

MATHEMATICS 3AMAT

EXCELSIOR MONTGOMERY SCHOOLS



**RESOURCE-RICH
PART B**

Time allowed for this paper: Three hours and twenty minutes
Reading time before commencing work: Ten minutes
Working time for paper: One hour and twenty minutes

Special items: Curriculum Council Mathematical Formulate and Statistical Tables Book, drawing
None

Module: _____
Subject: _____
Title: _____
Date: _____
Page: _____

Note: Personal copies of the Tabbed Book should not contain any underlining and highlighting except a name and address.

Important note to Candidates
Important 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.

This paper is fair of units.

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Structure of this paper

Working time	Number of questions available	Number of questions to be attempted	Marks
1 hour 20 minutes	10	10	80
[Total marks]			80

This paper has **TEN (10)** questions. Attempt **ALL** questions.

Question	Marks
1	8
2	7
3	7
4	7
5	7
6	6
7	8
8	15
9	8
10	7
Total marks	80

Instructions to candidates

- The rules for the conduct of Examinations are detailed in the *Student Information Handbook*. Sitting this examination implies that you agree to abide by these rules.
- Write your answers in the spaces provided in this Question/Answer Booklet. Spare pages may be found at the end of the booklet. If you need to use them, indicate in the original answer space where the answer is continued (i.e. give the page number).
- A blue or black ballpoint or ink pen should be used.
- It is recommended that you **do not use pencil** except in diagrams.
- 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. Correct answers given without supporting reasoning may not be allocated full marks. Incorrect answers given without supporting reasoning cannot be allocated any marks. If you repeat an answer to any question, ensure that you cancel the answer you do not wish to have marked.
- On the front cover you are asked to state the kinds of calculator that you brought into the examination. This information is required to ensure the examination is fair for all students. Please complete the box. Note that the same marking procedure will apply to all scripts, whatever calculator you use.

- (d) Comment on the reliability of your prediction in (b), in terms of the context.

[1 mark]

Question 10 [7 marks]

The scores in a Chemistry Examination (maximum mark 200) were normally distributed with a mean of 124 marks and a standard deviation of 30 marks.

- (a) What proportion of students scored less than 100 marks?

[2 marks]

- (b) The top 2% of students were awarded a certificate of distinction. What minimum mark was needed for a certificate of distinction?

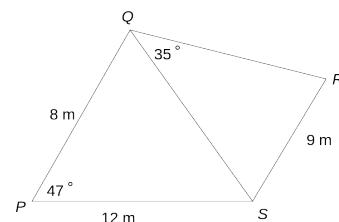
[2 marks]

- (c) The middle 40% of students received a grade of C. What were the minimum and maximum marks in order for a student to be awarded a C?

[3 marks]

Question 2 [7 marks]

Use the diagram below to answer the following questions:



- (a) Determine the length of QS.

[3 marks]

- (b) Given that angle R is acute, determine the size of angle QRS.

[2 marks]

- (c) Determine the area of quadrilateral PQRS.

[2 marks]

- (c) (i) What population size will the European wasps level out at if the sterilisation program continues?

[1 mark]

- (ii) Explain mathematically why the population levels out.

[3 marks]

- (d) Sketch the population from 1995 to beyond 2007 onto the axes below, including any important values.

[4 marks]



[3 marks]

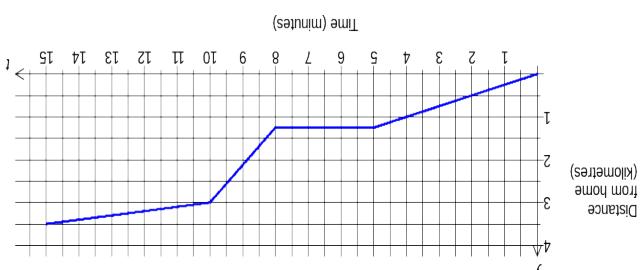
- (c) If Kim had ridden her bicycle all the way to school earlier, later or at the same time? Justify your answer.
- If Kim had ridden her bicycle all the way to school earlier, later or at the same time? Justify your answer.

[2 marks]

- (b) Determine the speed of the car in kilometres per hour.
- Determine the speed of the car in kilometres per hour.

[2 marks]

- (a) Determine Kim's bicycle riding speed in metres per second.
- Determine Kim's bicycle riding speed in metres per second.



Graph below represents their journey:

Kim rode her bicycle to her friend's place. After a brief stop, her friend's father gave them both a lift in his car to a point near their school. They then walked the final distance to school. The lift in his car to a point near their school. They then walked the final distance to school. The

Question 3 [7 marks]

SEMESTER ONE EXAM 2009

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MATHEMATICS 3A

graph below represents their journey:

At the beginning of 1995, the European wasp population in the Perth suburb of Waspville, was 400. It increased at a rate of 10% for 2 years.

