

Papers written by
Australian Maths
Software

SEMESTER TWO

YEAR 11

MATHEMATICS SPECIALIST

Units 1 & 2

2016

REVISION ONE

Section One
(Calculator-free)

Name: _____

Teacher: _____

TIME ALLOWED FOR THIS SECTION

Reading time before commencing work:

5 minutes

Working time for section:

50 minutes

MATERIAL REQUIRED / RECOMMENDED FOR THIS SECTION

To be provided by the candidate

Standard items: pens, pencils, pencil sharpener, highlighter, eraser, ruler.

IMPORTANT NOTE TO CANDIDATES

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

To be provided by the supervisor

Question/answer booklet for Section One.

A formula sheet which may also be used for Section Two.

Structure of this examination

	Number of questions available	Number of questions to be answered	Working time (minutes)	Marks available	Percentage of exam
Section One Calculator—free	7	7	50	52	35
Section Two Calculator—assumed	12	12	100	98	65
Total marks				150	

Instructions to candidates

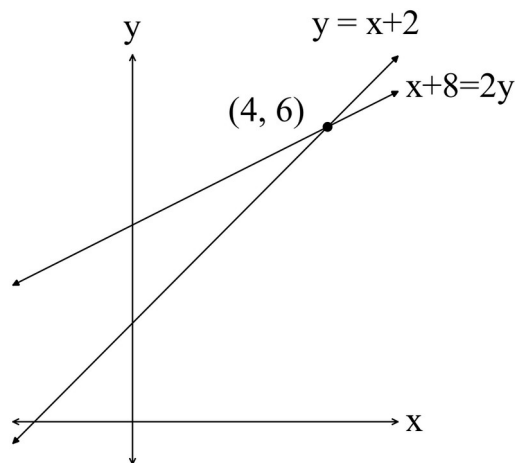
1. The rules for the conduct of this examination are detailed in the Information Handbook. Sitting this examination implies that you agree to abide by these rules.
2. Write your answer in the Question/Answer booklet.
3. You must be careful to confine your responses to the specific questions asked and to follow any instructions that are specific to a particular question.
4. Spare pages are provided at the end of this booklet. If you need to use them, indicate in the original answer space where the answer is continued i.e. give the page number.
5. Show all your working clearly. Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks. If you repeat an answer to any question, ensure that you cancel the answer you do not wish to have marked.
6. It is recommended that you **do not use pencil**, except in diagrams.
7. The Formula Sheet is **not** to be handed in with your Question/Answer booklet.

Section One: Calculator-free**52 marks**

This section has **seven (7)** questions. Attempt **all** questions.
Working time: 50 minutes

Question 1**(7 marks)**

- (a) Consider the graph of two intersecting lines below.



Verify the solution using a matrix method.

(4)

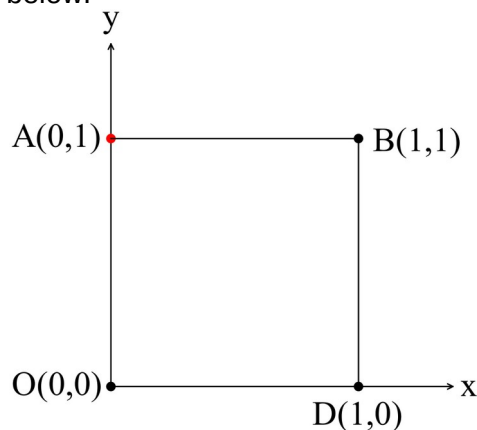
- (b) Given $A = \begin{pmatrix} x & 2 \\ -2 & -1 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & y \\ 1 & 2 \end{pmatrix}$, determine x and y if A and B are commutative under multiplication.

(3)

Question 2

(6 marks)

- (a) Consider the diagram below.

