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TIPS4RM

**TIPS4RM** Targeted Implementation  
and Planning Supports for  
Revised Mathematics

# Mathematics of Data Management (MDM4U)

# Mathematics of Data Management: Content and Reporting Targets

*Mathematical Processes across all strands: Problem Solving, Reasoning and Proving, Reflecting, Selecting Tools and Computational Strategies, Connecting, Representing, and Communicating.*

Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
<b>Counting and Probability</b> <ul style="list-style-type: none"> <li>Introducing probability vocabulary and notation in contexts involving simple counting</li> <li>Counting permutations and combinations</li> <li>Using mathematical notation to describe the number of permutations and combinations</li> <li>Solving counting problems</li> <li>Solving probability problems using counting principles</li> </ul>	<b>Organization of Data for Analysis</b> <ul style="list-style-type: none"> <li>Connecting questions and the data needed to answer them</li> <li>Understanding data concepts</li> </ul>	<b>Statistics</b> <ul style="list-style-type: none"> <li>Single-variable data</li> <li>Two-variable data</li> <li>Evaluating validity</li> </ul>	<b>Probability Distributions</b> <ul style="list-style-type: none"> <li>Discrete random variables</li> </ul>	<b>Modelling Continuous Data</b> <ul style="list-style-type: none"> <li>Continuous random variables</li> </ul>
<b>Culminating Projects and Investigations</b> <b>A: Permutations, Combinations, Probabilities; B: Statistics; C: Probability Distributions</b>				
<b>Counting Stories Project</b> <ul style="list-style-type: none"> <li>Choosing or creating a nursery rhyme or piece of literature that provides the potential for posing and answering connected problems that involve permutations, combinations, and probabilities</li> <li>Posing and solving the connected problems</li> </ul> <b>Culminating Investigation</b> <ul style="list-style-type: none"> <li>Identifying area of interest and connecting it to probability</li> <li>Posing a problem of interest, finding sources of data, determining relevance of data</li> <li>Designing a plan to study the problem of interest, formulating a research question</li> </ul>	<b>Culminating Investigation</b> <ul style="list-style-type: none"> <li>Retrieving/gathering data from various sources, e.g., e-Stat</li> <li>Dealing with/organizing various forms of data</li> <li>Fine-tuning their research question</li> <li>Learning to use data-analysis tools, e.g., Fathom</li> </ul>	<b>Culminating Investigation</b> <ul style="list-style-type: none"> <li>Interpreting, analysing, and interpreting the data</li> <li>Drawing conclusions from the analysis of data</li> <li>Compiling report, presenting multimedia summary to audience, and answering questions</li> <li>Posing probing questions of presenters</li> <li>Critiquing work of others</li> </ul>	<b>Games Fair Project</b> <ul style="list-style-type: none"> <li>Creating a game of chance that has an expected value <math>&gt; 0</math> for the game provider, and that encourages people to play the game</li> <li>Calculating the probability distribution for the game and the expected values</li> <li>Hosting the game and gathering experimental data</li> <li>Comparing the theoretical probability distribution and the experimental data</li> <li>Critiquing work of others</li> </ul>	

## Rationale

### Starting with Probability and Counting

- Helps students understand that this course requires new ways of thinking mathematically that is less algebraic than earlier courses.
- Due to new pathways producing a more diverse group of students, starting with Probability and Counting trains students to use more complex mathematical processes.
- Builds on prior experiences with and knowledge of probability to use a more formal mathematical approach, including its vocabulary and notation.
- Separates the establishment of this formal approach from the introduction to permutations and combinations.
- Offers an opportunity for success early in the course to students who may not have excelled in more algebraic approaches.
- Establishes this course as a university preparation course.
- Provides the opportunity to introduce concepts of variability.
- Prepares students for statistical analysis and probability distributions.

### Organization of Data for Analysis (in Unit 2)

- Provides students with tools for working with data prepares them to begin work on Culminating Investigation B early in the course.

### Probability Distributions (later in the course)

- Students benefit from seeing data distributions before applying those concepts to probability distributions.

### Culminating Projects and Investigations (addressed in all units)

- Provides time for students to develop quality projects and investigations.
- Provides time for students to incorporate feedback on Project A into Project and Investigation C
- Provides time for students to incorporate feedback on various stages of Investigation B into their presentation.
- Addresses all curriculum expectations through projects and investigations, thereby eliminating the need for an examination.
- Provides more opportunities for feedback and interactions.

# Mathematics of Data Management Year Outline – Planning Tool

- P** Number of pre-planned lessons (including instruction, diagnostic and formative assessments, summative assessments other than summative performance tasks)
- J** Number of jazz days of time (instructional or assessment)
- T** Total number of days
- SP** Performance task

