HAESE MATHEMATICS
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TEACHER NOTES FOR YEAR 11 GENERAL MATHEMATICS

CHAPTER 1: EQUATIONS AND FORMULAE

		SACE	ACARA
A	Algebraic substitution		
B	Linear equations		Unit 1
C	Problem solving with linear equations		Topic 2
D	Formula substitution		
E	Formula rearrangement		

This opening chapter allows students to practise solving linear equations, and to revise formula substitution and rearrangement.

Whilst the material in this chapter is not explicitly referenced in the SACE syllabus, we would encourage SACE students to study this chapter, as it provides the groundwork for tasks in later chapters. Chapter 3 (Investment and borrowing) and Chapter 4 (Share investments) use formulae extensively, and students are required to perform substitutions, and to rearrange the formulae to find unknowns that are not the subject of the formula. Students must also solve equations and work with formulae when studying measurement, similar triangles, and trigonometry.

The solution of linear equations is presented in a more graphical context in Chapter 12 (Linear functions).

CHAPTER 2: MEASUREMENT

		SACE	ACARA
A	International System (SI) units		
B	Scientific notation (standard form)	Topic 2	
C	Rounding numbers	Sub-topic 2.1	
D	Estimation and approximation		
E	Rates	Topic 2 Sub-topic 2.4	

The material presented in this chapter is in the SACE syllabus, but not the ACARA syllabus. Therefore, only South Australian students need to study this chapter. For students following the ACARA syllabus, a review of rates is presented as background knowledge at the start of Chapter 5 (Consumer arithmetic).

This Topic 2 chapter has been placed before the Topic 1 (Investing and borrowing) chapters, so that students can study rounding numbers before they must apply it in a financial context, for example, rounding an account balance to the nearest cent.

Sections A to D cover all of Sub-topic 2.1 in the SACE syllabus. Of these, Section D (Estimation and approximation) is likely to be the most challenging to students. We feel that estimation and approximation are very important skills for students to develop, as it gives students the 'number sense' needed to check the reasonableness of their calculations.

Section E (Rates) covers part of Sub-topic 2.4. The remainder of Sub-topic 2.4 (Scales) is presented with Similarity (Sub-topic 4.1) in Chapter 8. This is how the material is grouped in the ACARA syllabus, and we feel that it is a more logical way to group the material.

CHAPTER 3: INVESTING AND BORROWING

		SACE	ACARA
A	Financial institutions		
B	Simple interest	Topic 1	Unit 1
C	Compound interest	Sub-topic 1.1	Topic 1
D	Investment applications		
E	Tax and inflation	Topic 1 Sub-topic 1.3	
F	Borrowing	Topic 1 Sub-topic 1.4	

This is predominantly a SACE-only chapter. However, classes following the ACARA syllabus should complete as much of Sections B and C as they feel is necessary to satisfy the syllabus statement 'calculating simple and compound interest' in Topic 1 (ACMGM006).

This chapter extends the work done in previous years on simple and compound interest. When studying compound interest with different compounding periods, students should be encouraged not to focus too much on memorising the formula, but rather to adjust the time units they work with to match the compounding period. For example 8% p.a. interest compounded quarterly for 5 years should be thought of as 2% interest per quarter for 20 quarters.

Students are also introduced to the use of electronic technology for solving compound interest problems. This will provide solid groundwork for more complex calculations in Year 12, when regular payments or withdrawals are introduced.

CHAPTER 4: SHARE INVESTMENTS

		SACE	ACARA
A	Shares	Topic 1 Sub-topic 1.2	Unit 1 Topic 1
B	Price to earnings (P/E) ratio		
C	Buying shares		
D	Selling shares		
E	Breakeven price		
F	Capital gains	Topic 1 Sub-topic 1.3	
G	Inflation		
H	Dividends	Topic 1 Sub-topic 1.2	

As with Chapter 3, this is predominantly a SACE-only chapter. However, classes following the ACARA syllabus should complete Sections B and H, in order to satisfy the syllabus statement 'calculate the dividend paid on a portfolio of shares, given the percentage dividend or dividend paid per share, for each share; and compare share values by calculating a price-to-earnings ratio' in Topic 1 (ACMGM008).