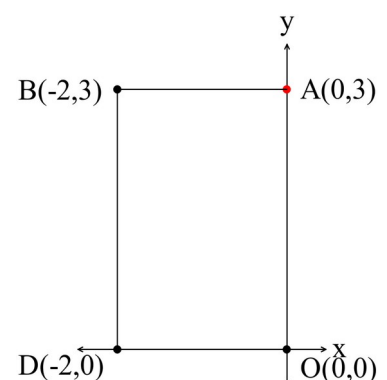


Let $P = \begin{bmatrix} a & 0 \\ 0 & 1 \end{bmatrix}$, and $Q = \begin{bmatrix} 1 & 0 \\ 0 & b \end{bmatrix}$ where $a > 0$ and $b > 0$.

- (a) Describe what happens to a point (x,y) when it is transformed using
 (i) matrix P . (2)

- (ii) matrix Q . (2)

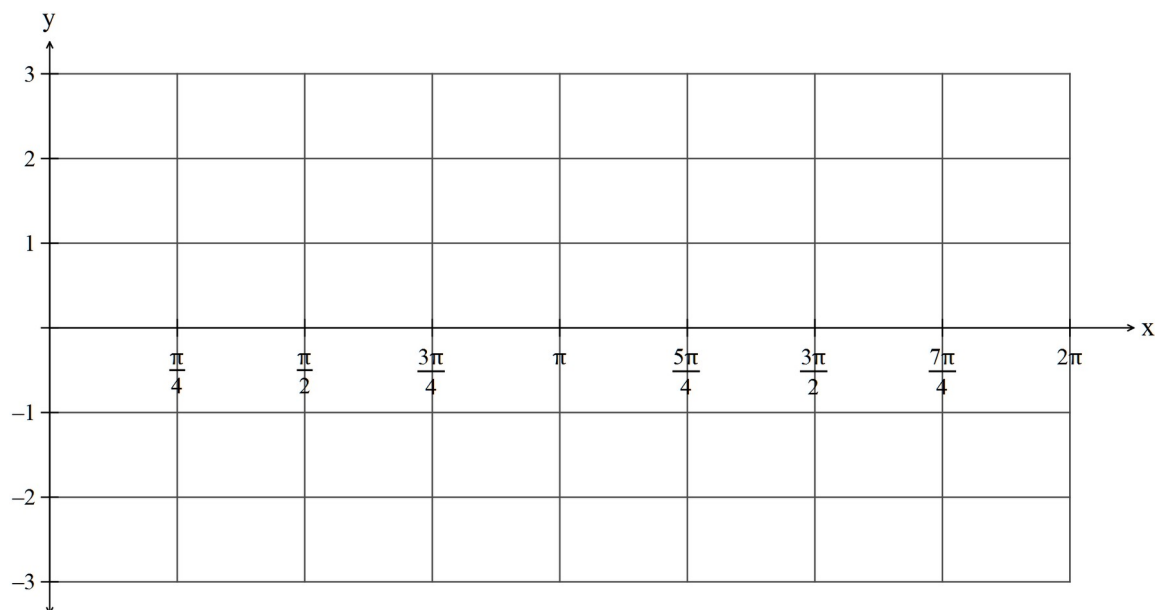
- (b) Write down the matrix required to transform the square ABCD above into the rectangle graphed below. (2)



