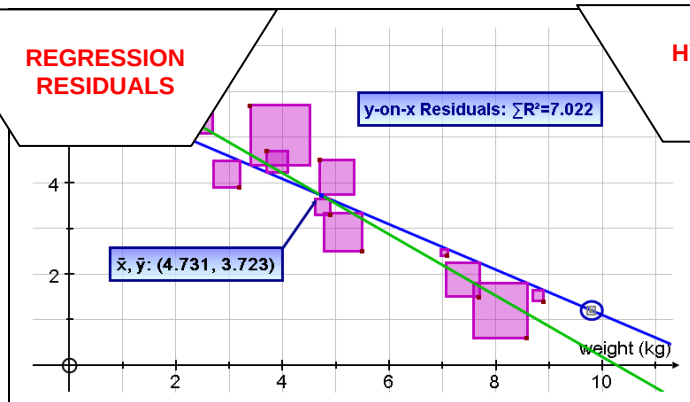
Autograph version 3

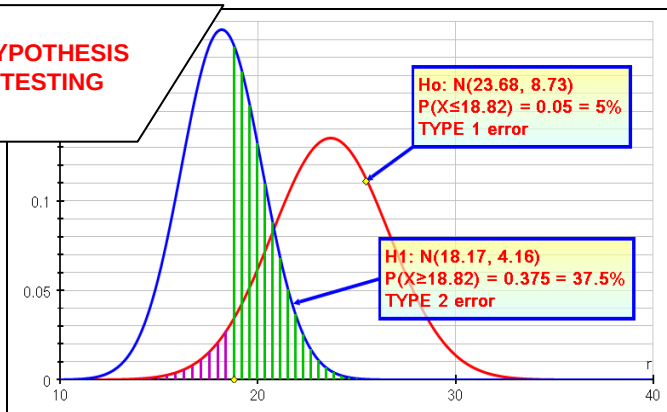
and Mathematics of Data Management

Autograph is spectacular dynamic software from the UK that allows teachers to visualise many of the mathematical topics that occur in the Ontario Grade 12 STATISTICS course [MDM4U].

