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YEAR 12 MATHEMATICS APPLICATIONS

CHAPTER 1: SIMULTANEOUS LINEAR EQUATIONS

| | WACE syllabus reference |
|---|-------------------------|
| A Linear functions | SACE only |
| B Simultaneous linear equations | |
| C Solving simultaneous equations using technology | |
| D Problem solving with simultaneous equations | |

Western Australian students should have studied linear simultaneous equations in Year 11. Therefore, this chapter should be omitted.

CHAPTER 2: LINEAR PROGRAMMING

| | |
|----------------------------|-----------|
| A Feasible regions | SACE only |
| B Constructing constraints | |
| C Linear programming | |
| D Non-integer vertices | |

This chapter is for South Australian students only, so Western Australian students can omit this chapter.

CHAPTER 3: NUMBER SEQUENCES

| | |
|------------------------|----------------------------|
| A Number sequences | |
| B Arithmetic sequences | 3.2.1, 3.2.2, 3.2.3, 3.2.4 |
| C Geometric sequences | 3.2.5, 3.2.6, 3.2.7, 3.2.8 |
| D Recurrence relations | 3.2.9, 3.2.10, 3.2.11 |

Students will see how geometric sequences can be used to model growth and decay problems in real-world contexts.

The last section uses recurrence relations to model loans and investments. More work is done on this in Chapters 7 and 8.

CHAPTER 4: BIVARIATE STATISTICS

| | | |
|---|---|---|
| A | Association between categorical variables | 3.1.2, 3.1.3, 3.1.4 |
| B | Association between numerical variables | 3.1.5, 3.1.6, 3.1.8, 3.1.9, 3.1.17, 3.1.18 |
| C | Measuring correlation | 3.1.7, 3.1.13 |
| D | Line of best fit by eye | |
| E | Least squares regression line | 3.1.10, 3.1.12, 3.1.14, 3.1.15 |
| F | Residual plots | 3.1.11 |
| G | Exponential regression | |

In Section A, two-way tables are used to explore associations between categorical variables.

Students will use the correlation coefficient and a residual plot to assess the suitability of the linear model.

Line of best fit by eye is not explicitly mentioned in the syllabus, so students may skip this section if they wish. However, we feel that studying the line of best fit by eye first will give students a greater understanding of linear regression when they find the least squares regression line using technology.

Section G (Exponential regression) is for South Australian students only, so Western Australian students should omit this section.

CHAPTER 5: THE NORMAL DISTRIBUTION

| | | |
|---|----------------------------------|-------------|
| A | The normal distribution | } SACE only |
| B | Probabilities using a calculator | |
| C | Quantiles | |

Western Australian students study the normal distribution in Year 11. Therefore, this chapter can be omitted.

CHAPTER 6: TIME SERIES

| | | |
|---|----------------------|--------------|
| A | Time series data | 4.1.1, 4.1.2 |
| B | Smoothing data | 4.1.3 |
| C | Deseasonalising data | 4.1.4, 4.1.5 |
| D | Forecasting | 4.1.6, 4.1.7 |

In this chapter, students construct and interpret time series plots, and represent time series data in ways that make it easier to identify long term trends.

Deseasonalising data involves many stages of calculations with many different data values. If students obtain a slightly different answer to that in the back of the book, it may simple be due to a difference in rounding procedures.

CHAPTER 7: INVESTMENTS

| | | |
|---|------------------------|--------------|
| A | Simple interest | |
| B | Compound interest | 4.2.1, 4.2.3 |
| C | Future value annuities | 4.2.6, 4.2.7 |
| D | Effective rates | 4.2.2 |
| E | Tax and inflation | |
| F | Superannuation | 4.2.7 |

In this chapter, students extend the work they did on compound interest in Year 11 to consider annuity models, with regular payments coming in or out of the account.

There are Activities in this chapter and Chapter 8 involving the use of recurrence relations in investment and loans problems.

CHAPTER 8: LOANS

| | | |
|---|---------------------------------------|--------------|
| A | Reducing balance loans | 4.2.4, 4.2.5 |
| B | Home loans | 4.2.4, 4.2.5 |
| C | Strategies to minimise interest | |
| D | Comparison rates | 4.2.2 |
| E | Interest-only loans and sinking funds | |

Students consider strategies for minimising the interest paid on loans, and calculate comparison rates to make a more informed choice when deciding between loans.

Interest-only loans and sinking funds are in the SACE syllabus but not the WACE syllabus, so Western Australian students should omit Section E.

CHAPTER 9: MODELLING WITH MATRICES

| | | |
|---|-----------------------|--------------|
| A | Networks | 3.3.1, 3.3.2 |
| B | Connectivity matrices | 3.3.3 |
| C | Dominance matrices | |
| D | Transition matrices | |

The matrix work done in Year 11 involved defining the matrix structure, and performing operations with matrices.

In Year 12, we extend on this work to see how matrices can be applied to networks.

Western Australian students should only complete Sections A and B.

CHAPTER 10: NETWORKS: CONNECTION PROBLEMS

| | | |
|---|------------------------------|---------------------|
| A | Terminology | 3.3.6 |
| B | Shortest path problems | 3.3.7 |
| C | Shortest connection problems | 4.3.1, 4.3.2, 4.3.3 |
| D | Maximum flow problems | 4.3.9 |

In this chapter, students build on the networks studied in the previous chapter to consider shortest path, shortest connection, and maximum flow problems.

Students will be given the opportunity to first use trial and error to solve these problems. This will allow them to see that the algorithms provide a method to solve the problems much faster.

CHAPTER 11: NETWORKS: GRAPH THEORY

| | | |
|---|--------------------|--------------|
| A | Routes on graphs | 3.3.6 |
| B | Eulerian graphs | 3.3.8 |
| C | Hamiltonian graphs | 3.3.9 |
| D | Planar graphs | 3.3.4, 3.3.5 |

This Unit 3 material is presented after the Unit 4 material in Chapter 10, as we feel that this order presents a more logical progression of concepts.

It is important that students become familiar with the terminology associated with routes on graphs early in the chapter. This will assist them in their understanding of Eulerian and Hamiltonian graphs later in the chapter.

CHAPTER 12: DISCRETE MODELS

| | | |
|---|------------------------|-----------------------------------|
| A | Critical path analysis | 4.3.4, 4.3.5, 4.3.6, 4.3.7, 4.3.8 |
| B | Assignment problems | 4.3.10, 4.3.11 |

We complete the course by studying critical path analysis and assignment problems. These topics have been placed in a chapter of their own because they are the network topics that are included in the SACE syllabus.

Section B may be unfamiliar to many teachers. An example of an assignment problem is determining which members of a swimming medley relay should swim each leg, if each swimmer's time for swimming each stroke type is known.