A sterilisation program was introduced at the beginning of 1997 by the WA Department of Agriculture. As a result, the numbers decreased dramatically then increased before leveling out at a stable population P_t , following the model:

$$P_t = 2.5P_{t-1} - 0.003(P_{t-1})^2 \quad \text{for } t > 2, \text{ where } t \text{ is in years.}$$

(a) Complete the table below showing the starting population for each year from 1995 to 2007.

P_t	Year	Beginning Population
P_0	1995	400
P_1	1996	
P_2	1997	
P_3	1998	39
P_4	1999	
P_5	2000	
P_6	2001	
P_7	2002	
P_8	2003	
P_9	2004	
P_{10}	2005	
P_{11}	2006	
P_{12}	2007	

[2 marks]

- (ii) Give the values of k and a .
- Give the values of k and a .

[1 mark]

- (i) What type of function is this?
- What type of function is this?

$$P_t = ka^t$$

- (b) Population during 1995 and 1996 can be described by:
- Population during 1995 and 1996 can be described by:

[4 marks]

(Note: Two values have been completed for you.)

(a) Complete the table below showing the starting population for each year from 1995 to 2007.

A sterilisation program was introduced at the beginning of 1997 by the WA Department of Agriculture. As a result, the numbers decreased dramatically then increased before leveling out at a stable population P_t , following the model:

$$P_t = 2.5P_{t-1} - 0.003(P_{t-1})^2$$

for $t > 2$, where t is in years.

Question 4 [7 marks]

The table below shows the tasks required to complete a job:

Task	A	B	C	D	E	F	G	H	I	J
Immediate Predecessor	-	-	A	A	B	C	C	D	G,H,E	F,I
Time (days)	6	8	3	5	5	5	4	4	2	4

- (a) Draw a project network which satisfies the above conditions.

[3 marks]

- (b) Determine the minimum time to complete the project and state the critical path, if all tasks are completed on time.

[2 marks]

- (c) If Task C were delayed by 3 days, what effect, if any, would this have on the completion time?

[1 mark]

- (d) If Task D were shortened by 3 days, what effect, if any, would this have on the completion time?

[1 mark]

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The table below shows the scores of the students at a large school in the Semester One Mathematics 3A examination.

Score on Maths 3A exam (%)	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	Number of students	2	4	7	8	15	25	29	20	9
Base, b (m)	Height, h (m)	Area, A (m^2)																	
90	178.61	8037.26																	
100																			
110																			

- (a) How many students sat for the examination? [1 mark]

- (b) Describe student performance in the examination. [6 marks]

$$h = \sqrt{200 + b}(200 - b)$$
 [2 marks]

- (c) Determine the maximum area. Clearly show the method used. [4 marks]

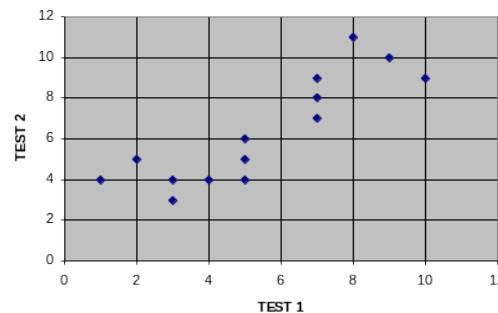
110		
100		
90	178.61	8037.26

- (b) Complete the following table (to two decimal places): [2 marks]

Question 6 [6 marks]

The graph below shows the results of 14 students on two tests. All marks are whole numbers.

TEST SCORES



Using all the 14 data points:

- the correlation coefficient is $r = 0.864$ (3 d.p.) (R1)
- the equation of the line of regression is $y = 0.844x + 1.775$ (3 d.p.) (L1)

When the two data points with the lowest scores on Test 1 and the two data points with highest scores on Test 1 are removed

- the correlation coefficient is $r = 0.928$ (3 d.p.) (R2)
- the equation of the line of regression is $y = 1.359x - 1.239$ (3 d.p.) (L2)

- (a) (i) Use the more appropriate of the two lines of regression to estimate the mark on Test 2 for a student who scored 4 on Test 1.

[1 mark]

- (ii) Justify why you used that particular line of regression and comment on the reliability of your prediction.

[2 marks]

- (b) (i) Use the more appropriate of the two lines of regression to estimate the mark on Test 2 for a student who scored 11 on Test 1.

[1 mark]

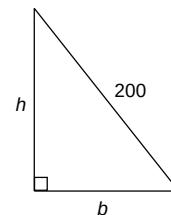
- (ii) Justify why you used that particular line of regression and comment on the reliability of your prediction.

[2 marks]

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Question 7 [8 marks]

A farmer wishes to create a holding pen by fencing off an area in the corner of a fenced paddock with 200 metres of fencing as shown in the right triangle:



- (a) Show that the height, in terms of the base, is given by the equation: