

Western Australian Certificate of Education

Examination, 2015

Question/Answer Booklet

MATHEMATICS

3A/3B

Section One:

Calculator-free

Place one of your candidate identification labels in this box.

↑

↓

Ensure the label is straight and within the lines of this box.

Student Number:    In figures

In words

**Time allowed for this section**

Reading time before commencing work:    five minutes

Working time for section:    fifty minutes

Number of additional answer booklets used

(if applicable):

**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.

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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	6	6	50	50	33⅓
Section Two: Calculator-assumed	12	12	100	100	66⅔
Total					100

Instructions to candidates

1. The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2015*. 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/Answer Booklet.

See next page

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Additional working space

Question number: \_\_\_\_\_

Additional working space

Question number: \_\_\_\_\_

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Section One: Calculator-free

33⅓% (50 Marks)

This section has six (6) 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 that you are continuing to answer at the top of the page.

Working time: 50 minutes.

Question 1

(8 marks)

(a) Determine  $\frac{dy}{dx}$  for each of the following:

(i)  $y = \frac{3}{2}ax^3 + a^2$  ( $a$  is a constant)

(2 marks)

(ii)  $y = \frac{6x - 3x^3}{2x}$ .

(2 marks)

(b) Determine the equation of the tangent to the curve  $y = x - x^3 - 2 + 2x^2$  at the point where  $x = 1$ .

(4 marks)

See next page

Question 2

(11 marks)

(a) (i) Express, as a power of  $a$ ,  $a^x \times a^y \div a^{x-y}$ . (2 marks)

(ii) Evaluate  $\left(\frac{16}{9}\right)^{\frac{3}{2}}$ . (2 marks)

(b) (i) Solve the equation  $\sqrt{3^{2x+4}} = 27^x$  for  $x$ . (3 marks)

(ii) Solve the following simultaneous equations for  $a$  and  $b$ . (4 marks)

$$2^{a+b} = 4$$

$$3^{5a-2b} = 27$$

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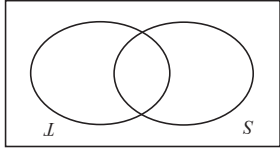
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Additional working space

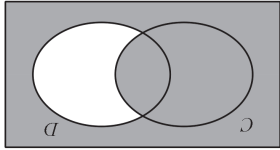
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Question 6

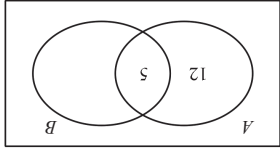
(a) For the sets  $S$  and  $T$ , shade the region  $S \cap (\bar{S} \cup T)$ . (1 mark)



(b) Use set notation to describe the shaded region below. (1 mark)



(c) (i) If  $n(\bar{A} \cup \bar{B}) = x$  and  $n(B \cap \bar{A}) = 7$ , complete the Venn diagram below. (2 marks)



(ii) Determine  $n(\bar{A})$ . (1 mark)

(iii) Determine  $n(\bar{A} \cap B)$ . (1 mark)

(iv) If  $P(\bar{A} | B) = \frac{7}{1}$ , calculate the value of  $x$ . (3 marks)

End of questions

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Question 3

A game is played using three coloured marbles (red, green and blue) and a four-sided die. The marble is drawn at random from a bag (and replaced), and then the die is rolled.

(a) Complete the table below. (1 mark)

Marble	Die			
	1	2	3	4
Red	(R, 1)			(R, 4)
Green		(G, 2)		
Blue			(B, 3)	

(b) What is the probability of choosing a green marble and rolling a five? (1 mark)

(c) What is the probability of choosing a red marble or rolling a number greater than one? (2 marks)

(d) What is the probability of choosing a blue marble, given that the score on the die was even? (2 marks)

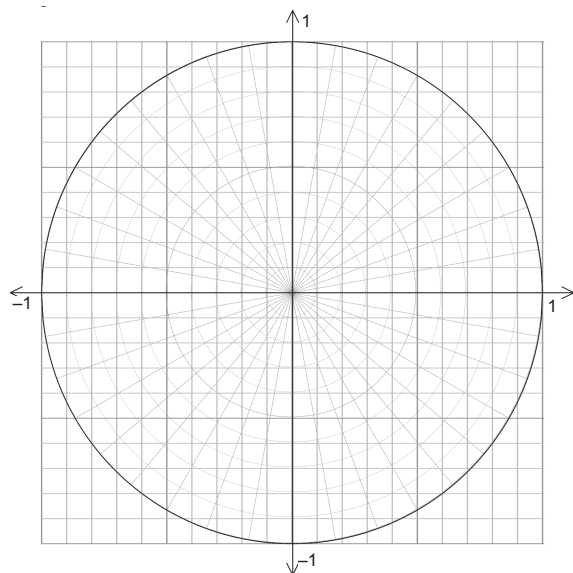
(e) What is the probability of choosing a non-red marble and a prime number on the die? (1 mark)

See next page

Question 4

(4 marks)

A unit circle is given below.



Use the unit circle to estimate each of the following:

(a)  $\sin 130^\circ$  (1 mark)

(b)  $\cos 180^\circ$  (1 mark)

(c)  $\theta$  given that  $\sin \theta = 0.35$  for  $0^\circ \leq \theta \leq 180^\circ$ . (2 marks)

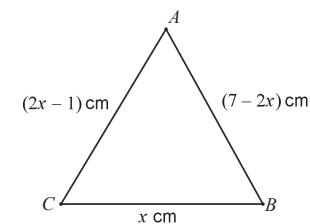
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Question 5

(11 marks)

In the triangle  $ABC$  below (not drawn to scale), the side lengths are  $(2x - 1)$  cm,  $(7 - 2x)$  cm and  $x$  cm.



- (a) If  $AB = AC$  then triangle  $ABC$  would be isosceles. There are two other possibilities for which the triangle is isosceles. Using this information, write down **three** separate equations in terms of  $x$  for which triangle  $ABC$  is isosceles. (3 marks)

- (b) Solve each equation found in part (a) for  $x$ . (3 marks)

- (c) Write down the side lengths of each triangle using the values of  $x$  obtained in part (b). (3 marks)

- (d) One of these triangles is not possible. State, with reasons, the triangle that is not possible. (2 marks)

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