

**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 notes with you, hand it to the supervisor before reading any further.

**Special items:** drawing instruments, templates, notes on two unfolded sheets of A4 paper, and up to three calculators approved for use in the WACE examinations.

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

**To be provided by the supervisor**  
Formula Sheet (retained from Section One)  
This Question/Answer booklet

### **Material required/recommended for this section**

**Time allowed for this section**  
Reading time before commencing work: ten minutes  
Working time for paper: one hundred minutes

Teacher's Name:

Student Name:

**Calculator-assumed**  
**Section Two:**

### **MATHEMATICS METHODS UNIT 1**



Semester One Examination 2017  
Question/Answer Booklet

## Structure of this paper

	Number of questions available	Number of questions to be attempted	Suggested working time (minutes)	Marks available	%
Section One Calculator-free	8	8	50	51	35
<b>Section Two Calculator—assumed</b>	<b>13</b>	<b>13</b>	<b>100</b>	<b>99</b>	<b>65</b>
				150	100

## Instructions to candidates

1. The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2017*. Sitting this examination implies that you agree to abide by these rules.
2. Answer the questions according to the following instructions.

Section Two: Write answers in this Question/Answer Booklet. Answer **all** questions.

**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 that you are continuing to answer at the top of the page.
5. The Formula Sheet is **not** handed in with your Question/Answer Booklet.

(b) Jan is a real estate agent who earns a commission of 3.25% on the sale of a house. If \$C is the commission and \$S is the sale price of a house, show clearly C is directly proportional to S.

(1 mark)

(ii) Describe the effect on V when P is halved.

(2 marks)

(i) Find k, the constant of proportionality, given that when  $P = 11.5 \text{ Pa}$  and  $V = 2.84 \text{ L}$ ,

inversely to the pressure (P) in Pascals (Pa).

(a) The volume (V) in litres (L) of a gas, at a fixed temperature and of a certain mass, varies

### Question 9 (5 marks)

Working time: 100 minutes

- 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 this clearly at the top of the page.

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.

This section has **thirteen (13)** questions. Attempt all questions. Write your answers in the spaces provided.

Section Two: Calculator-assumed  
99 marks

MATHEMATICS METHODS UNIT 1  
3  
CALCULATOR-ASSUMED

Question number(s): .....

Additional working space

MATHEMATICS METHODS UNIT 1

18

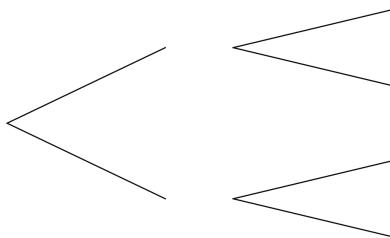
CALCULATOR-ASSUMED

**Question 10 (9 marks)**

Given the following:  $P(R|S) = 0.5$ ,  $P(R|S') = 0.4$  and  $P(S) = 0.6$

- (a) Complete the tree diagram showing all the probabilities.

(3 marks)



- (b) Determine the following:

(i)  $P(S \cap R)$

(1 mark)

(ii)  $P(S' \cap R')$

(1 mark)

(iii)  $P(R)$

(2 marks)

(iv)  $P(S'|R)$

(2 marks)

**Additional working space**

Question number(s): .....

(2 marks)

(c) state the domain of the function  $f(x+3)$ .

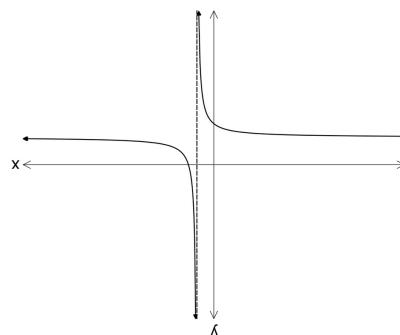
(2 marks)

(b) determine the coordinates of the  $y$ -intercept of  $y = -\frac{3}{x} - 2$ .

(1 mark)

(a) determine the equation of the horizontal asymptote for  $y = f(2x) + 4$ .

In terms of  $a$ ,  $b$  and/or  $c$ :



The  $y$ -intercept is at  $(0, c)$ .

