

Pure Mathematics 30

Teacher Notes: Holiday Travel



February 2005

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Pure Mathematics 30

Holiday Travel—Teacher Notes

Introduction

This project relates to the practice of overbooking in the transportation and tourism industries. For example, carriers often sell more seats on an aircraft than are available. They do this to compensate for the “no-shows” that would leave empty seats on a flight. Carriers have extensive data that allow them to plan for the number of no-shows for a particular flight. Students will need to use their knowledge from the Exponents, Logarithms, and Geometric Series Unit, the Permutations and Combinations Unit, and the Statistics Unit. This project is designed to be completed in three to five hours of student time. The use of this project is optional; however, if you do choose to use it, you may include it as a part of your assessment. Sample solutions for the project questions can be found on the Alberta Learning extranet <https://phoenix.edc.gov.ab.ca>. A hard copy will be mailed to your school in late January. The general scoring guide for the project is the same as the one issued in September 2000.

The first written-response question, which is worth 10%, on the Pure Mathematics 30 June 2005 diploma examination will be related to this project. Students who do not complete the project but who have completed the course will have the knowledge to answer the written-response question; however, students who have completed the project will have had experience with the related mathematical skills in another context.

Specific Notes

Teachers may wish to

- remind students that calculating sample standard deviation is not part of the Pure Mathematics 30 program of studies,
- demonstrate to students that a population standard deviation can be calculated from a frequency table by entering the data points in one list (i.e. L_1) and the frequency in another list (i.e. L_2), and using the operation 1-Var Stats L_1, L_2 .

Program of Studies

The project relates to mathematics learned in the following units of Pure Mathematics 30.

Exponents, Logarithms, and Geometric Series

Specific Outcome 2.6: Model, graph, and apply exponential functions to solve problems. [PS, T, V]

Permutations and Combinations

Specific Outcomes 5.1: Use the fundamental counting principle to determine the number of different ways to perform multistep operations. [PS, R]

5.2: Determine the number of linear permutations of n objects taken r at a time, and use this to solve problems. [PS, R, V]

5.3: Determine the number of combinations of n distinguishable objects taken r at a time, and use this to solve problems. [PS, R, V]

5.5: Determine the number of pathways in a given compound pathway problem. [CN, PS, R, V]

Statistics

Specific Outcomes 6.1: Find the population standard deviation of a data set, using technology. [CN, E, T, V]

6.2: Solve probability problems, using the binomial distribution. [PS, R, T]

6.3: Use z -scores to solve problems related to the normal distribution. [PS, R, T, V]

Mathematical Processes

The seven mathematical processes identified in the *Program of Studies* are addressed in this project in the following manner.

Communication	Use correct mathematical notations and conventions and appropriate graphs and diagrams to communicate answers.
Connections	Understand the connections between the probability of an event and its location within a distribution of data.
Estimation and Mental Mathematics	Use estimation to determine if answers are reasonable within a given scenario.
Problem Solving	Develop graphs to model data sets and find probabilities and arrangements representative of the data sets.
Reasoning	Decide if an exponential function is a reasonable model for a given set of data.
Technology	Use a graphing calculator to build a histogram and to perform an exponential regression on a set of data.
Visualization	Visualize the effects on a compound pathway problem of imposing restrictions on the pathways.

ICT Program of Studies

C.6—Students will use technology to investigate and/or solve problems.

- Specific Outcomes**
- 4.1: Investigate and solve problems of prediction, calculation, and inference.
 - 4.2: Investigate and solve problems of organization and manipulation of information.
 - 4.3: Manipulate data by using charting and graphing technologies in order to test inferences and probabilities.
 - 4.5: Evaluate the appropriateness of the technology used to investigate or solve a problem.

F.1—Students will demonstrate an understanding of the nature of technology.

- Specific Outcome**
- 4.2: Solve mathematical and scientific problems by selecting appropriate technology to perform calculations and experiments.

P.2—Students will organize and manipulate data.

- Specific Outcome**
- 4.1: Manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases, and/or spreadsheets.