Kalamunda Senior High School
An Independent Public School
Mathematics Department

Year 12 Maths Applications Units 3 & 4

Program and Assessment Outline

Time Allocation	Topic/s	Key Teaching Points	Nelson Reference	Assessment
Weeks 1-3 12 hours	Unit 3 Topic 1 Data Analysis	**Bivariate Data Analysis** (1.01 – 1.08) · 1.01 Posing questions and collecting data. *Reviewing and working out how to collect the data and collecting the data. This includes the different types of data, the appropriate questions to ask and whether to use a census or a sample.* · 1.02 Summary statistics. *Calculate the summary statistics to analyse data and interpreting their meaning in relation to the question posed. This includes calculating the measures of centre and spread.* · 1.03 Displaying and describing data. *Displaying data in different ways. This includes frequency tables, column and bar graphs, dot plots, stem and leaf, box plots and histograms. Use the different displays to describe the data, identify outliers and describe the shape of the data.* · 1.04 Looking for associations. *When comparing two variables, identify each variable as the explanatory or response variable. Draw an appropriate graph with the explanatory variable and the response variable used correctly. For numerical data, draw a scatterplot and for categorical data draw a side by side column graph.* · 1.05 *Relationships between categorical variables. Draw and interpret a two way table. Display data from a two way table using a side by side column graph. Draw and interpret a percentage two way table including looking at the possibility of any association between the variables.* · 1.06 Relationships between numerical and categorical variables. *Draw back to back stem and leaf plots parallel boxplots. Use the graphical display, the shape of the data and the summary statistics to compare the data and to determine whether there is a possible relationship between the data* · 1.07 Relationship between numerical variables. *Draw and interpret a scatterplot to determine the nature and relationship of the variables.* · 1.08 Interpretation of scatter plots. *Calculate and interpret the correlation coefficient, r, to determine the strength of the relationship between the two variables.*	Please refer to www.nelsonnet.com.au as there are many teaching resources including worksheets & investigations that support this textbook. Chapter 1	
Weeks 4-5 8 hours	Unit 3 Topic 1 Bivariate Data Analysis	Linear Models for Numerical Data (2.01 – 2.04) · 2.01 Fitting regression lines. *Finding the equation of the least squares regression line in the form y = a+bx. Interpreting the least squares regression line. Finding the equation of the least square regression line using the value of the correlation coefficient and the mean and standard deviation for each variable. Drawing in the least square regression line on the scatter plot of the data* · 2.02 The coefficient of determination. *Calculating and interpreting the coefficient of determination.*	Chapter 2	Week 5 Test 1 (8%)

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		· 2.03 Making predictions by substituting values into the equation of the least squares regression line. *Defining interpolation and extrapolation.* · 2.04 Residuals. *Calculate and draw a residual plot. Use the residual plot to recognise the appropriateness of fitting a linear model to the data.*		
Weeks 6-8 12 hours	Unit 3 Topic 2 Growth and Decay in Sequences	Arithmetic's & Geometric Sequences (3.01 – 3.07) · 3.01 Arithmetic's sequences. *Defining an arithmetic sequence, finding the common difference, d. finding the rule of the general term of an arithmetic sequence, use the rule to solve problems involving arithmetic sequences.* · 3.02 Arithmetic series. *Defining an arithmetic series as the sum of the terms of an arithmetic sequence. Showing the formula for an arithmetic series and for the partial sum and using these to solve problems.* · 3.03 Modelling and arithmetic sequence *Solve practical problems involving linear growth and decay using our knowledge of arithmetic sequences and series. This includes defining the different types of depreciation and solving problems involving straight line or unit cost methods of depreciation.* · 3.04 Geometric sequences. *Defining a geometric sequence and find the common ratio. Find the rule for the general term of the geometric sequence and use this to solve problem involving geometric sequences.* · 3.05 Geometric series. *Defining the geometric series as the sum of a geometric sequence. Showing the formula for geometric series and the formula for the infinite sum of a geometric sequence and use these to solve problems involving geometric sequences.* · 3.06 Modelling a geometric sequence. *Solving practical problems involving geometrical growth and decay using our knowledge of geometric sequences and series. Expressing a recurring decimal as a fraction using our knowledge of geometric series.* · 3.07 Arithmetic & geometric modelling. *Solving a practical problem by first deciding whether it is arithmetic or a geometric problem and then solving knowledge of sequences and series.*	Chapter 3	**Week 8** **Investigation 1 (6%)** **Sequences & series**

