

# **Patterning and Algebra**

# From Patterns to Prediction

## The Task

This task required students to:

- extend and describe a pattern;
- investigate sequences and patterns.

Following a given design, each student built a series of patterned structures, described the pattern, and used it to make a prediction. Each student then constructed his or her own pattern, recorded and described it, and posed and answered a question about it. Next, students identified and described the patterns in a series of triangles. They then determined the pattern of the number of tiles in a given series of rectangular shapes and in a series that they designed, and used the patterns to make predictions and/or solve problems.

## Expectations

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

*Students will:*

1. identify the relationships between whole numbers and variables (7m66);
2. identify, extend, create, and discuss patterns using whole numbers and variables (7m67);
3. identify, create, and solve simple algebraic equations (7m68);
4. extend a pattern, complete a table, and write words to explain the pattern (7m71);
5. recognize patterns and use them to make predictions (7m72);
6. interpret a variable as a symbol that may be replaced by a given set of numbers (7m73);
7. present solutions to patterning problems and explain the thinking behind the solution process (7m75);
8. evaluate simple algebraic expressions by substituting natural numbers for the variables (7m76);
9. translate simple statements into algebraic expressions or equations (7m77);
10. solve problems giving rise to first-degree equations with one variable by inspection or by systematic trial (7m79).

### **Prior Knowledge and Skills**

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

- recognizing and discussing mathematical relationships between and among patterns
- identifying, extending, and creating patterns in a variety of contexts
- applying patterning strategies to problem-solving situations
- identifying, creating, and solving simple algebraic equations
- the following mathematical expressions: *term, variable, algebraic, expression, linear pattern, equation*

*For information on the process used to prepare students for the task and on the materials, resources, and equipment required, see the Teacher Package reproduced on pages 181–187 of this document.*

## Task Rubric – From Patterns to Prediction

| Expectations*                                 | Level 1   | Level 2  | Level 3  | Level 4  |
|---|---|--|--|--|
| <b>Problem solving</b>                        |   |  |  |  |
| <b>The student:</b>                           |   |  |  |  |
| 3, 7, 10                                      | <ul style="list-style-type: none"> <li>– selects and applies a problem-solving strategy that leads to an incomplete or inaccurate solution</li> <li>– selects and applies a problem-solving strategy to investigate number patterns, arriving at an incomplete or inaccurate solution</li> </ul>                            | <ul style="list-style-type: none"> <li>– selects and applies an appropriate problem-solving strategy that leads to a partially complete and/or partially accurate solution</li> <li>– selects and applies an appropriate problem-solving strategy to investigate number patterns, arriving at a partially complete and/or partially accurate solution</li> </ul> | <ul style="list-style-type: none"> <li>– selects and applies an appropriate problem-solving strategy that leads to a generally complete and accurate solution</li> <li>– selects and applies an appropriate problem-solving strategy to investigate number patterns, arriving at a generally complete and accurate solution</li> </ul> | <ul style="list-style-type: none"> <li>– selects and applies an appropriate problem-solving strategy that leads to a thorough and accurate solution</li> <li>– selects and applies an appropriate problem-solving strategy to investigate number patterns, arriving at a thorough and accurate solution</li> </ul>   |
| <b>Understanding of concepts</b>              |   |  |  |  |
| <b>The student:</b>                           |   |  |  |  |
| 1, 2, 5, 6                                    | <ul style="list-style-type: none"> <li>– interprets a variable as a symbol that may be replaced by a given set of numbers with limited success</li> <li>– demonstrates a limited understanding of how to make a generalization from a pattern</li> <li>– demonstrates a limited understanding of linear patterns</li> </ul> | <ul style="list-style-type: none"> <li>– interprets a variable as a symbol that may be replaced by a given set of numbers with some success</li> <li>– demonstrates some understanding of how to make a generalization from a pattern</li> <li>– demonstrates some understanding of linear patterns</li> </ul>   | <ul style="list-style-type: none"> <li>– interprets a variable as a symbol that may be replaced by a given set of numbers with general success</li> <li>– demonstrates a general understanding of how to make a generalization from a pattern</li> <li>– demonstrates a general understanding of linear patterns</li> </ul>            | <ul style="list-style-type: none"> <li>– successfully interprets a variable as a symbol that may be replaced by a given set of numbers and recognizes multiple applications of the variable</li> <li>– demonstrates a thorough understanding of how to make a generalization from a pattern</li> <li>– demonstrates a thorough understanding of linear patterns</li> </ul> |
| <b>Application of mathematical procedures</b> |   |  |  |  |
| <b>The student:</b>                           |   |  |  |  |
| 4, 5, 8, 9                                    | <ul style="list-style-type: none"> <li>– uses mathematical procedures that include many errors and/or omissions</li> </ul>  | <ul style="list-style-type: none"> <li>– uses mathematical procedures that include some errors and/or omissions</li> </ul>   | <ul style="list-style-type: none"> <li>– uses mathematical procedures that include few errors and/or omissions</li> </ul>  | <ul style="list-style-type: none"> <li>– uses mathematical procedures that include few, if any, minor errors and/or omissions</li> </ul>   |

| Expectations*                              | Level 1   | Level 2  | Level 3  | Level 4  |
|--|---|--|--|--|
| <b>Communication of required knowledge</b> |   |  |  |  |
| The student:                               |   |  |  |  |
| 4, 7                                       | – uses mathematical language and notation with limited clarity to describe the various patterns | – uses mathematical language and notation with some clarity to describe the various patterns | – uses mathematical language and notation clearly to describe the various patterns | – uses mathematical language and notation clearly and precisely to describe the various patterns |

\*The expectations that correspond to the numbers given in this chart are listed on page 136.

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