Semester Two Examination, 2016

Question/Answer Booklet

MATHEMATICS METHODS UNITS 1 AND 2

Section One: Calculator-free

If required by your examination administrator, please place your student identification label in this box

Student Number: In figures | | | | | | | | |

In words _____

Your name _____

Time allowed for this section

Reading time before commencing work: five minutes
Working time for section: fifty minutes

Materials required/recommended for this section

To be provided by the supervisor
This Question/Answer Booklet
Formula Sheet

To be provided by the candidate
Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: nil

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

Section	Number of questions available	Number of questions to be answered	Working time (minutes)	Marks available	Percentage of exam
Section One: Calculator-free	8	8	50	52	35
Section Two: Calculator-assumed	12	12	100	98	65
			Total	150	100

Instructions to candidates

1. The rules for the conduct of examinations are detailed in the school handbook. Sitting this examination implies that you agree to abide by these rules.

2. Write your answers in this Question/Answer Booklet.

3. You must be careful to confine your response to the specific question asked and to follow any instructions that are specified to a particular question.

4. Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.
   - Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
   - Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question that you are continuing to answer at the top of the page.

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 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/Booklet.

See next page

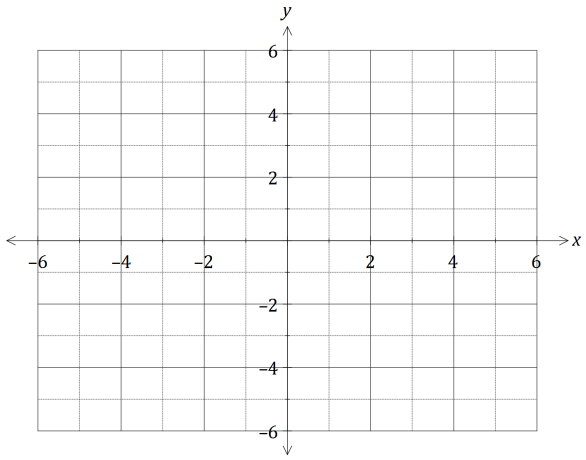
Additional working space

Question number: _____

Question 8 **(7 marks)**

Let $f(x)=\frac{1}{x+1}$, $x\neq -1$.

(a) Sketch the graph of $y=f(x)$ on the axes below. (3 marks)



(b) Evaluate the difference quotient $\frac{f(x+h)-f(x)}{h}$ as $h\to 0$ to determine the slope of $f(x)$ when $x=2$. (4 marks)

End of questions

Section One: Calculator-free **35% (52 Marks)**

This section has **eight (8)** questions. Answer **all** questions. Write your answers in the spaces provided.

Working time for this section is 50 minutes.

Question 1 **(4 marks)**

A box contains a total of 500 marker and highlighter pens of various colours, as shown in the table. Some of the marker pens are permanent and the rest are non-permanent.

	Colour			
Type of pen	Black	Yellow	Pink	Green
Permanent marker	55	83	40	24
Non-permanent marker	45	67	24	12
Highlighter	0	50	46	54

A pen is selected at random from the box. Determine the probability that it is

(a) a yellow pen. (1 mark)

(b) a marker pen. (1 mark)

(c) a yellow pen or a marker pen. (1 mark)

(d) a green pen, given that it is a highlighter. (1 mark)

See next page

Question 2 **(6 marks)**

(a) Determine $f'(x)$ when $f(x)=(x-5)^2$. (2 marks)

(b) Simplify

(i) $\frac{d}{dx}(5x^2-4x+3)$. (1 mark)

(ii) $\lim_{h\to 0}\frac{(x+h)^4-x^4}{h}$. (1 mark)

(c) Calculate the gradient of the curve $y=2x^5-3x^4$ where $x=-1$. (2 marks)

Question 7 **(7 marks)**

The first three terms, in order, of geometric sequence are $x-5$, $x-1$ and $2x+4$.

(a) Explain why $(x-1)(x-1)=(x-5)(2x+4)$. (2 marks)

(b) Determine the value(s) of x. (3 marks)

(c) Determine all possible values for the fourth term of the sequence. (2 marks)

Question 6 **(5 marks)**

(a) The expression $(2x-1)^3$ can be expanded to give $8x^3+ax^2+6x-1$. Show that the value of a is -12. (2 marks)

(b) Using the result from (a), or otherwise, determine $f(x)$ if $f'(x)=(2x-1)^3$ and $f(1)=5$. (3 marks)

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Question 3 **(8 marks)**

(a) The equations $x^3+x^2+ax+b=0$ and $x^3-bx^2-ax+4=0$ both have $x=2$ as a solution. Determine the values of a and b. (4 marks)

(b) The equation $x^3-x^2-14x+24=0$ also has $x=2$ as a solution. Determine all other solutions to the equation. (4 marks)

See next page

Question 4 **(6 marks)**

(a) A and B are independent events such that $P(A)=\frac{2}{3}$ and $P(B)=\frac{1}{4}$. Determine

(i) $P(A \cap B)$. (1 mark)

(ii) $P(B \vee A)$. (1 mark)

(iii) $P(A \cup B)$. (2 marks)

(b) A number is selected at random from the set of positive integers. Event P occurs when the number is odd, event Q occurs when the number is a multiple of five and event R occurs when the number is a perfect square. Determine the smallest number that belongs to the following sets:

(i) $\overline{P} \cap (Q \cup R)$. (1 mark)

(ii) $\overline{P} \cap Q \cap R$. (1 mark)

See next page

Question 5 **(9 marks)**

Solve the following equations for x:

(a) $(x-11)^2-49=0$. (2 marks)

(b) $27^{x+1}=9^{1-x}$. (3 marks)

(c) $\sin^2 x-\cos^2 x=\frac{1}{2}, 0 \le x \le 360°$. (4 marks)

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