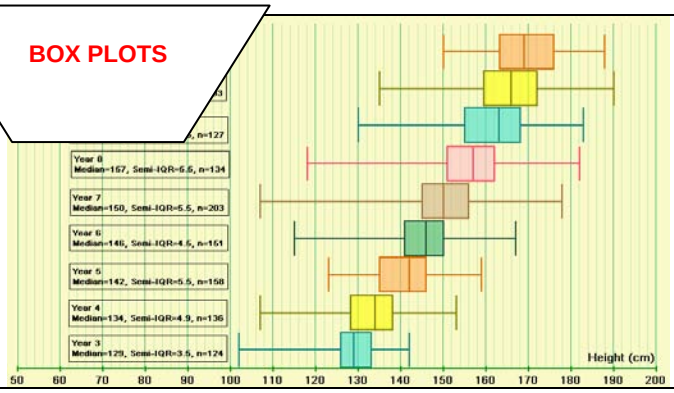
REGRESSION RESIDUALS



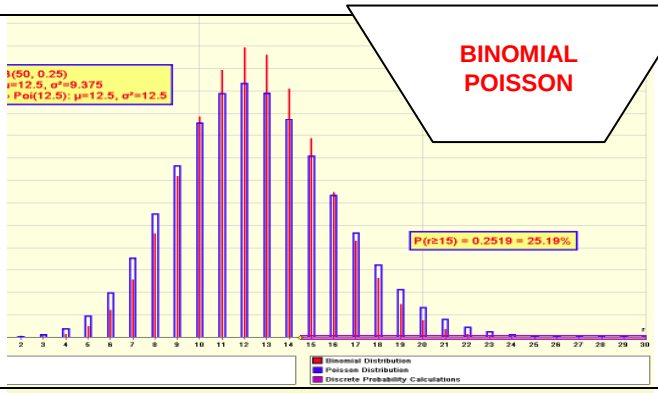
HYPOTHESIS TESTING



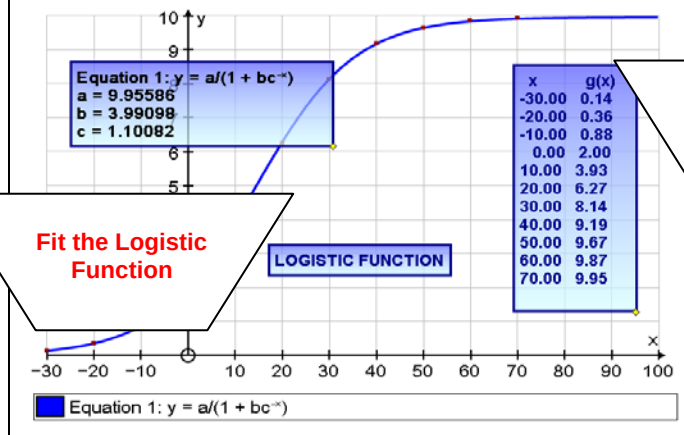
BOX PLOTS



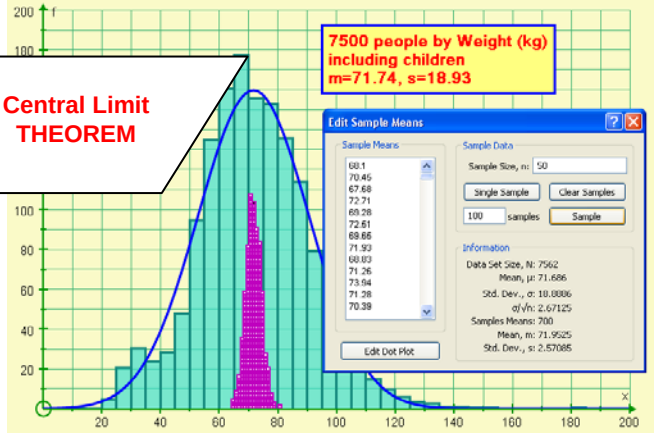
BINOMIAL POISSON



Fit the Logistic Function



Central Limit THEOREM



CCS Educational Inc **Web: http://home.ican.net/~ccs**
24 Rogate Place, Toronto, ON, M1M 3C3, CANADA

Tel/Fax: +1 416 267 8844 or toll free: 1-877-CCS EDUC or 1-877 227 3382
Contact: Don Bosy Email: don@ccseducational.com

Ministry of Education The Ontario Mathematics Curriculum [2007]

MATHEMATICS OF DATA MANAGEMENT

Grade 12 - University Preparation **MDM4U**

Edited to show Autograph associations (in red) [*]

==========

A. COUNTING AND PROBABILITY

1. PROBABILITY PROBLEMS INVOLVING DISCRETE SAMPLE SPACES

1.1 how probabilities are used to represent the likelihood of a result of an experiment and the likelihood of a real-world event

1.2 describe a sample space as a set that contains all possible outcomes of an experiment, and distinguish between a discrete sample space and a continuous sample space

1.3 determine the theoretical probability of each outcome of a discrete sample space; recognize that the sum of the probabilities of the outcomes is 1: recognize that the probabilities P form the probability distribution

1.4 determine, through investigation using class generated data and technology-based simulation models; the tendency of experimental probability to approach theoretical probability

1.5 recognize and describe an event as a set of outcomes and as a subset of a sample space, determine the complement of an event, determine whether two or more events are mutually or non-mutually exclusive

1.6 determine whether two events are independent or dependent and whether one event is conditional on another event, and solve related probability problems

2. SOLVING PROBLEMS USING COUNTING PRINCIPLES

2.1 recognize the use of permutations and combinations as counting techniques with advantages over other counting techniques

2.2 solve simple problems using techniques for counting permutations and combinations, where all objects are distinct

2.3 solve introductory counting problems involving the additive counting principle, and the multiplicative counting principle

2.4 connections between combinations and Pascal's triangle

2.5 solve probability problems using counting principles for situations involving equally likely outcomes

Autograph

AUTOGRAPH PAGE

==========

STATISTICS

MATHEMATICS OF DATA MANAGEMENT [Grade 12]	AUTOGRAPH PAGE
B. PROBABILITY DISTRIBUTIONS	
1. PROB. DISTRIBUTIONS: DISCRETE RANDOM VARIABLES	
1.1 recognize and identify a discrete random variable X; generate a probability distribution by calculating the probabilities associated with all values of a random variable, and represent a numerically using a table	
1.2 calculate the expected value for a given probability distribution, and make connections between the expected value and the weighted mean of the values of the discrete random variable	
1.3 represent a probability distribution graphically using a probability histogram, and make connections between the frequency histogram and the probability histogram (e.g., by comparing their shapes)	
1.4 recognize conditions that give rise to a binomial probability distribution, calculate the probability associated with each value of the random variable, represent the distribution numerically using a table	STATISTICS
1.5 recognize conditions that give rise to a hypergeometric probability distribution, calculate the probability associated with each value of the random variable	
1.6 compare the probability distributions of discrete random variables (e.g., compare binomial distributions with the same probability of success for increasing numbers of trials	STATISTICS
1.7 solve problems involving probability distributions (e.g., uniform, binomial, hypergeometric), including problems arising from real-world applications	STATISTICS
2. PROB. DISTRIBUTIONS: CONTINUOUS RANDOM VARIABLES	
2.1 recognize and identify a continuous random variable, and distinguish between situations that give rise to discrete frequency distributions and situations that give rise to continuous frequency distributions	
2.2 recognize standard deviation as a measure of the spread of a distribution, and determine, with and without technology, the mean and standard deviation of a sample of values of a continuous random variable	STATISTICS
2.3 describe challenges associated with determining a continuous frequency distribution and recognize the need for mathematical models to represent continuous frequency distributions	
2.4 represent, using intervals, a sample of values of a continuous random variable numerically using a frequency table and graphically using a frequency histogram and a frequency polygon	STATISTICS
2.5 recognize that theoretical probability for a continuous random variable is determined over a range of values, that the probability that a continuous random variable takes any single value is zero	