Much of the material is similar to that presented in the South Australian Mathematical Applications course. However, shares occupy a much smaller proportion of this course than the Mathematical Applications course, and this chapter does not go into the same level of detail as the shares chapter in the Applications textbook. Teachers should therefore spend less time on shares than they previously have done in Mathematical Applications.

CHAPTER 5: CONSUMER ARITHMETIC

		SACE	ACARA
A	Employment		Unit 1 Topic 1
B	Government allowances and pensions		
C	Budgets		
D	Buying and selling		
E	Inflation		
F	Foreign currency		

The content in this chapter is in the ACARA syllabus, but not the SACE syllabus. South Australian students can therefore skip this chapter. South Australian students study this content in the Essential Mathematics course.

A review of percentages and rates is given online as background knowledge. Students who need this review should cover the material quickly, before moving on to the rest of the chapter.

CHAPTER 6: PYTHAGORAS' THEOREM

		SACE	ACARA
A	Pythagoras' theorem		
B	Right angles in geometry	Topic 2	Unit 1
C	The converse of Pythagoras' theorem	Sub-topic 2.2	Topic 3
D	Problem solving		
E	Three-dimensional problems		

This chapter provides a fairly standard treatment of Pythagoras' theorem. Classes should not spend too much time on this chapter if students are comfortable with the content. Teachers should keep in mind that this is likely to be the first time students have used Pythagoras' theorem in three-dimensional problems.

CHAPTER 7: PERIMETER, AREA, AND VOLUME

		SACE	ACARA
A	Length and perimeter	Topic 2	Unit 1
B	Area	Sub-topic 2.2	Topic 3
C	Areas of irregular shapes		
D	Surface area	Topic 2	
E	Volume	Sub-topic 2.3	
F	Capacity		

This chapter follows on from the measurement work done in previous years. The most challenging aspect of this chapter is likely to be Section C, which looks at estimating areas of irregular shapes. Students must use a regular shape to approximate the irregular shape, or use Simpson's rule.

CHAPTER 8: SIMILARITY AND SCALE

		SACE	ACARA
A	Similarity	Topic 4	Unit 1
B	Similar triangles	Sub-topic 4.1	Topic 3
C	Problem solving		
D	Areas of similar figures		
E	Surface areas and volumes of similar solids	Topic 2 Sub-topic 2.4	
F	Scale diagrams		

This chapter brings together the remaining material from Topic 2 and the opening material from Topic 4. We feel it is sensible to present this material in one chapter as the concept of scale, especially scaling areas and volumes, is inherently linked to similarity. This material is also presented together in the ACARA syllabus.

CHAPTER 9: STATISTICS

		SACE	ACARA
A	Sampling	Topic 3 Sub-topic 3.2	
B	Types of data		
C	Displaying categorical data	Topic 3	
D	Displaying numerical data	Sub-topic 3.3	Unit 2
E	Stem plots		Topic 1
F	Measuring the centre of data		
G	Measuring the spread of data	Topic 3	
H	Box-and-whisker plots	Sub-topic 3.4	
I	Standard deviation		
J	The normal distribution		

This is a long chapter, however it should be remembered that the whole topic is covered in this chapter, whereas most topics are covered over 2 or 3 chapters.

The SACE Sub-topics 3.1 and 3.5, involving the statistical investigation process and comparing data, are embedded throughout the chapter where appropriate.

Section J (The normal distribution) is only applicable to Western Australian students. South Australian students will study the normal distribution in Year 12 General Mathematics.

CHAPTER 10: RIGHT ANGLED TRIANGLE TRIGONOMETRY

		SACE	ACARA
A	Labelling right angled triangles		
B	The trigonometric ratios		
C	Finding sides and angles	Topic 4	Unit 2
D	Trigonometry in geometric figures	Sub-topic 4.2	Topic 2
E	Problem solving using trigonometry		
F	True bearings		
G	3-dimensional problem solving		

The material in this chapter is likely to be familiar to most students. If students are comfortable with this material, the chapter should be completed quickly, leaving more time to study non-right angled trigonometry in the following chapter.

