

**Advanced Functions and
Introductory Calculus
University Preparation
(MCB4U)**

Lifeguard Procedures Report

The Task

Students were presented with the following scenario:

As a mathematician, you have been hired by the Department of Parks and Recreation to investigate lifeguard procedures. In particular, you are to determine the best route for a lifeguard to take from the edge of a pool to a swimmer in trouble. You will produce a report summarizing your analysis and recommendations. The intent of this report is to provide the Department of Parks and Recreation with safety recommendations that it can implement across the entire region.

Final Product

Each student was to submit a project report that included:

- explicitly stated simplifying assumptions;
- a series of scenarios;
- relevant hypotheses, and confirmation or repudiation of these hypotheses;
- all calculations and analysis;
- appropriate visuals (e.g., diagrams, graphs);
- recommendations with supporting justification.

Expectations Addressed in the Exemplar Task

This task gave students the opportunity to demonstrate achievement of all or part of each of the following selected expectations. Expectations 1, 2, and 4–6 are from the Derivatives and Applications strand of the course. Expectation 3 is from the Underlying Concepts of Calculus strand.

Students will:

1. determine the key features of a mathematical model of an application drawn from the natural or social sciences, using the techniques of differential calculus;
2. pose questions related to an application and answer them by analysing mathematical models, using the techniques of differential calculus;
3. pose problems and formulate hypotheses regarding rates of change within applications drawn from the natural and social sciences;
4. communicate findings clearly and concisely, using an effective integration of essay and mathematical forms;
5. solve optimization problems involving polynomial and rational functions;
6. compare the key features of a mathematical model with the features of the application it represents.

For information on the process used to prepare students for the task and on the materials and resources required, see the Teacher Package reproduced on pages 77–82 of this document.