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C O L L E G E
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MATHEMATICS: SPECIALIST
3CDMAS
Section One
(calculator-free)

Name: _____

Teacher: _____

Time allowed for this section
Section One
Reading time before commencing work: 5 minutes
Working time for paper: 50 minutes

Material required/recommended for this paper
To be provided by the supervisor
Question/answer booklet for Section One and a formula sheet (from Curriculum Council) which can be used for Section Two.

To be provided by the candidate
Section One:
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

Section	Number of questions available	Number of questions to be answered	Suggested working time (minutes)	Marks available
Section One: Calculator-free	7	7	**50**	**39**
Section Two: Calculator-assumed	13	13	100	79
				118

Instructions to candidates

1. The rules for the conduct of Western Australian examinations are detailed in the *Year 12 Information Handbook 2010*. Sitting this examination implies that you agree to abide by these rules.

2. Answer the questions according to the following instructions.
   Section One: Write answers in this Question/Answer Booklet. **All** questions should be answered.
   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.
   It is recommended that you **do not use pencil** except in diagrams.

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 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(s) that you are continuing to answer at the top of the page.

MARK ALLOCATION AND RECORDS:

Section	Question	Marks	Awarded
ONE	1	3	
	2	3	
	3	4	
	4	6	
	5	6	
	6	7	
	7	10	
	Penalties	- 1/2/3	
	ONE	39	
	TWO	79	

TOTAL	**118**	

Penalties

Rounding (-1)	

Units (-1)	

Notation (-1)	

	%

Section One (calculator-free) 39 marks

This section has **SEVEN (7)** questions. Attempt **all** questions.

Working time: **50 minutes**

The following exact value table may be useful to answer questions in this examination.

	0^0	30^0	45^0	60^0	90^0
Sin	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
Cos	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
Tan	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	undefined

1. [3 marks]

Find the value(s) of a if $\langle 6, a, -4 \rangle$ and $\langle -1, 2a, a \rangle$ are perpendicular.

2. [3 marks]

Find $\frac{dy}{dx}$ for $x^2 + 2xy - y^2 = 7$

3. [4 marks]

Find $\dfrac{d}{dx}(x \sin x)$ and hence $\displaystyle\int x \cos x \, dx$.

4. [2, 1, 3 marks]

(a) Find the equation of the plane through A $(2, -3, 4)$ which has a normal vector of $\langle -1, 5, 3 \rangle$.

(b) Find the equation of the line through $\langle 16, -17, -8 \rangle$ and parallel to $\langle -2, 3, 1 \rangle$.

(c) Hence, find where the above line and plane intersect.

5. [6 marks]

Show how to find the derivative of $\cos 2x$ from first principles if it is known that $\lim_{h \to 0} \dfrac{\cos 2h - 1}{h} = 0$.

6. [7 marks]

Prove that the square of every whole number has a remainder of either 1 or 0 when divided by 3.

7. **[3,7 marks]**

Find the following:

(a) $\displaystyle\int \frac{3x}{\sqrt{2 - 3x^2}}\, dx$ without letting $u = 2 - 3x^2$.

(b) $\displaystyle\int_0^{\sqrt{3}} x\sqrt{4 - x^2}\;$ by letting $x = 2 \sin \theta$.