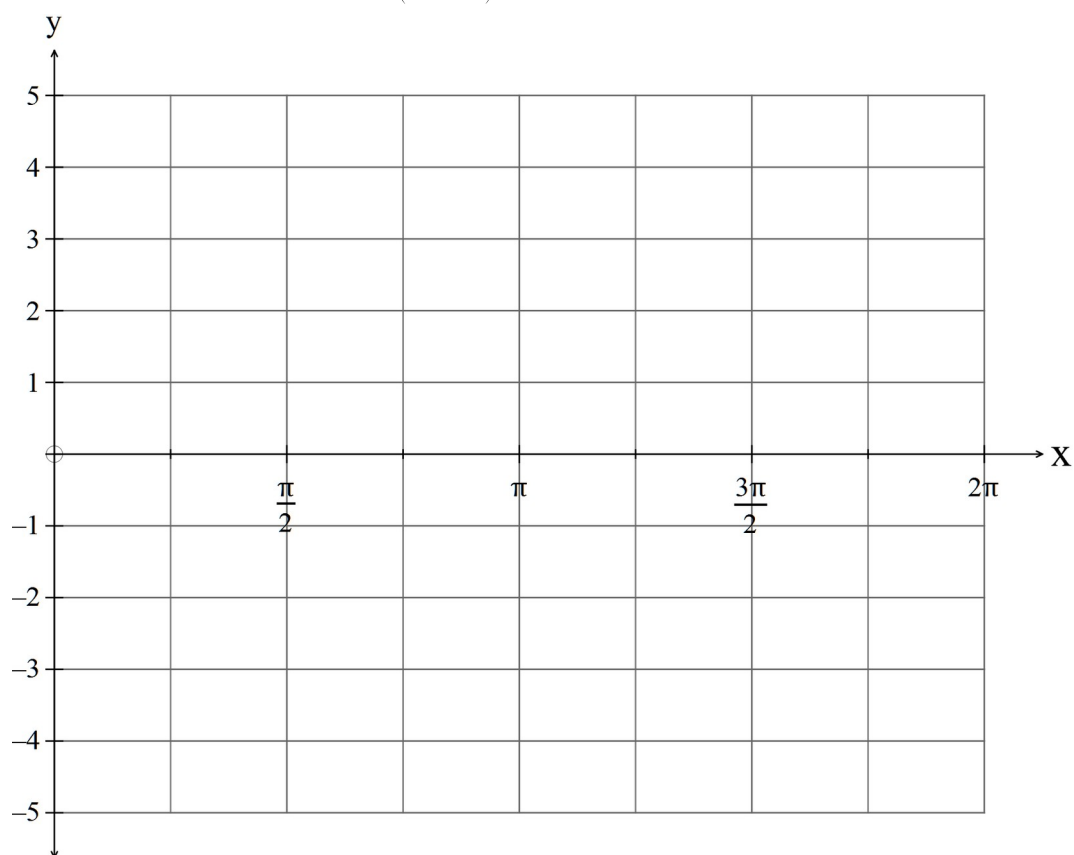
Question 3

(4 marks)

- (a) Sketch the function $y = 1 - 2\sin(2x)$ on the domain $0 \leq x \leq 2\pi$. (2)

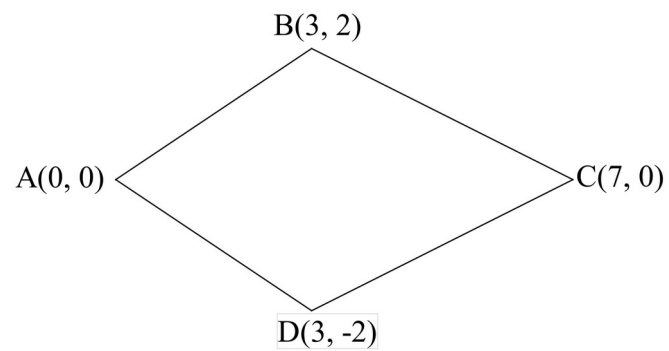


- (b) Sketch the function $y = 2\sec\left(x + \frac{\pi}{2}\right)$ on the domain $0 < x < 2\pi$. (2)



Question 4**(8 marks)**

(a) Consider the following diagram.



(i) Use vectors to prove that $ABCD$ is not a parallelogram. (1)

