

**Mathematics for
College Technology
College Preparation
(MCT4C)**

Caterpillar Growth Problem

The Task

Students were presented with the following scenario:

The City of Pleasantville found a small infestation of 5000 caterpillars four years ago, but city council did not worry about it. Today, the council has realized that the caterpillar population has doubled every year. The caterpillars are a major problem, because they are destroying Pleasantville's beautiful parks and forests. You are an environmental consultant hired by the city. You will prepare a written report that includes an analysis of the effectiveness and environmental impact of the following four options. In your report, you will recommend and justify one of the options to city council.

Option 1: Use a chemical spray, “X,” that will reduce the caterpillar population by half every four years and will take effect immediately.

Option 2: Introduce a fly population that will reduce the caterpillar population by half every two years and will take effect after one year.

Option 3: Do nothing because, in a similar situation in a different location, the caterpillar population died out naturally after 15 years.

Option 4: Use a combination of the first three options. Predict how well this combination will work. Use mathematics to support your predictions.

Final Product

Each student was to submit a report that included:

- an analysis of the advantages and disadvantages of each of the four options, with some consideration of the environmental impact;
- all calculations, tables, equations, graphs, and/or other forms of communication;

- a conclusion, including a recommendation of the best option and a justification for this choice.

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, 4, and 5 are from the Applications and Consolidation strand of the course. Expectation 3 is from the Exponential and Logarithmic Functions strand.

Students will:

1. determine the key features of a mathematical model (e.g., an equation, a table of values, a graph) of a function drawn from an application;
2. analyse and interpret a given mathematical model of a piecewise-defined function, and relate the key features of the model to the characteristics of the application it represents;
3. pose and solve problems related to models of exponential functions drawn from a variety of applications, and communicate the solutions with clarity and justification;
4. pose questions related to an application and use a given function model to answer them;
5. make predictions and answer questions about an application represented by a graph or formula of a piecewise-defined function.

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 152–155 of this document.