

21 November 2016

TEACHER NOTES FOR YEAR 12 ESSENTIAL MATHEMATICS

CHAPTER 1: GEOMETRY

	SACE	ACARA
A 2-dimensional shapes	Topic 1 Sub-topic 1.1	Unit 3
B 3-dimensional solids		Topic 2
C Sketching solids		
D Views of solids		
E Nets of solids		

This is a fairly straightforward chapter to ease students into the school year. Much of the content of this chapter is revision of the geometry work in Year 11. The emphasis this year is looking at the number of vertices, edges, and faces of the shapes, and drawing three-dimensional solids using nets and perspective diagrams. The material in Section D: Views of solids provides the groundwork for the three-dimensional scale diagrams encountered in Chapter 3.

CHAPTER 2: LENGTH AND AREA

	SACE	ACARA
A Metric length	Topic 2 Sub-topic 2.1	
B Imperial length		
C Perimeter		Unit 3
D Area	Sub-topic 2.2	Topic 1
E Area formulae		
F Areas of irregular shapes		

We have started SACE Topic 2 before completing Topic 1, however we felt it was sensible to convert between length units before studying scale diagrams, where length conversions are used extensively.

In addition to dealing with exact measurements, students should be encouraged to improve their skills in estimating lengths. This chapter contains activities to assist with this.

Section B (Imperial length) is not in the ACARA syllabus, so students following the ACARA syllabus may skip this section.

CHAPTER 3: SCALE DIAGRAMS

	SACE	ACARA
A Scale factor	Topic 1 Sub-topic 1.2	Unit 3
B Scale diagrams		Topic 2
C Problems involving bearings		

Students should be familiar with scale diagrams from the Ratio chapter in Year 11. Emphasis has been placed on the types of scale diagrams students are likely to encounter in their adult lives, such as maps and house plans.

Students may be unfamiliar with bearings, so some extra time may need to be spent exploring this concept, before using them in a scale diagram context.

CHAPTER 4: PYTHAGORAS' THEOREM

	SACE	ACARA
A Solving $x^2 = k$	Topic 2 Sub-topic 2.1	Unit 3
B Pythagoras' theorem		Topic 2
C The converse of Pythagoras' theorem		Topic 2
D Problem solving		

This chapter comprises a fairly standard treatment of Pythagoras' theorem. Students who have previously only encountered equations with one solution may need extra help solving equations of the form $x^2 = k$. Section A will help students with this. Of course, in applying Pythagoras' theorem to right angled triangles, only the positive solution is considered.

Students are given opportunities to solve problems in real-world contexts, including landscaping and design.

CHAPTER 5: FURTHER MEASUREMENT

	SACE	ACARA
A Surface area	Topic 2 Sub-topic 2.3	Unit 3
B Volume		Topic 1
C Capacity		
D Mass		
E Density		

In this chapter, students extend the measurement work done in Year 11 to consider cones and pyramids. Students will have another opportunity to use Pythagoras' theorem here.

Many of the problems involving mass and capacity are grounded in real-world contexts, including nursing, hospitality, and nutrition.

Imperial mass units are not in the ACARA syllabus, however the right hand column of the SACE syllabus states that these units "could be considered". We have therefore included a small sub-section on them in Section D.

Density is included in the SACE syllabus, but not the ACARA syllabus. Thus, only South Australian students need complete the last section.

CHAPTER 6: RIGHT ANGLED TRIANGLE TRIGONOMETRY

	SACE	ACARA
A Labelling right angled triangles	} Topic 2 Sub-topic 2.1	} Unit 3 Topic 2
B The trigonometric ratios		
C Finding sides and angles		
D Problem solving using trigonometry		

It is likely that students will have struggled with trigonometry in previous years, if indeed they have encountered trigonometry at all. The material in this chapter should therefore be covered very carefully.

When students are introduced to trigonometric ratios in Section B, students should understand that trigonometric ratios such as $\sin 57^\circ$ are not variables but have a particular value, and they should understand what that value represents in the context of right angled triangles. Having this understanding early will help greatly for the sections which follow.

The problem solving section includes some questions involving bearings. This is not explicitly asked for in the SACE syllabus, but it is included in the ACARA syllabus, and it seems a reasonable application of bearings given that bearings were introduced in Chapter 3.

CHAPTER 7: NON-RIGHT ANGLED TRIANGLE TRIGONOMETRY

	SACE	ACARA
A Trigonometric ratios of obtuse angles	} Topic 2 Sub-topic 2.1	}
B The cosine rule		
C The sine rule		
D Problem solving		

Non-right angled triangle trigonometry is in the SACE syllabus, but not the ACARA syllabus. Therefore, only South Australian students must complete this chapter.

Section A uses the unit circle to motivate the trigonometric ratios of obtuse angles. This is not in the syllabus, however we felt it was inappropriate to simply use trigonometric ratios like $\cos 100^\circ$ without any justification for their meaning. Teachers may skip this section if they feel it is beyond their students, however this will leave complete reliance on the calculator.

The ambiguous case is not addressed when finding angles using the sine rule. In all questions of this type, there is only one valid solution.