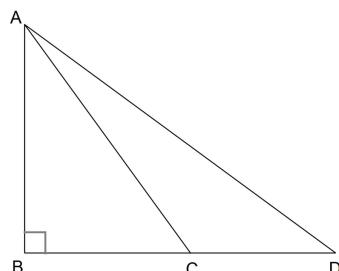
The reciprocal function  $y = f(x)$  shown below has asymptotes at  $x = a$  and  $y = b$ .

Question 11 (5 marks)

## Question 12 (8 marks)

- (a) Given that  $\cos \theta = -\frac{8}{15}$  and  $\tan \theta$  is positive, find the exact value of  $\cos 2\theta$ . (4 marks)

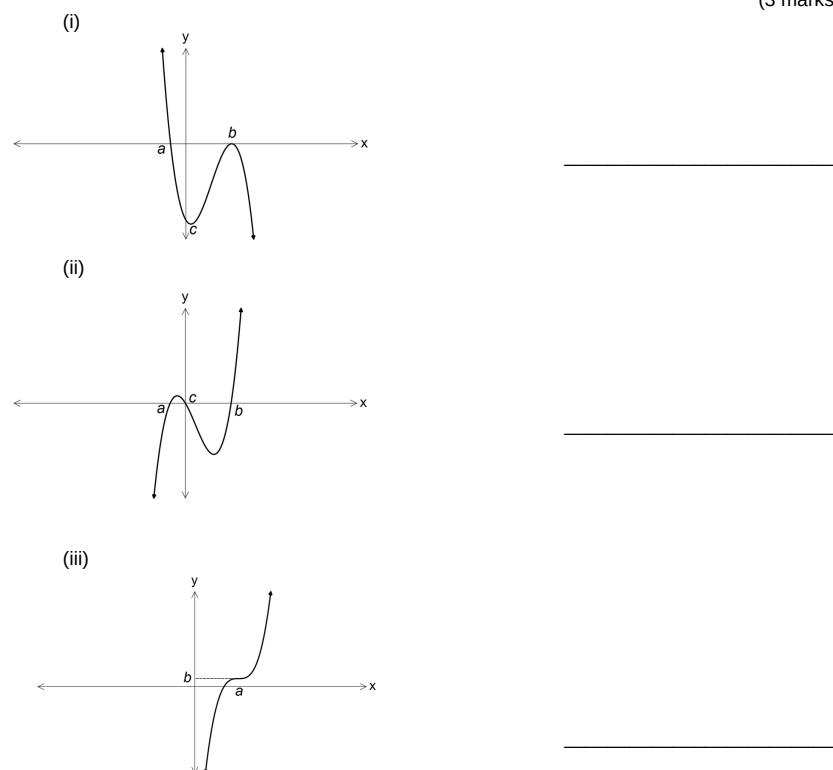
- (b) Bruno stands on a cliff, AB, 123 m above sea level. He observes two boats on the sea. The angle of depression for the boat further away at D is  $31^\circ$  and for the boat closer to the cliff at C is  $43^\circ$ . How far apart are the two boats to the nearest metre? (4 marks)



## Question 21 (5 marks)

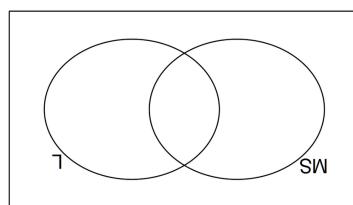
- (a) State the centre, C, and the radius, r, of the circle given by  $(2x - 3)^2 + (2y - 5)^2 - 36 = 0$ . (2 marks)

- (b) Write a possible equation, in terms of  $a$ ,  $b$  and/or  $c$ , which are positive constants, for each graph shown below. (3 marks)



