);
- click **Done**;
- click the **Graphs** icon in the left margin;
- click **Bar Graph** and click **GO**.

To change the category name (under the graph):

- click the name and type in the word you want;
- click **OK** or press the **Enter** key on the keyboard.

To change the category symbols:

- click the **Tools** icon;
- click the **dog** icon on the **Toolbar** (this changes picture symbols to words);
- click the word you want to change and type in the new word;
- click **OK** or press **Enter** on the keyboard;
- continue for each word you want to change.

To print the graph:

- click the **Print** icon;
- click the appropriate **Graph** icon;
- click on the **Put In** icon;
- click **Done**.

Appendix 3: Evaluation – Mathematician’s Chair

Name of Student:	
Date:	
Expectation	Comments:
– collect, organize, and describe data using concrete materials and drawings (1m92)	
– interpret displays of data using concrete materials, and discuss the data (1m93)	
Language – use mathematical terminology	

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