Time Allocation	Topic/s	Key Teaching Points	Nelson Reference	Assessment
Weeks 9-11 12 hours	Unit 3 Topic 2 Growth & Decay in Sequences	**Recurrence Relations (4.01 – 4.07)** · 4.01 Generating sequences using recurrence relations. *Defining a recurrence relation, knowing what the general first recurrence relation is, generating sequences using recurrence relations and find the required term of a sequence defined by a given recurrence relation.* · 4.02 Finding a recurrence relation for a given sequence. *Find the recurrence*	Chapter 4	Week 11 Test 2 (8%)

Time Allocation	Topic/s	Key Teaching Points	Nelson Reference	Assessment
		relation for a given sequence. · 4.03 Recurrence relations from arithmetic sequences. *Solve problems for arithmetic sequences using our knowledge of arithmetic sequences and recurrence relation.* · 4.04 Recurrence relations for geometric sequences. *Solve problems for geometric sequences using our knowledge of geometric sequences and the recurrence relation.* · 4.05 Graphical representation of first order recurrence relations. *Draw and interpret graphs from recurrence relations including practical problems. Know that the terms of an arithmetic recurrence relation lie on a straight line. Know that the terms of a geometric recurrence relation line on a curved line. Know that the terms generated by a recurrence relation are neither arithmetic nor recurrence and that they may increase or decrease indefinitely or approach a particular value in the long term.* · 4.06 Long term steady state solution of a recurrence relation. *Define the steady state solution of a recurrence relation and solve problems using our knowledge of recurrence relations and steady state solutions.* · 4.07 Applications recurrence relations. *Solve practical problems by modelling them using our knowledge of recurrence relations.*		
Weeks 12-14 12 hours	Unit 3 Topic 3 Graphs & Networks	Undirected Graphs (5.01 – 5.010) · 5.01 Basic concepts of a graph. *Define the basic concepts of graphs and draw graphs from a description.* · *5.02 Types of graph. Have knowledge of the different types of graph* · 5.03 Applications of graphs. *Use graphs to represent practical problems. Solve problems using graphs.* · 5.04 The adjacency matrix. *Define the degree of a vertex and the degree sum. Write an adjacency matrix for a graph.* · 5.05 Planar graphs and Euler's formula. *Define a planar graph and Euler's formula.* · 5.06 Walks, paths and trails. *Define walk, path, cycle, trail and bridge and solve problems.* · 5.07 *Define Eulerian and semi Eulerian graphs.* · 5.08 *Define Hamiltonian path and cycle and solve practical problems.* · 5.*09 Define tree and spanning tree and solve practical problems.* · 5.10 *Define a weighted graph, define a minimum spanning tree and Prim's algorithm.*	Chapter 5	Week 14 Investigation 2 (7%) Networks
Weeks 15-16 8 hours	Unit 4 Topic 1 Time series analysis	Time series analysis · 6.01 *Define time series data, construct a time series plot, describe a time series plot by identifying features such as trends, seasonal patterns, cyclic*	Chapter 6 THE CONTENT OF THIS CHAPTER WILL NOT BE TESTED IN THE	**Week 16** Test 3 (8%)

