ACKNOWLEDGEMENT

Section One

Question 6 Data source: Australian Bureau of Statistics. (n.d.). Retrieved March, 2010, from www.abs.gov.au.

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Government of Western Australia
Curriculum Council

WACE
Western Australian Certificate of Education

Western Australian Certificate of Education Examination, 2010

Question/Answer Booklet

MATHEMATICS 2C/2D

Section One: Calculator-free

Please place your student identification label in this box

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

In words _____

_____

Time allowed for this section

Reading time before commencing work: five minutes
Working time for this 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, pencils, pencil sharpener, eraser, correction fluid/tape, ruler, highlighters

Special items: nil

Important note to candidates

No other items may be used in this section of the examination. 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	7	7	50	40	
Section Two: Calculator-assumed	12	12	100	80	
			Total	120	100

Instructions to candidates

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

2. Write your answers in the spaces provided in this Question/Answer Booklet. 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.

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.

See next page

Additional working space

Question number: _____

Additional working space

Question number: _____

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See next page

Section One: Calculator-free **(40 Marks)**

This section has **seven (7)** questions. Answer **all** questions. Write your answers in the spaces provided.

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.

Working time: 50 minutes.

Question 1 **(6 marks)**

Solve each of the following equations.

(a) $3x^2 - 15x = 0$ (3 marks)

(b) $(x + 1)(x - 2) = 4$ (3 marks)

See next page

Additional working space

Question number: _____

Question 7 **(3 marks)**

The following is a list of all prime numbers less than 20.

2, 3, 5, 7, 11, 13, 17, 19

Kate looked at this list and came up with the following conjecture:

'Every integer greater than three can be written as the sum of two prime numbers.'

(a) Show calculations for four different integers to test whether this conjecture might be true. (2 marks)

(b) Give your conclusion to the conjecture, based on your results in (a). (1 mark)

End of questions

Question 2 **(3 marks)**

(a) Simplify

$$\frac{2^5 \times 2^3}{2^4}$$

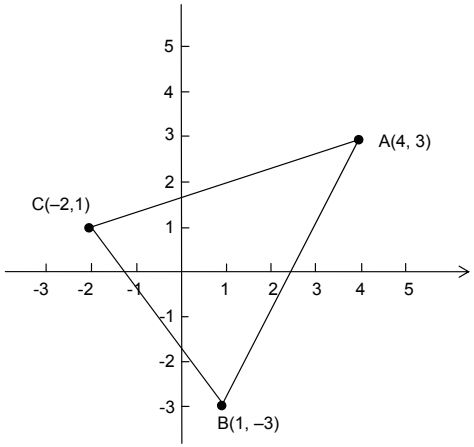
(1 mark)

(b) Estimate the solution to the equation $\frac{14}{2^x} = 1$ to the nearest whole number. Justify your answer. (2 marks)

See next page

Question 3 **(7 marks)**

The diagram below shows the position of three mine shafts A(4, 3), B(1, –3) and C(–2, 1), relative to the processing plant that is located at the origin (0, 0). All units are in kilometres.



(a) Determine the gradient of the line passing through AB. (1 mark)

(b) What is the gradient of the line perpendicular to the side AB? (1 mark)

(b) Explain the real-life meaning of $n(H^+ \cap V^+)$ and find its value. (2 marks)

(c) Evaluate

(i) $P(H^+ \cup V^+)$ (1 mark)

(ii) $P(\overline{H^+ \cup V^+})$ (1 mark)

(iii) $P(\overline{H}^+ \cup \overline{V}^+)$ (2 marks)

(d) (i) Express the following question using probability notation:

'Given that the value of a crop for the year ending June 2009 was greater than the value for the year ending June 2008, what is the probability that the harvest (tonnes) increased?' (1 mark)

(ii) Determine the answer to the question in (i). (1 mark)

Question 6 **(12 marks)**

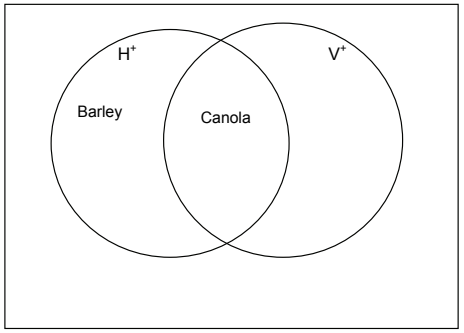
Australian agriculture is important for food production and export earnings. The table compares the harvest (000t) and value ($million) of some crops in Australia for the years ending June 2008 and June 2009.

