

# Erindale College

<b>Assessment Period:</b>	<b>2021 S2</b>
<b>Course:</b>	<b>MATHEMATICAL APPLICATIONS</b>
<b>Unit:</b>	<b>Unit 2: Mathematical Applications (1.0)</b>
<b>Accreditation:</b>	<b>T</b>
<b>Year:</b>	<b>11</b>

## Unit Goals

- understand the concepts and techniques in univariate data analysis and the statistical investigation process, linear equations and their graphs, and applications of trigonometry
- apply reasoning skills and solve practical problems in univariate data analysis and the statistical investigation process, linear equations and their graphs, and the applications of trigonometry
- implement the statistical investigation process in contexts requiring the analysis of univariate data
- communicate their arguments and strategies, when solving mathematical and statistical problems, using appropriate mathematical or statistical language
- interpret mathematical and statistical information, and ascertain the reasonableness of their solutions to problems and their answers to statistical questions
- choose and use technology appropriately and efficiently.

## Content Description

### Topic 1: Univariate data analysis and the statistical investigation process

- The statistical investigation process:
  - o review the statistical investigation process; for example, identifying a problem and posing a statistical question, collecting or obtaining data, analysing the data, interpreting and communicating the results
- Making sense of data relating to a single statistical variable:
  - o classify a categorical variable as ordinal, such as income level (high, medium, low), or nominal, such as place of birth (Australia, overseas), and use tables and bar charts to organise and display the data
  - o classify a numerical variable as discrete, such as the number of rooms in a house, or continuous, such as the temperature in degrees Celsius
  - o with the aid of an appropriate graphical display (chosen from dot plot, stem plot, bar chart or histogram), describe the distribution of a numerical dataset in terms of modality (uni or multimodal), shape (symmetric versus positively or negatively skewed), location and spread and outliers, and interpret this information in the context of the data
  - o determine the mean and standard deviation of a dataset and use these statistics as measures of location and spread of a data distribution, being aware of their limitations.
- Comparing data for a numerical variable across two or more groups:
  - o construct and use parallel box plots (including the use of the ' $Q1 - 1.5 \times IQR$ ' and ' $Q3 + 1.5 \times IQR$ ' criteria for identifying possible outliers) to compare groups in terms of location (median), spread (IQR and range) and outliers and to interpret and communicate the differences observed in the context of the data
  - o compare groups on a single numerical variable using medians, means, IQRs, ranges or

standard deviations, as appropriate; interpret the differences observed in the context of the data; and report the findings in a systematic and concise manner

- o implement the statistical investigation process to answer questions that involve comparing the data for a numerical variable across two or more groups; for example, are Year 11 students the fittest in the school?

## Topic 2: Applications of trigonometry

- Applications of trigonometry:
  - o review the use of the trigonometric ratios to find the length of an unknown side or the size of an unknown angle in a right-angled triangle
  - o determine the area of a triangle given two sides and an included angle by using the rule  $\text{Area} = \frac{1}{2}ab \sin C$ , or given three sides by using Heron's rule, and solve related practical problems
  - o solve problems involving non-right-angled triangles using the sine rule (ambiguous case excluded) and the cosine rule
  - o solve practical problems involving the trigonometry of right-angled and non-right-angled triangles, including problems involving angles of elevation and depression and the use of bearings in navigation.

## Topic 3: Linear equations and their graphs

- Linear equations:
  - o identify and solve linear equations
  - o develop a linear formula from a word description
- Straight-line graphs and their applications:
  - o construct straight-line graphs both with and without the aid of technology
  - o determine the slope and intercepts of a straight-line graph from both its equation and its plot
  - o interpret, in context, the slope and intercept of a straight-line graph used to model and analyse a practical situation
  - o construct and analyse a straight-line graph to model a given linear relationship; for example, modelling the cost of filling a fuel tank of a car against the number of litres of petrol required
- Simultaneous linear equations and their applications:
  - o solve a pair of simultaneous linear equations, using technology when appropriate
  - o solve practical problems that involve finding the point of intersection of two straight-line graphs; for example, determining the break-even point where cost and revenue are represented by linear equations
- Piece-wise linear graphs and step graphs:
  - o sketch piece-wise linear graphs and step graphs, using technology when appropriate
  - o interpret piece-wise linear and step graphs used to model practical situations; for example, the tax paid as income increases, the change in the level of water in a tank over time when water is drawn off at different intervals and for different periods of time, the charging scheme for sending parcels of different weights through the post.

## Assessment Tasks

Name	Due Date	Weighting
Assignment	Task completed in-class and submitted the following Monday: 16 August - 23 August	25%
Exam 1	TBC - Exam timetable: 3 September - 7 September	30%
Validation task	Ongoing task throughout the semester: 12 July - 16 November	15%
Exam 2	TBC - Exam timetable: 17 November - 19 November	30%

## Specific Unit Information

Students require a scientific calculator for this course.

## School Assessment Information

### For penalties for late and non-submission of work

See [BSSS Policy and Procedure Manual 4.3.10](#) for further information.

### For academic integrity

See [BSSS Policy and Procedure Manual 4.3.12](#) for further information.

### For appeals processes

See [BSSS Policy and Procedure Manual 7.2](#) for further information.

### For moderation procedures (internal and external)

See [BSSS Policy and Procedure Manual 5](#) for further information.

