Chapter 4: TRANSFORMATIONS

The chapter, Transformations is useful for both the visual learner and the abstract learner. Each lesson allows students to manipulate, derive and define mathematical terms through the use of Geometer's Sketchpad. When students work through each lesson they will be introduced and will utilize new GSP commands. Along with new commands, each student will be required to manipulate images in each lesson. Using a trial and error method and the students will then determine the correct transformation image from the file.

This chapter will require both teacher-directed and student-directed learning. Different modes of teaching may be used depending on how well students grasp the new GSP commands.

LESSON ONE - Investigation of Translations

ONTARIO CURRICULUM Covered:

- Grade 7: 7m47, 7m50, 7m51, 7m52, 7m61, 7m62, 7m65
- Grade 8: 8m55, 8m60

The first lesson in the chapter, Transformations, is a good introductory lesson to the chapter itself. It introduces students to graphs and translating figures constructed using GSP. It incorporates several of the expectations from the grade seven strand "Geometry and Spatial Sense" in the Ontario Curriculum and opens the door for further exploration in the grade eight curriculum.

Investigation of Translations will enable the students to make observations about transformations based on constructed angles in GSP. GSP commands introduced in the lesson include: plot points, graph, translate and transform.

It is recommended that the teacher lead this lesson because of the new GSP commands and concepts used.

LESSON TWO - Investigation of Rotations

ONTARIO CURRICULUM Covered:

- Grade 7: 7m47, 7m50, 7m51, 7m52, 7m61, 7m62, 7m65
- Grade 8: 8m55, 8m60, 8m68

The lesson Investigation of Reflections follows the introductory lesson in this chapter. Students will be using graphs and will be plotting points using GSP functions previously delved into. A new function that will be introduced to students in GSP is the mirror command.

Students will be able to create a triangle on the graph and then visualize the reflection of this image in GSP. Similar to the lesson Investigation of Translations, this lesson is geared towards the grade seven mathematics curriculum.

It is suggested that students have a basic knowledge of mathematical terminology prior to this activity. This will ensure maximum understanding of the mathematical concepts being used in GSP. Since students are familiar with graphing in GSP, instructors may allow students to work independently to discover properties of geometric reflections.

LESSON THREE - Investigation of Rotations

ONTARIO CURRICULUM Covered:
- Grade 7: 7m47, 7m50, 7m51, 7m52, 7m61, 7m62, 7m65
- Grade 8: 8m55, 8m60, 8m68

The lesson Investigation of Rotations allows students to continue experimenting and discovering with geometric figures - this time students will make observations about rotations rather than reflections or translations. Students will investigate the different properties a rotation will have on a shape by using the GSP function rotate. Similar to the previous lessons in this chapter, students will plot specified points on a graph before beginning the transformation.

The suggested mode of learning will be a student-centred approach to this lesson. The students have worked with various GSP commands in the chapter and rotate is the only new command for this lesson. Students will then be able to hypothesize and make observations on their own.

LESSON FOUR - Investigation of Dilations

ONTARIO CURRICULUM Covered:
- Grade 7: 7m24, 7m41, 7m47, 7m50, 7m51, 7m52, 7m62, 7m65
- Grade 8: 8m55, 8m60, 8m68, 8m70

The lesson Investigation of Dilations delves into area and dilation. Dilation is a transformation that changes all dimensions by a factor k called the scale factor. For enlargements, k is greater than 1 and for reductions, k is between 0 and 1. Since dilations can either be an enlargement or reduction, it is advised that teacher direct this lesson and follow through the steps with the students to ensure maximum understanding of both the mathematical terminology and the GSP commands used. The GSP command that will be introduced and utilized in this specific lesson is dilate.

Along with a new GSP function that will be explored, students will also be required to problem solve independently throughout this activity. Students will make conclusions based on their research in this activity. It is essential for students to have background information regarding the mathematics exhibited in this lesson.

LESSON FIVE - Investigation of Glide Reflections

ONTARIO CURRICULUM Covered:
- Grade 7: 7m47, 7m50, 7m51, 7m52, 7m61, 7m62, 7m65
- Grade 8: 8m55, 8m60, 8m68

This lesson will incorporate the material learned throughout lessons in this chapter. This is a good culminating lesson as it reviews the GSP commands used and introduces the new commands mark vector, hide transformation and glide reflection. Students will have the opportunity to experiment with the GSP functions to glide both the specified transformation and a created transformation of their choice.

Considering this lesson is highly student-centred, the instructor may allow the students to make discoveries without their guidance.