Teacher Package

Mathematics Exemplar Task
Grade 2 – Patterning and Algebra

Teacher Package

Title: Growing Patterns

Time Requirements: 50–65 minutes (total)
- 20 minutes to complete the pre-task
- 30–45 minutes to complete the exemplar task

These tasks 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. Large blocks of time are 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 tasks.

Description of the Task

This task will require students to:

- make a growing pattern by using interlocking cubes;
- describe the pattern they made;
- investigate a classmate's growing pattern;
- extend a classmate's pattern.

For the first part of the task, students will each make a pattern, draw it, write the pattern rule, and then describe the pattern in such a way that someone else can determine the next term. They will then look at the numbers in their pattern to see what addition pattern is evident in it. For the second part of the task, students will each draw a classmate's pattern and the next term, write the pattern rule, and compare their own pattern with the classmate's.

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. identify, extend, and create number, geometric, and measurement patterns, and patterns in their environment (2m82);
2. explore patterns and pattern rules (2m83);
3. identify relationships between and among patterns (2m84);
4. recognize that patterning results from repeating an operation (e.g., addition), using a transformation (slide, flip, turn), or making some other change to an attribute (e.g., position, colour) (2m85);
5. describe and make models of patterns encountered in any context (e.g., wallpaper borders, calendars), and read charts that display the patterns (2m86);
6. identify patterns (e.g., in shapes, sounds) (2m87);
7. relate growing and shrinking patterns to addition and subtraction (2m92);
8. explain a pattern rule (2m93);
9. given a rule expressed in informal language, extend a pattern (2m94).

Note that, although all of the expectations listed will be addressed through instruction relating to the task, student achievement of expectations 2, 5, and 6 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:
- creating growing and shrinking patterns from a variety of materials
- discussing and explaining pattern rules
- exploring addition and subtraction in patterns
- extending existing patterns

The Rubric*

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

**The rubric is reproduced on page 68 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:

- Pre-task – a large-group work area on the floor, with the students sitting in a circle
- Exemplar task – individual workspaces at desks or tables

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
– writing instruments (pencils, erasers)
– manipulatives (e.g., pattern blocks, coloured tiles, toothpicks, interlocking cubes)
– pieces of paper or place mats to go under each term of the pattern
– interlocking cubes
– rulers

General Instructions

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

The pre-task activities are to be completed with the whole group. Students are to work individually and independently to complete the exemplar task.

When students are completing the introductory activities, provide prompts to get them started or to extend their investigations. Recording the prompts serves as a reminder of the conversation that occurred between you and the student. These notes provide valuable information that will allow you to plan the next steps for both individual and group instruction.

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 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.

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 that you may include for this task are: *growing pattern, increase, bigger, adding, counting by*.

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: Investigating Growing Patterns (20 minutes)

1. Invite the students to sit on the carpet or floor in a circle. In the centre of the circle, place a growing pattern. This can be made from a variety of materials (e.g., coloured tiles, pattern blocks, toothpicks, interlocking cubes).
2. Have students discuss the growing pattern. You may use the following prompts:
   – "What do you notice about this series of _____ (pattern blocks, cubes)?"
   – "If I were to continue it, what do you think would happen? Why?"
3. Build patterns modelled on the samples from Appendices 2 and 3 to show that patterns can grow in a manner that is not simply linear.
4. Ask students to describe the patterns. Have them use mathematical language (e.g., "The unit of the pattern is _____ ." "The pattern grows three more times." "Each term is bigger than the one before." "Each time, the pattern increases by _____ .").
5. Have students use the various pieces to build their own growing patterns.
6. Ask the students to state the pattern rule. They can tell how many pieces are added each time.
7. Invite the students to extend the pattern by showing what the next two entries would look like.

Exemplar Task (30–45 minutes)

1. Distribute a copy of the student package to each student.
2. Make sure that there is an adequate supply of interlocking cubes for the students.
3. Tell the students that they will be working independently to make, describe, and classify growing patterns. They will be given opportunities to write about the patterns they have created. The problem that the students will solve independently is provided in the worksheets in Appendix 1.