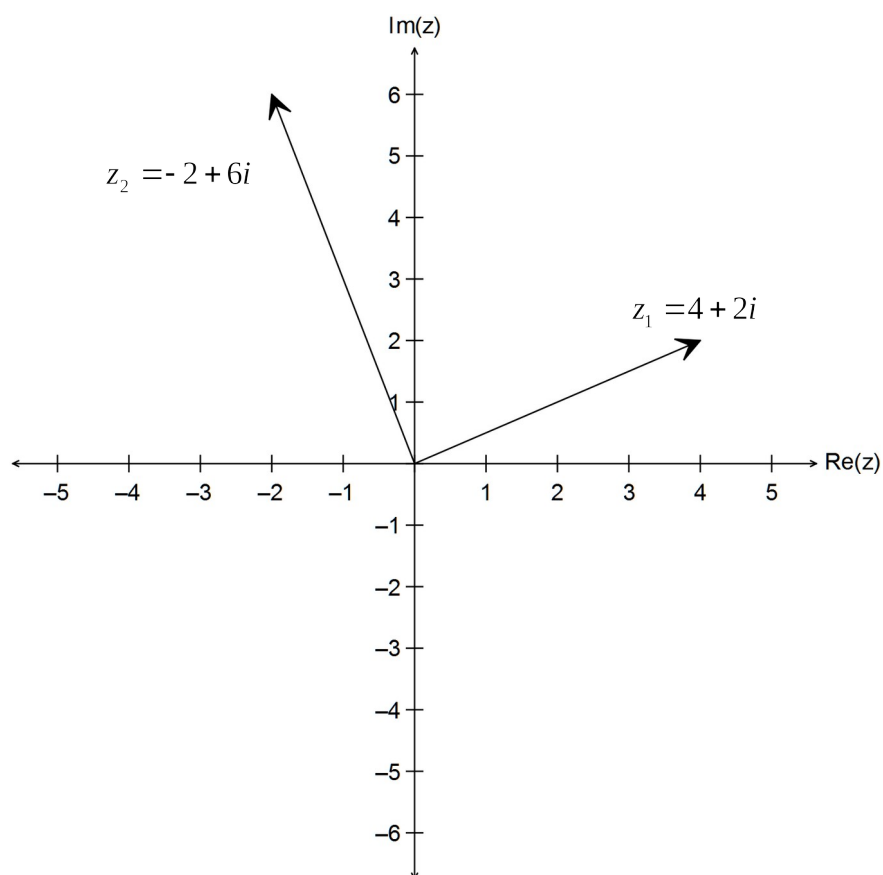
(ii) Use the diagonal vectors to prove that $ABCD$ is a kite. (4)

(b) Given $A(1,1)$ and $\mathbf{AB} = \begin{pmatrix} 4 \\ -2 \end{pmatrix}$ find point P such that $\mathbf{AP} = 3\mathbf{AB}$. (1)

(c) Find $\cos(\theta)$ given θ is the angle between vectors $\mathbf{a} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 1 \\ -7 \end{pmatrix}$. (2)

Question 5**(11 marks)**

Two complex numbers shown on the set of axes below



(a) Sketch on the diagram above

(i) $\overline{z_1}$ (2)(ii) $\frac{(z_1)^2}{4}$ (2)

(b) Determine the expressions for

(i) $|z_1 - z_2|$ (3)

(ii) $\frac{10}{z_1} - 2z_2 =$ (3)

(iii) $z_1 - iz_2$ (1)

Question 6**(9 marks)**

- (a) State the converse of the following theorem. (1)

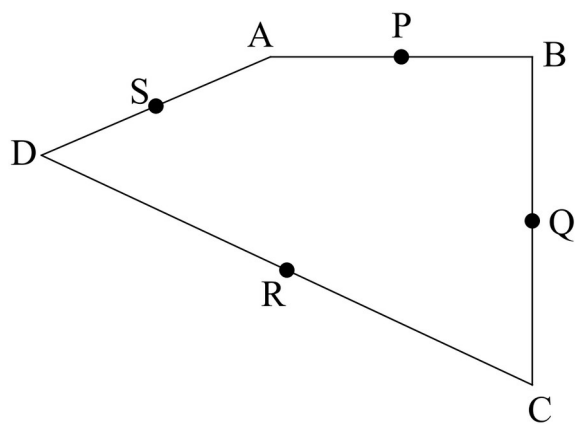
"The opposite angles of a cyclic quadrilateral are supplementary."

- (b) Prove that *"The tangents drawn to a circle from an external point are equal."* (4)

(c) Prove the following using vectors:

“If the midpoints of the adjacent sides of a quadrilateral are joined, then the resulting quadrilateral is a parallelogram.”

(4)



Question 7**(7 marks)**

- (a) Use the expansion of $\sin(x + y)$ to find an expression for $\sin(3x)$. (3)

- (b) Solve $\tan^2\left(x + \frac{\pi}{4}\right) = 1$ for $-\pi \leq \theta \leq \pi$. (4)

END OF SECTION ONE