END OF QUESTIONS

- (c) Show that  $G$  and  $H$  are not mutually exclusive. (2 marks)
- (d) Given that a student studies Literature, what is the probability that she studies Media Studies? (2 marks)
- (e) Are the two events independent? Justify your answer mathematically. (2 marks)
- (i)  $P(G \cup H)$  (1 mark)
- (ii)  $P(H)$  (1 mark)
- (iii)  $P(G \cap H')$  (1 mark)
- (iv) If there are 190 students in Year 11, how many students take neither subject? (1 mark)
- (b) What is the probability of a student studying both Media Studies and Literature? (1 mark)
- (c) If there are 190 students in Year 11, how many students take neither subject? (1 mark)
- (d) Given that a student studies Literature, what is the probability that she studies Media Studies? (2 marks)
- (e) Are the two events independent? Justify your answer mathematically. (2 marks)
- (f) Find: (1 mark)
- |      |     |      |
|------|-----|------|
|      | $G$ | $G'$ |
| $H$  |     |      |
| $H'$ |     | 1    |
- (g) Complete the two-way table below. (3 marks)
- Given  $G$  and  $H$  are events such that  $P(G) = 0.7$ ,  $P(G \cap H) = 0.4$  and  $P(G \cup H') = 0.2$ .  
 The probability of a Year 11 student in a certain school studying Media Studies or Literature is 0.3.  
 $\frac{1}{4}$  of the students study Media Studies and  $\frac{3}{8}$  of the students study Literature.



(a) Complete the Venn diagram. (3 marks)

The probability of a Year 11 student in a certain school studying Media Studies or Literature is 0.3.  
 $\frac{1}{4}$  of the students study Media Studies and  $\frac{3}{8}$  of the students study Literature.

Question 13 (9 marks)

	$G$	$G'$
$H$		
$H'$		1

(a) Complete the two-way table below. (3 marks)

**Question 14 (10 marks)**

(a) Consider the following sets of ordered pairs:

$$f = \{ (1,2), (2,3), (3,4) \} \quad h = \{ (-1,4), (0,3), (1,2) \}$$

(i) Find  $f(2)$ .

(1 mark)

(ii) Find  $a$  such that  $h(a) = 3$ .

(1 mark)

(iii) Find  $t$  such that  $f(t) = h(t)$ .

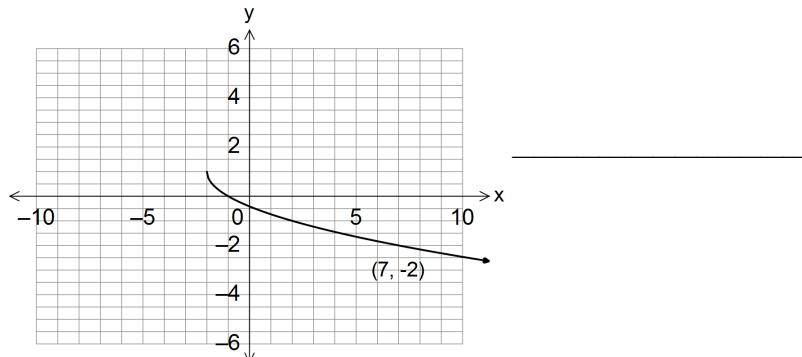
(1 mark)

(b) Compare the domain of  $p(x) = (\sqrt{x})^2$  and  $m(x) = \sqrt{x}$ .

(2 marks)

(c) (i) The function,  $q(x)$  below, is a transformation of  $y = \sqrt{x}$ . State the equation of the function,  $q(x)$ , below.

(2 marks)

(ii) On the same set of axes draw the transformed function  $g(x)$  such that  $g(x) = -q(2x + 4)$ .

(3 marks)

**Question 19 (6 marks)**

(a) Write the equation of a sine function with the following features:

an amplitude of 2

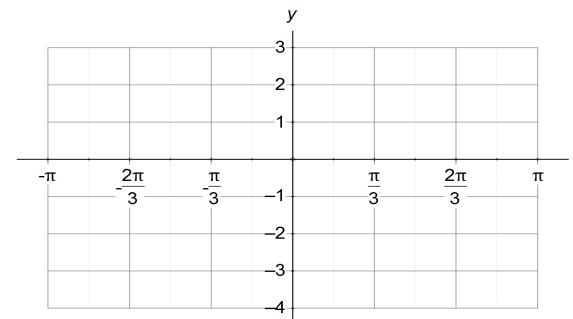
a phase shift of  $\frac{\pi}{3}$  to the righta period of  $2\pi$ 

a vertical translation of 1 in the negative direction

(2 marks)

(b) Draw the function from (a) on the axes below for the domain  $x \in [-\pi, \pi]$ .