Time Allocation	Topic/s	Key Teaching Points	Nelson Reference	Assessment
		patterns and random variables. · 6.02 *Know why time series data needs to be smoothed, know how to smooth data using moving averages, define centring and know how to incorporate centring, if required when calculating moving averages.* · 6.03 *Know how to smooth data using medians with a graphical or numerical approach.* · 6.04 *Define seasonal data and deseasonalisation. Calculate seasonal indices using the average percentage method. Interpret the seasonal index. Calculate deseasonalised data using the formula and plot the data.* · 6.05 *Fit a least squares regression line to a time series plot. Analyse time series data by using the least squares regression line to look at long term trends and forecasting values in the future.*		
Weeks 17-18		· EXAMS END OF UNIT 3	SEMESTER 1 EXAM	**Exam (20%)**
Weeks 19-21 12 hours	Unit 4 Topic 2 Loans and investments	· 7.01 Simple interest review. *Use formula to calculate simple interest earned. Calculate the total amount of the investment. Use the simple interest formula to calculate principal, rate or time given the interest and two other values.* · 7.02 Hire purchase. *Solve practical application of simple interest.* · 7.03 Compound interest. *Use repeated applications of simple interest to calculate compound interest. Use a recurrence relation to calculate the value of compound interest* investment at a given time. · 7.04 The compound interest formula. *Use the formula to calculate the total amount of an investment that is compounded using different time periods. Calculate principal, rate or time given the total amount of the compound interest investment and two of the other values.* · 7.05 Interest graphs. *Construct and interpret simple and compound interest graphs.* · 7.06 Effective interest rate. *Define and calculate effective interest using the given formula. Use the effective interest rate to solve practical problems.*	Chapter 7	Week 21 Investigation 3 (7%) Financial Matters
Wees 22-24 12 hours	Unit 4 Topic 2 Reducing balance loans and annuities	· 8.01 Reducing balance loans. *Calculate the amount still owing on a reducing balance loan after a certain time period. Calculate the interest paid on a reducing balance loan. Write a recurrence relation and then when using it to calculate the amount still owing on a reducing balance loan using the given formula.* · 8.02 *Use the CAS calculator to solve reducing balance loan problems.* · 8.03 *Solve practical problems involving the changing of the terms on a reducing balance loan.* · 8.04 Annuities. *Solve practical problems involving annuities.* · 8.05 Perpetuities. *Define a perpetuity, calculate the value of a regular*	Chapter 8	**Week 24** Test 4 (8%)

Time Allocation	Topic/s	Key Teaching Points	Nelson Reference	Assessment
		payment using the give formula. · 8.06 Compound interest investments with regular deposits. *Define an annuity investment and solve practical problems involving and annuity investment.*		
Weeks 25-28 16 hours	Unit 4 Topic 3 Directed graphs and networks	· 9.01 Directed graphs, reachability and dominance. *Define directed graphs and reachability, calculate reachability, calculate a dominance matrix and interpret it.* · 9.02 Drawing network diagrams. Know how to draw a project network and know why dummy activities are required and how to use them. · 9.03 Forward and backward scanning. *Determine the earliest starting time of an activity using forward scanning, and determine the latest starting time of an activity using backward scanning.* · 9.04 Locating the critical path. *Define the critical path and how to determine it, define and determine activity float times, define project crashing and how it affects project completion time.* · 9.05 Network and flow problems. *Know practical applications of network and flow networks, define, draw and calculate flow networks, flow capacity, maximum flow and the capacity of the cut.* · 9.06 Bipartite graphs and the assignment problem. *Define bipartite graph and how to draw one. Define the assignment problem and how to solve the problem using inspection, row and column reduction and the Hungarian algorithm.*	Chapter 9	Week 28 Test 5 (8%)
Week 29–30		**Revision/end of course exam**		**Exam (20%)**

Assessment weightings	Tasks	Week	Task weighting	Task content descriptions
Unit 3				
Response 20%	**Test 1:** Bivariate data analysis	5	8%	Fitting a linear model to numerical data; association and causation
	Test 2: Growth and Decay	11	8%	The arithmetic and geometric sequences; Sequences generated by first-order linear recurrence relations
	Test 3: Graphs and Networks	16	8%	Planar graphs; Paths and cycles;
Investigation 10%	**Investigation 1:** Sequences and series	8	6%	Sequences & series
	Investigation 2: Graphs and networks	14	7%	Planar graphs; Paths and cycles
Examination 10%	**Examination 1**	19/20	20%	Unit 3 content
	Semester 1 total		57%	
Unit 4				
Response 20%	**Test 4:** Time series analysis; Finance, loans, investments and annuities	24	8%	Time series analysis; Compound interest loans and investments
	Test 5: Directed graphs and networks	28	8%	Directed graphs, reachability and dominance; Locating critical path, flow capacity, maximum flow and capacity of the cut
Investigation 10%	**Investigation 3:** Financial Applications	18	7%	Analysing time series data, including the data investigation process
Examination 30%	**Examination 2**	30	20%	Unit 3 and 4 content
	Semester 2 total		43%	
	Year total		100%	