Section G (3-dimensional problem solving) is the only section in this chapter which may be new to students. It is unfortunate that we were not forewarned that there would be a substantial amount of three-dimensional work in Year 11 General Maths, otherwise we would have included some of this work at Year 10.

CHAPTER 11: NON-RIGHT ANGLED TRIANGLE TRIGONOMETRY

		SACE	ACARA
A	The unit circle	Topic 4	
B	Areas of triangles	Sub-topic 4.3	Unit 2
C	The cosine rule	Topic 4	Topic 2
D	The sine rule	Sub-topic 4.4	
E	Problem solving		

This chapter starts with a study of the unit circle. This is not explicitly asked for in the syllabus, however it is important that we give meaning to the trigonometric ratios of obtuse angles. The unit circle is also essential for establishing the rules $\sin(180° - \theta) = \sin\theta$ and $\cos(180° - \theta) = -\cos\theta$, which are used later in the chapter.

When finding angles using the sine rule, the ACARA syllabus excludes the ambiguous case, whereas the SACE syllabus has included the ambiguous case.

In Section D.2, only the centre angle is considered, and in Section D.3 the ambiguous case is addressed. Only South Australian students need to study Section D.3.

The chapter concludes with a problem solving section, which gives students practice at determining the most appropriate rule to use in a given situation.

CHAPTER 12: LINEAR FUNCTIONS

		SACE	ACARA
A	Linear relationships		
B	Graphing linear relationships	Topic 5	
C	Linear functions	Sub-topic 5.1	
D	Graphing lines from equations		Unit 2
E	Piece-wise linear graphs and step graphs		Topic 3
F	Linear simultaneous equations		
G	Problem solving with simultaneous equations		

In this chapter, students are presented with practical problems involving linear relationships. They will see how representing these relationships graphically and algebraically can help to find efficient solutions to these problems.

South Australian students need only complete Sections A to D. Piece-wise linear graphs and step graphs have been removed from the SACE syllabus, and simultaneous equations have been moved to Year 12.

Graphing lines in general form has been included in Section D, as it is useful for the graphical solution of simultaneous equations and for linear programming in Year 12.

CHAPTER 13: EXPONENTIAL FUNCTIONS

		SACE	ACARA
A	Indices	Topic 5 Sub-topic 5.2	
B	Exponential functions		
C	Graphs of exponential functions		
D	Exponential equations		
E	Growth and decay		

Exponential functions are in the SACE syllabus in Year 11, but not the ACARA syllabus. Therefore, only South Australian students need to study this chapter.

This chapter focuses on exponential functions of the form $y = a \times b^x$. This provides a solid foundation for performing exponential modelling in Year 12.

Compound interest is touched on in this chapter, as required by the syllabus. However, we do not spend much time on compound interest questions in this chapter, as compound interest has already been studied in Chapter 3 (Investing and borrowing), in much more detail than what would be appropriate to give in this chapter.

CHAPTER 14: MATRICES

		SACE	ACARA
A	Matrix structure	Topic 6 Sub-topic 6.1	Unit 1 Topic 2
B	Matrix operations and definitions		
C	Matrix multiplication		
D	Using technology for matrix operations		
E	Costing and inventory problems		

This chapter provides a fairly standard treatment of matrices. We look at matrix structure and operations, and use matrices to solve problems involving costing and inventory.

This chapter gives students a solid foundation in matrices before Year 12, where they study more complicated applications of matrices, such as connectivity and transition matrices.

CHAPTER 15: NETWORKS

		SACE	ACARA
A	Networks	Topic 6 Sub-topic 6.2	
B	Number of paths problems		
C	Shortest path problems		
D	Longest path problems		
E	Shortest connection problems		
F	Maximum flow problems		

This content is in the SACE syllabus in Year 11, but does not appear in the ACARA syllabus until Year 12. Therefore, only South Australian students need to study this chapter.

This chapter introduces a lot of terminology about networks. It is important that students become familiar with this terminology, so that they can talk about networks in a concise manner.