

MATHEMATICS - CHRISTCHURCH BOYS' HIGH SCHOOL

It is important that these notes are attached inside the front cover of your text book. They are referred to many times throughout the year and must be readily available.

STATISTICS and MODELLING - 2009

INTRODUCTION

The Statistics and Modelling course is intended as a preparation for tertiary study for students who will pursue careers in fields where collection, analysis and interpretation of quantitative data is important.

COURSE THEMES

Topic detail follows below but it is worth noting specific goals of the course:

1. To revise, with some extension, Year 12 content, particularly in algebra, graphing techniques and calculus
2. To develop understanding of statistical concepts
3. To conduct statistical experiments and draw valid conclusions from raw data
4. To ensure familiarity with the essential tools of mathematics - the computer, the calculator and mathematical tables
5. To extend the ability to tackle simple modelling and problem-solving situations
6. To develop awareness of the wide range of applications of mathematics and of the reasons for its usefulness

CONSISTENT EFFORT - ESSENTIAL AND WELL REWARDED

Statistics and Modelling is studied by a wide range of Year 13 students throughout New Zealand. Therefore with appropriate goals and effort all CBHS students will be able to experience success.

The steps required to achieve this success are

- **Listen to** the explanations and if necessary request further explanation so that you **understand**.
- **Practice** the skills in class and **at home**.
- Undertake a thorough **revision** programme prior to exams and assessments.

ASSESSMENT

Level 3 NCEA requires active course involvement throughout the year.

The assessment programme is detailed below:

Internally Assessed Achievement Standards

| | | |
|---------------------------------|------------------------|--------|
| 3.7 Modelling and Curve Fitting | 9 th April, | Term 1 |
| 3.1 Time-Series | Exam block | Term 2 |
| 3.5 Regression Project | Exam block, | Term 3 |

Appeals concerning grades

1. The staff to approach are (in order): class teacher, HOD, Principal's Nominee. In some situations it may be appropriate to approach the relevant Dean.
2. Students are reminded of their right to question marking decisions when tasks are returned.
3. Students must initiate any appeal within 2 days of receiving a piece of marked work.
4. Work written in pencil (unless approved at the time of the assessment) or with "white out" corrections is not be subject to appeal.
5. It is the student's responsibility to collect marked work if they are absent on the day the work was returned to the class. They must do this within 5 days of returning to class.

Externally Assessed Achievement Standards

- End of topic tests will be used to gain information in the case of compassionate considerations.

Graphics calculators will probably be available through school at discounted prices. It is recommended that a graphics calculator should be purchased.

Year 13 Statistics and Modelling "Study Pass" is also available but are not being recommended – it is not essential to course success.

YEAR 13 STATISTICS AND MODELLING

FOLLOWING IS A LIST OF THE LEVEL 3 ACHIEVEMENT STANDARDS:

- 3.1 (I) DETERMINE THE TREND FOR TIME SERIES DATA (3 CREDITS)
- 3.2 (E) CALCULATE CONFIDENCE INTERVALS FOR POPULATION PARAMETERS (3 CREDITS)
- 3.3 (E) SOLVE STRAIGHTFORWARD PROBLEMS INVOLVING PROBABILITY (4 CREDITS)
- 3.4 (E) SOLVE EQUATIONS (4 CREDITS)
- 3.5 (I) COMPLETE A STATISTICAL INVESTIGATION INVOLVING BI-VARIATE DATA (3 CREDITS)
- 3.6 (E) USE PROBABILITY DISTRIBUTION MODELS TO SOLVE STRAIGHTFORWARD PROBLEMS (4 CREDITS)
- 3.7 (I) USE A MATHEMATICAL MODEL INVOLVING CURVE FITTING TO SOLVE A PROBLEM (3 CREDITS)

COURSE CONTENT

- 1. Graphs & Algebra Revision (Preparation for A.S. 3.4 and 3.7)**
Graphing polynomials, rational functions, absolute values, step and piecewise functions. Factorising, simplifying and solving algebraic expressions. *Graphics calculator use.*
- 2. 3.4: Systems of Equations & Linear Programming (External) Sigma Ch 10, 11 & 12**
Simultaneous equations in 2 or 3 unknowns. Consistency and uniqueness of resulting solutions.
Finding the optimal solution to a problem by graphical means.
The Bisection and Newton-Raphson iteration formulae
- 3. 3.7: Modelling - Curve Fitting (Internal) Sigma Ch 19 & 20 Nulake**
Indices and logarithm revision. Graphing and solving algebraically power and exponential expressions. Graphically determining relationships between data through choices of axes and scales
- 4. 3.3: Probability (External) Sigma Ch 6 to ch 9**
Combining probabilities of related and unrelated events - complementary, mutually exclusive, conditional and independent
Defining a random variable and building probability distributions.
Formulae for the expected value (mean) and variance of such a distribution and combinations of distributions are introduced
Combinations and Permutations

5. **3.1: Time Series (Internal) Sigma Ch 1 & 2, Nulake**
Calculating trends. Identifying variation such as seasonal and cyclical patterns.
6. **3.6: Probability Distributions (Internal) Sigma Ch 15 to ch 18**
Binomial & Poisson distributions and their normal approximations
7. **3.2: Confidence Intervals (External) Sigma Ch 3, 4 & 5**
Confidence intervals for the means and proportions of random samples. Difference of means. Estimating the appropriate sample size. Estimation of Population Parameters-application of the Central Limit Theorem
8. **3.5 Statistics-Bi-variate Data and Regression (Internal) Sigma Ch 13 & 14 Nulake**
Sampling, data collection and display, central tendency of data and measures of dispersion.
9. **Examination Revision for External Achievement Standards**

PROBLEMS - a few ideas

- * Re-read the textbook examples (often clearer than the notes)
- * Discuss the problem with someone else in the class
- * Look for similar Bursary questions - and answers
- * Discuss the problem with your teacher
- * Attend Early Morning Maths-M1 Monday, Wednesday & Friday