Learning Outcomes – MATH 10041 – Chapter 1

Ch.	***Sec.***	***Big idea***	***Learning outcomes – Conceptual***	***Learning Outcomes - Observable***
1	1	What is data? What is data analysis?	Understand the difference between numbers and data; Understand what data analysis is.	Explain in their own words what data and data analysis are.
	2	Stacked vs unstacked data; Numerical vs categorical data; Coding categorical variables with numbers;	Understand the difference between a variable as studied in algebra vs one as studied in statistics; Understand the benefit of having data in stacked format; Understand the difference between categorical and numerical data; Understand the method of coding categorical variables and why we do it.	Give definition of variable as used in statistics; Determine whether given data set is in stacked or unstacked form; Convert given data set from unstacked to stacked and vice versa; Give examples of categorical variables and of numerical variables; Determine if a given variable is categorical or numerical; Interpret the meaning of a coded data set; Given a categorical variable with two categories and the counts for each, code the values.
	3	2-way tables for organizing categorical variables	Understand the difference between frequency and relative frequency; Understand ***rates*** of a certain occurrence.	Explain the difference between a frequency and relative frequency; Explain when and why relative frequencies are used; Read a 2-way table: • Determine percentages of data falling into certain categories or combination of categories; • Determine the rate per unit (eg. Or per 1000) of a certain occurrence.
	None	Sampling Methods	Understand that the population is fixed but sample statistics vary from sample to sample; Understand what bias is and how to avoid it in data collection; Understand the basic vocabulary of sampling: population, sample, representative sample, bias.	Explain how to collect data using each of the following methods: simple random sampling, systematic sampling, stratified sampling, and cluster sampling; Identify the type of sampling used in a given experiment;
	4	Causality in the design of experiments	Understand the difference between a controlled experiment and an observational study; Understand the difference between association and causation and under what circumstances causation can be inferred; Understand the vocabulary of designing studies: **treatment variable, outcome(response) variable, treatment group, control group, anecdote, placebo, association, causation, confounding variable, blinding**.	Design an observational study; design a controlled experiment given a research question; Given an experiment, determine if it is a controlled experiment or observational study; Given an experiment, determine if causation can be inferred.