HAESE MATHEMATICS
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TEACHER NOTES FOR YEAR 12 GENERAL MATHEMATICS

CHAPTER 1: SIMULTANEOUS LINEAR EQUATIONS

		SACE	ACARA
A	Linear functions		
B	Simultaneous linear equations		
C	Solving simultaneous equations using technology	Topic 1 Sub-topic 1.1	
D	Problem solving with simultaneous equations		

In the ACARA syllabus, linear simultaneous equations are studied in Year 11, whereas in the SACE syllabus, they are studied in Year 12. Therefore, only South Australian students need to complete this chapter.

The chapter begins with a review of graphing linear functions. This will help students when they use graphical methods to solve simultaneous equations.

In the SACE syllabus, students must complete the work in this chapter, however it is not examinable.

CHAPTER 2: LINEAR PROGRAMMING

		SACE	ACARA
A	Feasible regions		
B	Constructing constraints	Topic 1	
C	Linear programming	Sub-topic 1.2	
D	Non-integer vertices		

This chapter is for South Australian students only. As with Chapter 1, students must complete the work in this chapter, but it is not examinable.

The review work done on graphing linear functions, especially in general form, will help students graph their constraint lines. The work on simultaneous equations can help find the vertices of the feasible region.

In the final section, we consider cases where the variables can only take whole number values, but the vertices of the feasible region are not integers. In these cases, students must test the discrete points which surround the optimal point, and are in the feasible region. Our linear programming software is also useful for dealing with such situations.

CHAPTER 3: NUMBER SEQUENCES

		SACE	ACARA
A	Number sequences		
B	Arithmetic sequences		Unit 3
C	Geometric sequences		Topic 2
D	Recurrence relations		

Number sequences is in the ACARA syllabus, but not the SACE syllabus. Therefore, South Australian students do not need to complete this chapter.

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, as required in Unit 4, Topic 2 of the ACARA syllabus. More work is done on this in Chapters 7 and 8.

CHAPTER 4: BIVARIATE STATISTICS

		SACE	ACARA
A	Association between categorical variables		
B	Association between numerical variables		Unit 3
C	Measuring correlation	Topic 3	Topic 1
D	Line of best fit by eye	Sub-topic 3.1	
E	Least squares regression line		
F	Residual plots		
G	Exponential regression		

In Section A, two-way tables are used to explore associations between categorical variables. This is not in the SACE syllabus, so South Australian students need not complete this section.

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.

The exponential regression section is for South Australian students only. Students are not required to establish a log-linear relationship between the variables, instead the regression is done using technology.

CHAPTER 5: THE NORMAL DISTRIBUTION

		SACE	ACARA
A	The normal distribution	Topic 3	
B	Probabilities using a calculator	Sub-topic 3.2	
C	Quantiles		

The normal distribution is not in the ACARA syllabus. WACE added it to their Year 11 course, which is why there is a section on the normal distribution in our Year 11 Statistics chapter. SACE have added the normal distribution to their Year 12 course.

Students find probabilities involving normal distributions, first using the "68%-95%-99.7%" rule, and then using technology.

Students should be encouraged to sketch the normal distribution when solving problems using technology, especially when finding quantiles in Section C. This will help them establish a rough estimate of what the answer should be, which will enable them to assess whether their answer is reasonable.

CHAPTER 6: TIME SERIES ANALYSIS

		SACE	ACARA
A	Time series data		
B	Smoothing data		Unit 4
C	Deseasonalising data		Topic 1
D	Forecasting		

Time series analysis is in the ACARA syllabus, but not the SACE syllabus. Therefore, South Australian students do not need to study this chapter. However, it could be used as a basis for an Open Topic.

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 simply be due to a difference in rounding procedures.

CHAPTER 7: INVESTMENTS

		SACE	ACARA
A	Simple interest		
B	Compound interest		
C	Future value annuities	Topic 4	Unit 4
D	Effective rates	Sub-topic 4.1	Topic 2
E	Tax and inflation		
F	Superannuation		

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. Students are also required to consider the effect of factors such as tax and inflation on the value of the investment.

For students following the ACARA syllabus, there are Activities in this chapter and Chapter 8 involving the use of recurrence relations in investment and loans problems.

CHAPTER 8: LOANS

		SACE	ACARA
A	Reducing balance loans		
B	Home loans	Topic 4	Unit 4
C	Strategies to minimise interest	Sub-topic 4.2	Topic 2
D	Comparison rates		
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 ACARA syllabus, so only South Australian students must complete Section E.

CHAPTER 9: MODELLING WITH MATRICES

		SACE	ACARA
A	Networks	Topic 2	Unit 3
B	Connectivity matrices	Sub-topic 2.1	Topic 3
C	Dominance matrices		
D	Transition matrices	Sub-topic 2.2	

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 and transition problems.

In Section B, we refer to "routes" between nodes, rather than "paths" as outlined in the SACE syllabus. This is because the term "path" has a more precise definition in the ACARA syllabus, and is used in Chapter 11.

Sections C and D are for South Australian students only.

In the SACE syllabus, this chapter is not examinable. If schools wish to develop an Open Topic, the Open Topic must replace this chapter. However, students taking this option may still benefit from studying Section A, to familiarise themselves with network terminology before studying Topic 5.

CHAPTER 10: NETWORKS: CONNECTION PROBLEMS

		SACE	ACARA
A	Terminology		
B	Shortest path problems		Unit 4
C	Shortest connection problems		Topic 3
D	Maximum flow problems		

The material in this chapter was covered in the SACE syllabus in Year 11, so South Australian students do not need to complete this chapter.

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

		SACE	ACARA
A	Journeys on graphs		
B	Eulerian graphs		Unit 3
C	Hamiltonian graphs		Topic 3
D	Planar graphs		

Graph theory is not in the SACE syllabus, so South Australian students need not complete this chapter. Again, this could be used as a basis for an Open Topic.

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.

CHAPTER 12: DISCRETE MODELS

		SACE	ACARA
A	Critical path analysis	Topic 5	Unit 4
B	Assignment problems	Sub-topic 5.1	Topic 3
		Sub-topic 5.2	

The critical path method has been upgraded from the one presented in the previous SACE Mathematical Applications text, making it easier for students to identify earliest starting times, latest starting times, and slack times for each task.

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.