### For meshing procedures

See [BSSS Policy and Procedure Manual 5.4.1](#) for further information.

### For method of unit score calculation

See [BSSS Policy and Procedure Manual 4.3.6.2](#) for further information.

### For procedures for calculating course scores

See [BSSS Policy and Procedure Manual 4.3.13.2](#) for further information.

## Achievement Standards for MATHEMATICAL APPLICATIONS T - Year 11

	<i>A student who achieves an A grade typically</i>	<i>A student who achieves a B grade typically</i>	<i>A student who achieves a C grade typically</i>	<i>A student who achieves a D grade typically</i>	<i>A student who achieves an E grade typically</i>
<b>Reasoning and Communications</b>	<ul style="list-style-type: none"> <li>represents complex mathematical concepts in numerical, graphical and symbolic form in routine and non-routine problems in a variety of contexts</li> <li>communicates mathematical judgements and arguments in oral, written and/or multimodal forms, which are succinct and well-reasoned, using appropriate and accurate language</li> <li>evaluates the reasonableness of solutions to routine and non-routine problems in a variety of contexts</li> <li>reflects with insight on their own thinking and that of others and evaluates planning, time management, use of appropriate strategies to work independently and collaboratively</li> <li>evaluates the potential of Mathematics to generate knowledge in the public good</li> </ul>	<ul style="list-style-type: none"> <li>represents mathematical concepts in numerical, graphical and symbolic form in routine and non-routine problems a variety of contexts</li> <li>communicates mathematical judgements and arguments in oral, written and/or multimodal forms, which are clear and reasoned, using appropriate and accurate language</li> <li>analyses the reasonableness of solutions to routine and non-routine problems</li> <li>reflects on their own thinking and analyses planning, time management, use of appropriate strategies to work independently and collaboratively</li> <li>analyses the potential of Mathematics to generate knowledge in the public good</li> </ul>	<ul style="list-style-type: none"> <li>represents mathematical concepts in numerical, graphical and symbolic form to some routine and some non-routine problems in some contexts</li> <li>communicates mathematical judgements and arguments in oral, written and/or multimodal forms, using appropriate and accurate language</li> <li>explains the reasonableness of solutions to some routine and non-routine problems</li> <li>reflects on their own thinking and explains planning, time management, use of appropriate strategies to work independently and collaboratively</li> <li>explains the potential of Mathematics to generate knowledge in the public good</li> </ul>	<ul style="list-style-type: none"> <li>represents simple mathematical concepts in numerical, graphical or symbolic form in routine problems in limited contexts</li> <li>communicates simple mathematical judgements or arguments in oral, written and/or multimodal forms, with some use of appropriate language</li> <li>describes the appropriateness of solutions to routine problems</li> <li>reflects on their own thinking with some reference to planning, time management, use of appropriate strategies to work independently and collaboratively</li> <li>describes the potential of Mathematics to generate knowledge in the public good</li> </ul>	<ul style="list-style-type: none"> <li>represents simple mathematical concepts in numerical, graphical or symbolic form in structured contexts</li> <li>communicates simple mathematical information in oral, written and/or multimodal forms, with limited use of appropriate language</li> <li>identifies solutions to routine problems in structured contexts</li> <li>reflects on their own thinking with little or no reference to planning, time management, use of appropriate strategies to work independently and collaboratively</li> <li>identifies some ways in which Mathematics is used to generate knowledge in the public good</li> </ul>
<b>Concepts and Techniques</b>	<ul style="list-style-type: none"> <li>critically applies mathematical concepts in a variety of complex contexts to routine and non-routine problems</li> <li>selects and applies advanced mathematical techniques to solve complex problems in a variety of contexts</li> <li>constructs, selects and applies complex mathematical models to routine and non-routine problems in a variety of contexts</li> <li>uses digital technologies efficiently to solve routine and non-routine problems in a variety of contexts</li> </ul>	<ul style="list-style-type: none"> <li>applies mathematical concepts in a variety of contexts to routine and non-routine problems</li> <li>selects and applies mathematical techniques to solve routine and non-routine problems in a variety of contexts</li> <li>selects and applies mathematical models to routine and non-routine problems to a variety of contexts</li> <li>uses digital technologies effectively to solve routine and non-routine problems in a variety of contexts</li> </ul>	<ul style="list-style-type: none"> <li>applies mathematical concepts in some contexts to routine and non-routine problems</li> <li>applies mathematical techniques to solve routine and non-routine problems in some contexts</li> <li>applies mathematical models to routine and non-routine problems in some contexts</li> <li>uses digital technologies appropriately to solve routine and non-routine problems in some contexts</li> </ul>	<ul style="list-style-type: none"> <li>applies simple mathematical concepts in limited contexts to routine problems</li> <li>applies simple mathematical techniques to solve routine problems in limited contexts</li> <li>applies simple mathematical models to routine problems in limited contexts</li> <li>uses digital technologies appropriately to solve routine problems in limited contexts</li> </ul>	<ul style="list-style-type: none"> <li>applies simple mathematical concepts in structured contexts</li> <li>uses simple mathematical techniques to solve routine problems in structured contexts</li> <li>demonstrates limited familiarity with mathematical models in structured contexts</li> <li>uses digital technologies to solve routine problems in structured contexts</li> </ul>