Unit	Cluster of Curriculum Expectations	Overall Expectations	P	J	T	SP
1	<p><b>Counting and Probability</b></p> <ul style="list-style-type: none"> <li>• Introducing probability vocabulary (e.g., sample space, outcomes, events, trials, discrete, continuous, theoretical probability, experimental probability, mutually exclusive, random number generator, Venn diagram, independent and dependent events, conditional probability, complement, simulation) and notation (e.g., <math>P(\sim A)</math>, <math>P(A \text{ and } B)</math>, <math>P(A \text{ or } B)</math>, <math>P(A / B)</math>) in contexts involving simple counting (e.g., where the sample space is given)</li> <li>• Distinguish between and make connections between situations involving the use of permutations and combinations</li> <li>• Develop, through investigation the number of permutations and combinations</li> <li>• Using mathematical notation (e.g., <math>n!</math>, <math>P(n, r)</math>, <math>\binom{n}{r}</math>) to count</li> <li>• Solving counting problems using counting principles – additive, multiplicative</li> <li>• Solving probability problems using counting principles</li> <li>• Culminating Investigation – identifying area of interest and connecting it to probability</li> </ul>	<p><b>A1</b> solve problems involving the probability of an event or a combination of events for discrete sample spaces;</p> <p><b>A2</b> solve problems involving the application of permutations and combinations to determine the probability of an event;</p> <p><b>E1</b> design and carry out a culminating investigation that requires the integration and application of the knowledge and skills related to the expectations of this course;</p> <p><b>E2</b> communicate the findings of a culminating investigation and provide constructive critiques of the investigations of others.</p>	15	2	17	2

Unit	Cluster of Curriculum Expectations	Overall Expectations	P	J	T	SP
2	<b>Organization of Data for Analysis</b> <ul style="list-style-type: none"> <li>Demonstrate an understanding of the role of data in statistical studies</li> <li>Describe the characteristics of a good sample and compare sampling techniques</li> <li>Design an effective survey and collect data</li> <li>Understand how data is organized</li> <li>Find sources of data, refine topic of interest and design a plan in preparation for the Culminating Investigation</li> </ul>	<b>C1</b> demonstrate an understanding of the role of data in statistical studies and the variability inherent in data, and distinguish different types of data;  <b>C2</b> describe the characteristics of a good sample, some sampling techniques, and principles of primary data collection, and collect and organize data to solve a problem;  <b>E1</b> design and carry out a culminating investigation that requires the integration and application of the knowledge and skills related to the expectations of this course.	9	2	11	
3	<b>Statistics</b> <ul style="list-style-type: none"> <li>Explore, analyse, interpret, and draw conclusions from one-variable data</li> <li>Explore, analyse, interpret, and draw conclusions from two-variable data</li> <li>Investigate and evaluate validity of statistical summaries</li> <li>Perform a Culminating Investigation               <ul style="list-style-type: none"> <li>Analyse, interpret, draw conclusions and write a report of their research</li> <li>Present summary of findings</li> <li>Critique presentations of their peers</li> </ul> </li> </ul>	<b>D1</b> analyse, interpret, and draw conclusions from one-variable data using numerical and graphical summaries;  <b>D2</b> analyse, interpret, and draw conclusions from two-variable data using numerical, graphical, and algebraic summaries;  <b>D3</b> demonstrate an understanding of the applications of data management used by the media and the advertising industry and in various occupations;  <b>E1</b> design and carry out a culminating investigation that requires the integration and application of the knowledge and skills related to the expectations of this course;  <b>E2</b> communicate the findings of a culminating investigation and provide constructive critiques of the investigations of others.	18	2	20	10

Unit	Cluster of Curriculum Expectations	Overall Expectations	P	J	T	SP
4	<b>Probability Distributions</b> <ul style="list-style-type: none"> <li>Understand probability distributions for discrete random variables</li> <li>Explore and connect Binomial and Hypergeometric distributions</li> <li>Recognize that the differences between a probability histogram and a frequency histogram may be the result of variability</li> <li>Complete a Games Fair culminating project</li> </ul>	<b>B1</b> demonstrate an understanding of discrete probability distributions, represent them numerically, graphically, and algebraically, determine expected values, and solve related problems from a variety of applications;  <b>E1</b> design and carry out a culminating investigation that requires the integration and application of the knowledge and skills related to the expectations of this course;  <b>E2</b> communicate the findings of a culminating investigation and provide constructive critiques of the investigations of others.	10	1	11	2
5	<b>Modelling Continuous Data</b> <ul style="list-style-type: none"> <li>Describe the shapes of distributions of continuous data</li> <li>Extend the concept of a discrete probability distribution to a continuous probability distribution</li> <li>Understand the features of the normal distribution</li> <li>Apply normal distributions to real-world situations recognizing the role of variability</li> </ul>	<b>D1</b> analyse, interpret, and draw conclusions from one-variable data using numerical and graphical summaries;  <b>B2</b> demonstrate an understanding of continuous probability distributions, make connections to discrete probability distributions, determine standard deviations, describe key features of the normal distribution, and solve related problems from a variety of applications.	9	2	11	
	<b>Summative Performance Tasks</b>					<b>14</b>
	<b>Total Days</b>		<b>63</b>	<b>9</b>	<b>71</b>	<b>85</b>

The number of prepared lessons represents the lessons that could be planned ahead based on the range of student readiness, interests, and learning profiles that can be expected in a class. The extra time available for “instructional jazz” can be taken a few minutes at a time within a pre-planned lesson or taken a whole class at a time, as informed by teachers’ observations of student needs.

The reference numbers are intended to indicate which lessons are planned to precede and follow each other. Actual day numbers for particular lessons and separations between terms will need to be adjusted by teachers.