CHAPTER 8: BUSINESS APPLICATIONS

	SACE	ACARA
A Planning business premises	Topic 3 Sub-topic 3.1	
B Costing calculations		
C Depreciation	Sub-topic 3.2	
D Insurance		
E Cost of goods sold		
F Profit and loss statements	Sub-topic 3.3	
G Break-even analysis		
H Business structures and taxation		

Again, this chapter is in the SACE syllabus, but not the ACARA syllabus. Therefore, only South Australian students must complete this chapter. South Australian teachers will recognise much of this content from the old South Australian Maths Applications “Mathematics and Small Business” topic.

Section D involves calculating workers compensation insurance premiums for a company, which is quite complicated. Teachers should keep in mind, however, that this topic is not examinable, so students will not be required to memorise all of the different rates and percentages in an exam. The focus should be on applying the procedure correctly, rather than memorising the procedure.

CHAPTER 9: LINE GRAPHS

	SACE	ACARA
A The Cartesian plane		
B Graphing linear relationships		Unit 3
C Graphing lines from equations		Topic 3
D Line graphs		
E The intersection of line graphs		

This chapter is in the ACARA syllabus, but not the SACE syllabus. Therefore, South Australian students do not need to complete this chapter. That being said, students may find it useful to study Sections B and C on graphing linear functions, as this will improve their understanding of the least squares regression line in Chapter 12.

CHAPTER 10: PROBABILITY

	SACE	ACARA
A Probability		
B Experimental probability		
C Sample space		Unit 4
D Theoretical probability		Topic 1
E Compound events		
F Tree diagrams		
G Simulations		

Again, this chapter is in the ACARA syllabus, but not the SACE syllabus, so South Australian students do not need to complete this chapter. However, it could possibly be used as a basis for an Open Topic.

While the syllabus makes no specific mention of compound events, there seems little point in studying tree diagrams without them.

CHAPTER 11: STATISTICS

	SACE	ACARA
A Sampling	Topic 4 Sub-topic 4.1	Unit 4
B Displaying data		Topic 4
C Measuring the centre of data	Sub-topic 4.2	
D Measuring the spread of data		
E Back-to-back stem plots		
F Parallel box plots		

Section A looks at various sampling methods, and the possible errors that can result from sampling. Students following the ACARA syllabus need only study this section, whereas South Australian students must complete the whole chapter.

Much of the remainder of the chapter is revision of the Year 11 work. In Year 12, a greater emphasis is placed on comparing data sets, using parallel box plots and back-to-back stem plots.

CHAPTER 12: LINEAR CORRELATION

	SACE	ACARA
A Correlation	Topic 4 Sub-topic 4.3	Unit 3
B Measuring correlation		Topic 4
C Line of best fit by eye		Topic 4
D Least squares regression line		

The SACE syllabus specifies that the least squares regression line should be drawn using technology, and instructions have been included to help with this. However, students would benefit from studying the graphing of linear functions in Chapter 9, so they have some understanding of how these lines can be graphed without technology.

CHAPTER 13: INVESTMENTS

	SACE	ACARA
A Simple interest	Topic 5 Sub-topic 5.1	Unit 4
B Compound interest		Topic 3
C Future value annuities	Sub-topic 5.2	
D Tax and inflation		
E Superannuation		

Sections A and B revise the concepts of simple and compound interest from Year 11.

The remaining sections involve future value annuities and regular payments. Only South Australian students are required to study these sections.

Much of the work in this chapter is done using the finance function of the calculator. This makes it difficult for students to “check their working”. Therefore, students are encouraged to think about the answers the calculator gives them, and to ask whether the answer is reasonable in the context of the question. An unreasonable answer may be a signal that they have performed one of the calculator entries incorrectly.

CHAPTER 14: LOANS

	SACE	ACARA
A Reducing balance loans	Topic 5 Sub-topic 5.3	Unit 4 Topic 3
B Home loans		
C Strategies to minimise interest		
D Comparing loans		

This chapter completes the finance work for this course by considering loans. As in the previous chapter, much of the work is done using technology, so students should assess the reasonableness of the answer the calculator gives.

This chapter contains information which should be useful to the students in their adult lives, such as strategies to minimise interest on a home loan, and the dangers of short term loans.

The SACE syllabus asks “What is a present-value annuity?”. However, this is not a well defined term, and we feel that it is not helpful for students to think of annuities in this way.

Some of the terminology in the right hand column of the SACE syllabus, such as split loans and offset accounts, are presented as research activities. It is important that students have a conceptual understanding of what these loan types mean. However, due to the laborious calculations involved in answering specific questions about these topics (even using a calculator), it seems reasonable to discuss these concepts more generally. The students could create a spreadsheet to explore these concepts.

CHAPTER 15: EARTH GEOMETRY AND TIME ZONES

	SACE	ACARA
A Latitude and longitude		Unit 3
B Distance on the Earth’s surface		Topic 2
C Time zones		

This chapter is in the ACARA syllabus, but not the SACE syllabus. Therefore, South Australian students do not need to complete this chapter. Again, it could be used as a basis for an Open Topic.

In accordance with the ACARA syllabus, distances on the Earth’s surface are only calculated along lines of longitude. We have included software which students can use to calculate the distance between any two points on the Earth.