Appendix 1: Student Worksheets

Growing Patterns

1. a) Use interlocking cubes to make a pattern that grows.

   Your growing pattern should grow at least 4 times.

   Draw your growing pattern below.

b) My patterning rule is:

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c) Describe your pattern in enough detail so that someone else can make it grow one more time.

d) Look at the numbers in your pattern.

How are they like adding?

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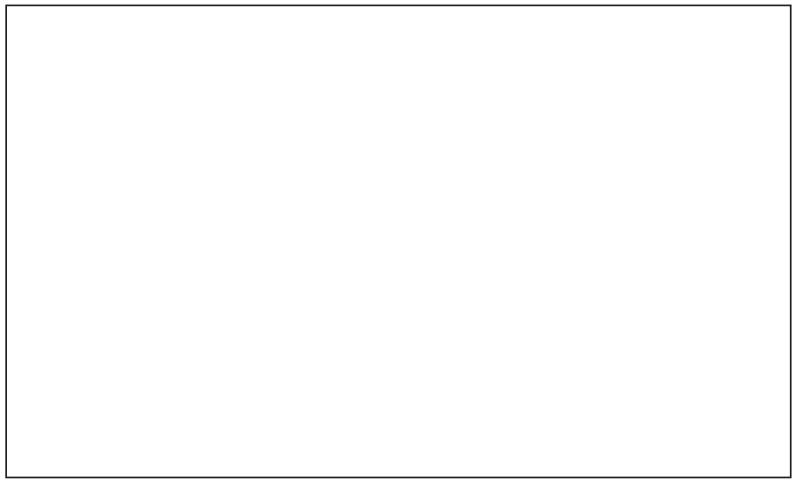
2. a) Look at a classmate's pattern.

Draw your classmate's pattern in your own booklet.

Make it grow one more time.



b) My classmate's patterning rule is:

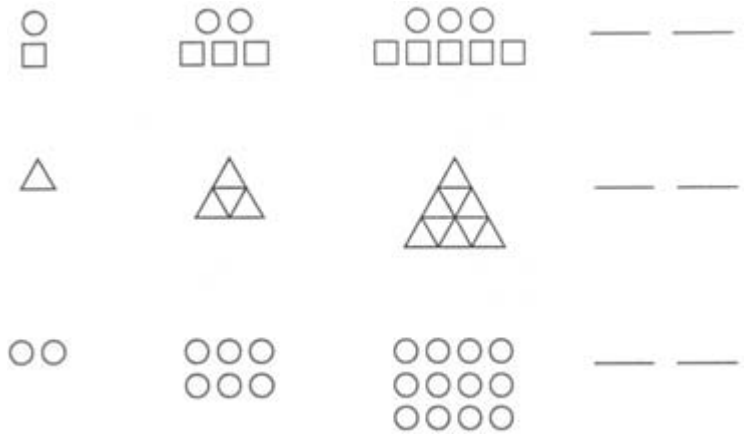
c) Compare your pattern with your classmate's pattern.

How are they alike?

How are they different?

Appendix 2: Growing Patterns

Continue the pattern.



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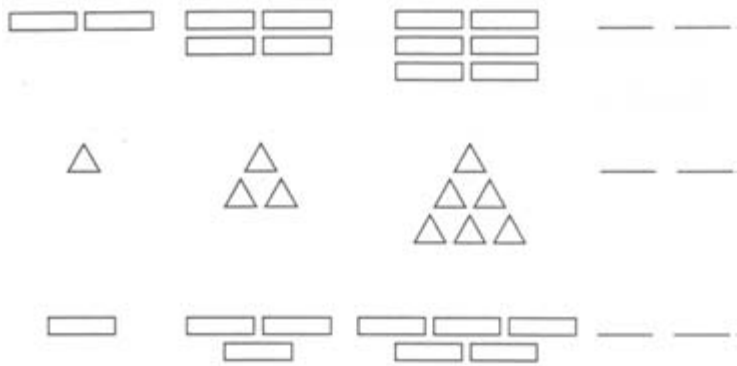
Appendix 3: Growing Patterns

Continue the pattern.



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