MATHEMATICS OF DATA MANAGEMENT [Grade 12]	AUTOGRAPH PAGE
2.6 recognize that the normal distribution is commonly used to model the frequency and probability distributions of continuous random variables, describe some properties of the normal distribution	STATISTICS
2.7 make connections between the normal distribution and the binomial and hypergeometric distributions for increasing numbers of trials of the discrete distributions	STATISTICS
2.8 recognize a z-score as the positive or negative number of standard deviations from the mean to a value of the continuous random variable, and solve probability problems involving normal	STATISTICS
C. ORGANIZATION OF DATA FOR ANALYSIS	
1. UNDERSTANDING DATA CONCEPTS	
1.1 recognize and describe the role of data in statistical studies, describe examples of applications of statistical studies	
1.2 recognize and explain reasons why variability is inherent in data, and distinguish between situations that involve one variable and situations that involve more than one variable	
1.3 distinguish different types of statistical data (eg discrete and continuous), and give examples	
2. COLLECTING AND ORGANIZING DATA	
2.1 determine and describe principles of primary data collection and criteria that should be considered in order to collect reliable primary data	
2.2 explain the distinction between the terms population and sample, describe the characteristics of a good sample, explain why sampling is necessary, and describe and compare some sampling techniques	
2.3 describe how the use of random samples with a bias or the use of non-random samples can affect the results of a study	
2.4 describe characteristics of an effective survey and design questionnaires or experiments for gathering data	
2.5 collect data from primary sources, through experimentation, or from secondary sources, and organize data with one or more attributes to answer a question or solve a problem	STATISTICS

MATHEMATICS OF DATA MANAGEMENT [Grade 12]	AUTOGRAPH PAGE
D. STATISTICAL ANALYSIS	
1. ANALYSING ONE-VARIABLE DATA	
1.1 recognize that the analysis of one-variable data involves the frequencies associated with one attribute	
1.2 determine the positions of individual data points within a one-variable data set using quartiles, percentiles, and z-scores; use the normal distribution to model suitable one variable data sets	 STATISTICS
1.3 graphical summaries of one-variable data (e.g., circle graphs, bar graphs, histograms, stem-and-leaf plots, boxplots)	 STATISTICS
1.4 interpret, for a normally distributed population, the meaning of a statistic qualified by the margin of error and the confidence level	
1.5 interpret statistical summaries to describe the characteristics of a one-variable data set and to compare two related one-variable data sets	 STATISTICS
2. ANALYSING TWO-VARIABLE DATA	
2.1 recognize that the analysis of two-variable data involves the relationship between two attributes, recognize the correlation coefficient	 STATISTICS
2.2 recognize and distinguish different types of relationships between two variables that have a mathematical correlation	 STATISTICS
2.3 generate, using technology, the relevant graphical summaries of two-variable data (e.g., scatter plots, side-by-side boxplots) based on the type of data provided (e.g., categorical, ordinal, quantitative)	
2.4 determine, by performing a linear regression using technology, the equation of a line that models a suitable two-variable data set, determine the fit of an individual data point to the linear model	 2D
2.5 interpret statistical summaries (e.g., scatter plot, equation representing a relationship) to describe the characteristics of a two variable data set and to compare two related two-variable data sets	 2D
3. EVALUATING VALIDITY	
3.1 interpret statistics presented in the media, and explain how the media use and misuse statistics to promote a certain point of view	
3.2 assess the validity of conclusions presented in the media by examining sources of data, including Internet sources, methods of data collection, and possible sources of bias	
3.3 gather, interpret, and describe information about applications of data management in occupations, and about university programs that explore these applications	

MATHEMATICS OF DATA MANAGEMENT [Grade 12]	AUTOGRAPH PAGE

E. CULMINATING DATA MANAGEMENT INVESTIGATION

1. DESIGNING AND CARRYING OUT A CULMINATING INVESTIGATION

1.1 pose a significant problem of interest that requires the organization and analysis of a suitable set of primary or secondary quantitative data, and conduct appropriate background research
1.2 design a plan to study the problem
1.3 gather data related to the study of the problem, and organize the data, with or without technology
1.4 interpret, analyse, and summarize data related to the study of the problem, with or without technology
1.5 draw conclusions from the analysis of the data, evaluate the strength of the evidence, specify any limitations of the conclusions, and suggest follow-up problems or investigations

2. PRESENTING AND CRITIQUING THE CULMINATING INVESTIGATION

2.1 compile a clear, well-organized, and detailed report of the investigation
2.2 present a summary of the culminating investigation to an audience of their peers within a specified length of time, with or without technology
2.3 answer questions about the culminating investigation and respond to critiques
2.4 critique the mathematical work of others in a constructive manner

DOUGLAS BUTLER
iCT Training Centre, Oundle, UK

debutler@argonet.co.uk
www.tsm-resources.com
www.autograph-maths.com

[*] **The Ontario Curriculum, Grades 11 and 12**
The full document, Revised 2007 is at:
www.edu.gov.on.ca/eng/curriculum/secondary/math1112currb.pdf

Oundle
May 2009