

# **Geometry and Spatial Sense**

# The Geometer's Sketchpad

## The Task

This task required students to:

- draw a variety of polygons;
- construct a variety of polygons;
- transform figures using The Geometer's Sketchpad;
- determine the sum of the angles in a variety of polygons;
- determine which regular polygons will tile a plane.

Students used The Geometer's Sketchpad\* to draw different polygons and find the sum of their interior angles. They transformed each of the polygons they had drawn and observed the results. Then they summarized what they knew about the sum of the interior angles of different polygons. Next, students constructed various regular polygons, described how to determine the size of their angles, and determined which of the regular polygons will tile a plane. Students used The Geometer's Sketchpad to investigate whether any triangle and any quadrilateral will tile a plane.

## Expectations

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

*Students will:*

1. identify, describe, compare, and classify geometric figures (7m47);
2. explore transformations of geometric figures (7m50);
3. understand, apply, and analyse key concepts in transformational geometry using concrete materials and drawings (7m51);
4. use mathematical language effectively to describe geometric concepts, reasoning, and investigations (7m52);
5. explain why two shapes are congruent (7m58);
6. create and analyse designs that include translated, rotated, and reflected two-dimensional images using concrete materials and drawings, and using appropriate computer applications (7m62);
7. identify whether a figure will tile a plane (7m63);
8. construct and analyse tiling patterns with congruent tiles (7m64).

\*The Geometer's Sketchpad software is licensed to the Ontario Ministry of Education (1999).

### **Prior Knowledge and Skills**

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

- the freehand tools of The Geometer's Sketchpad (menus, the difference between drawing and constructing a figure)
- creating tiling patterns using concrete materials
- the following terms: *tile, plane, transform, reflect, translate, rotate, congruent, regular polygon, tessellate*

*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 129–134 of this document.*

## Task Rubric – The Geometer’s Sketchpad

Expectations*	Level 1	Level 2	Level 3	Level 4
<b>Problem solving</b>				
	<b>The student:</b>			
2, 6, 7	– 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 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
<b>Understanding of concepts</b>				
	<b>The student:</b>			
3, 7, 8	– demonstrates a limited understanding of how to tessellate the plane using different transformations	– demonstrates some understanding of how to tessellate the plane using different transformations	– demonstrates a general understanding of how to tessellate the plane using different transformations	– demonstrates a thorough understanding of how to tessellate the plane using different transformations
<b>Application of mathematical procedures</b>				
	<b>The student:</b>			
1, 2, 3, 6, 8	– draws polygons using The Geometer’s Sketchpad and constructs a few of the required regular polygons – uses The Geometer’s Sketchpad to construct a few of the given figures that tessellate the plane	– draws polygons using The Geometer’s Sketchpad and constructs some of the required regular polygons – uses The Geometer’s Sketchpad to construct some of the given figures that tessellate the plane	– draws polygons using The Geometer’s Sketchpad and constructs many of the required regular polygons – uses The Geometer’s Sketchpad to construct many of the given figures that tessellate the plane	– draws polygons using The Geometer’s Sketchpad and constructs most or all of the required regular polygons – uses The Geometer’s Sketchpad to construct most or all of the given figures that tessellate the plane
<b>Communication of required knowledge related to concepts, procedures, and problem solving</b>				
	<b>The student:</b>			
4, 5, 8	– uses mathematical language and notation with limited clarity to state predictions and explain concepts of transformational geometry – summarizes the data about the sum of angles for polygons with limited clarity	– uses mathematical language and notation with some clarity to state predictions and explain concepts of transformational geometry – summarizes the data about the sum of angles for polygons with some clarity	– uses mathematical language and notation clearly to state predictions and explain concepts of transformational geometry – summarizes the data about the sum of angles for polygons clearly	– uses mathematical language and notation clearly and precisely to state and justify predictions and explain concepts of transformational geometry – summarizes the data about the sum of angles for polygons clearly and precisely

\*The expectations that correspond to the numbers given in this chart are listed on page 80.

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