# St Mary’s Anglican Girls’ School



# Semester II, 2011

### Question/Answer Booklet

**MATHEMATICS**

# SPECIALIST 3CD

## Section One

## (Calculator Free)

**Time allowed for this section**

Reading time before commencing work: 5 minutes

Working time for paper: 50 minutes

**Material required/recommended for this section**

**To be provided by the supervisor**

Question/Answer booklet for Section One, with a formula sheet which may also be used for Section Two.

**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.

**Structure of this paper**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Number of questions available | Number of questions to be attempted | Suggested working time (minutes) | Marks available |
| **Section One**  **Calculator—free** | **7** | **7** | **50 minutes** | **40** |
| Section Two  Calculator—assumed | 9 | 9 | 100 minutes | 80 |
| Total marks | | | | 120 |

**Instructions to candidates**

1. Answer the questions in the spaces provided.
2. Spare answer 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. Fill in the number of the question(s) that you are continuing to answer at the top of the page.
3. **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.
4. It is recommended that you **do not use pencil** except in diagrams.

# Section One: Calculator–Free 40 marks

This section has **seven (7)** questions. Attempt **ALL** questions.

**Question 1 [9 marks]**

Give exact values for the following:

(a) 

[1]

(b) 

[2]

(c) 

[3]



(d) The shaded area under the curve y = cos 2x.

[3]

**Question 2 [9 marks]**

Given that z = eix and w = e–ix (where x is a real number):

(a) express cis(3x) w in terms of z,

[2]

(b) determine the values of a and b if z - w is expressed in the form a + bi,

[2]

(c) simplify z3 + w3,

[2]

(d) solve for x given that z4 + 1 = 0

[3]

**Question 3 [6 marks]**

Points A, B and C have respective position vectors given by:

**a** = **i** + **j**  - **k**

**b** = **i** + **j**  + **k**

**c** = 2**i** + **j**

Determine :

(a) the value of cosine of the angle between vectors **a** and **b**,

[2]

(b) the vector equation of the line containing points A and B,

[2]

(c) the vector equation of the plane containing vectors **a** and **b** and also containing the point C.

[2]

**Question 4 [3 marks]**

Evaluate the definite integral  exactly.

**Question 5 [4 marks]**

(a) Determine matrix T = 

[1]

(b) Hence if matrix T represents a transformation matrix, describe the actions of matrix T.

[3]

**Question 6 [5 marks]**

The natural logarithm function can be defined as ln(x) =  where x > 0.

(a) Given that a, b > 0, using the substitution u =  find an expression for the definite integral  .

[3]

(b) By considering  =  +  and using the result from part (a) make a deduction about the natural logarithm function.

[2]

**Question 7 [4 marks]**

Prove, by any method, that the cube of any number that is 2 more than a multiple of 3 is always 1 less than a multiple of 9.

**END OF SECTION ONE**

**Additional working space**

Question number(s): ……………………

**Additional working space**

Question number(s): ……………………

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Question number(s): ……………………

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Question number(s): ……………………