Australian agriculture, years ending June 2008 and June 2009

		Harvest (000t)		Value ($million)	
	Crop	**2008**	**2009**	**2008**	**2009**
Harvest up in 2009	Barley	7 160	7 669	2 244	1 767
	Canola	1 214	1 861	659	1 026
	Cotton	119	303	227	623
	Lupins	662	716	222	202
	Rice	18	63	7.3	35.5
	Wheat	13 569	20 939	5 292	5 894
Harvest down in 2009	Grain sorghum	3790	2671	977	550
	Oats	1502	1205	423	255
	Sugar cane	32 621	30284	861	983

Let H^+ denote the set of crops for which the harvest was greater in the year ending June 2009 than in the year ending June 2008 and V^+ denote the set of crops whose value was greater in the year ending June 2009 than in the year ending June 2008.

(a) Complete the Venn diagram for sets H^+ and V^+. (4 marks)



(c) Determine the equation of the line that is perpendicular to the side AB and passes through the point C. (2 marks)

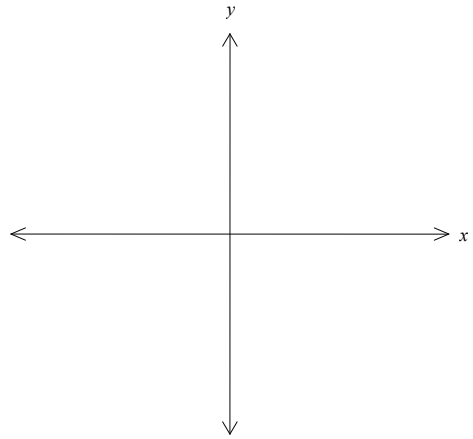
(d) Determine the distance between the mine shaft at A and the processing plant. (1 mark)

(e) Mary needs to drive from B to C, while John needs to return to the processing plant from A. Assuming that they both start to travel at the same time and at the same speed, determine who will be the first to arrive at their destination. Justify your answer. (2 marks)

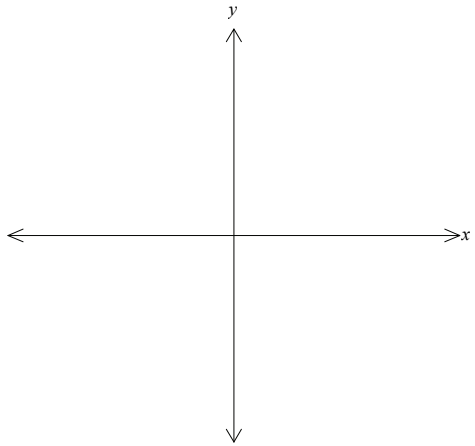
Question 4 **(5 marks)**

Draw a neat sketch of each function.

(a) $y = (x + 1)(x - 2)(x - 4)$ (3 marks)

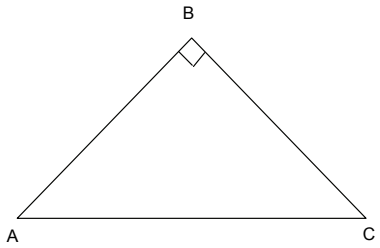


(b) $y = -x(x+2)^2$ (2 marks)



Question 5 **(4 marks)**

Consider the following triangle.



In the triangle above, $\cos \angle BAC = 0.8$.

(a) If the length of AC is 100 cm, calculate the length of AB. (2 marks)

(b) Evaluate $\tan \angle ACB$. (2 marks)