(3 marks)

(c) Use the graph from (b), or otherwise, to find the solutions to  $2 \sin\left(x - \frac{\pi}{3}\right) = 0$  in the given domain.

$$2 \sin\left(x - \frac{\pi}{3}\right) = 0$$

in the given  
(1 mark)

- (iii) If a fielder caught the ball when it was 2 m above the ground, how far was the fielder from the batsman? (2 marks)

- (ii) What was the maximum height reached by the cricket ball? (1 mark)

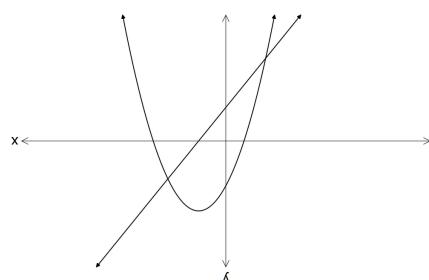
- (i) At what height was the ball when it was struck by the cricketer's bat? (1 mark)

$$\text{travelled } d \text{ metres horizontally is modelled by the rule } h = -\frac{d^2}{d^2} + \frac{5}{3d} + 1, d \geq 0$$

(c) A cricketer struck a cricket ball such that its height above the ground,  $h$  (metres), after it had

- (a) one solution? (4 marks)

For what value(s) of  $d$  does the equation  $m(x) = n(x)$  produce:



The following functions are shown below:  
 $m(x) = -x^2 + 3x + 4$  and  $n(x) = 2x + d$ , where  $d$  is a constant.

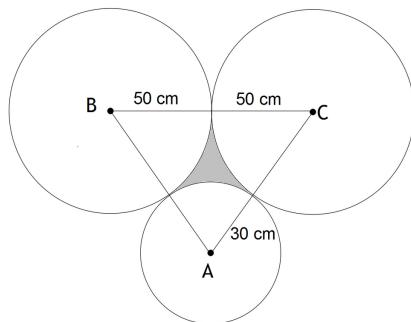
- (b) Complete the square to find the co-ordinates of the turning point of the function  $y = 2x^2 - 3x - 1$ . (3 marks)

- (a) Find the equation of a straight line which passes through the point  $(-2, 5)$  and makes an angle of  $122^\circ$  with the positive direction of the  $x$ -axis. (2 marks)

- Question 18 (6 marks)

**Question 16 (7 marks)**

Two circles shown below, with centres B and C, each have a radius of 50 cm, while a smaller circle, with centre A, has a radius of 30 cm.



- (a) Determine the area of triangle ABC.

(3 marks)

- (b) Find the area of the shaded section between the circles, to the nearest square centimetre.  
Show your reasoning.

(4 marks)

**Question 17 (10 marks)**

- (a) The 5 Olympic rings are each painted a different colour. A painter is asked to paint the five rings of the Olympic Games on a sports oval. He cannot remember the colours, but he knows they are all different. He has eight colours of paint with him.

(i) In how many ways can he paint the rings on the sports oval? (2 marks)

(ii) What is the probability that he chooses the correct colours? (1 mark)

- (b) The first four rows of Pascal's triangle can be written as follows:

$$\begin{array}{c} {}^0\mathbf{C}_0 \\ {}^1\mathbf{C}_0 \quad {}^1\mathbf{C}_1 \\ {}^2\mathbf{C}_0 \quad {}^2\mathbf{C}_1 \quad {}^2\mathbf{C}_2 \\ {}^3\mathbf{C}_0 \quad {}^3\mathbf{C}_1 \quad {}^3\mathbf{C}_2 \quad {}^3\mathbf{C}_3 \end{array}$$

(i) Show how you would use the fifth row of Pascal's triangle above to expand  $(a + b)^4$ . (2 marks)

(ii) Determine the fourth term in the expansion  $(2x - y)^7$ . (2 marks)

- (c) Six females and five males are interviewed for five positions in a company. If all applicants are acceptable for any position, in how many ways could the following combinations be selected?

(i) Three males and two females. (1 mark)

(ii) At least four females. (2 marks)