

**Semester One**  
**Examination 2017**  
**Question/Answer booklet**

**MATHEMATICS**  
**METHODS UNIT 1**

**Section One:**  
**Calculator-free**

Student's Name: \_\_\_\_\_

Teacher's Name: \_\_\_\_\_

**Time allowed for this section**

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

**Material 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 tape/fluid, erasers, 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

	Number of questions available	Number of questions to be attempted	Working time (minutes)	Marks available	Percentage of exam
<b>Section One Calculator—free</b>	<b>8</b>	<b>8</b>	<b>50</b>	<b>51</b>	<b>35</b>
Section Two Calculator—assumed	13	13	100	99	65
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.

**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.

**Section One: Calculator-free**

**35% (51 marks)**

This section has **eight (8)** questions. Attempt **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.

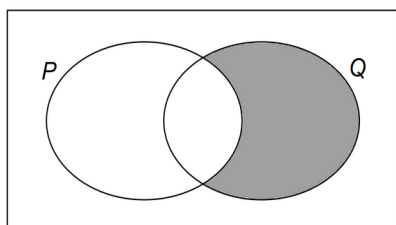
- Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
- Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s) that you are continuing to answer at the top of the page.

Working time: 50 minutes

**Question 1 (5 marks)**

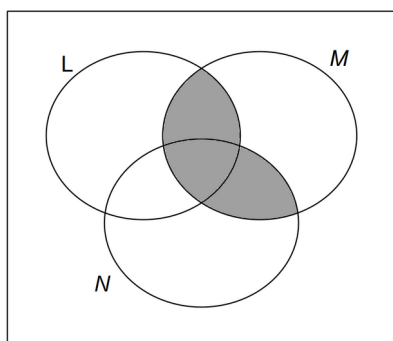
- (a) Describe the shaded region in set notation. (2 marks)

(i)



\_\_\_\_\_

(ii)



\_\_\_\_\_

- (b)  $U = \{\text{positive integers between 1 and 20, where 1 and 20 are not included}\}$   
 $A = \{\text{prime numbers less than 19}\}$      $B = \{\text{factors of 12}\}$      $C = \{\text{multiples of 3}\}$   
 State the following:

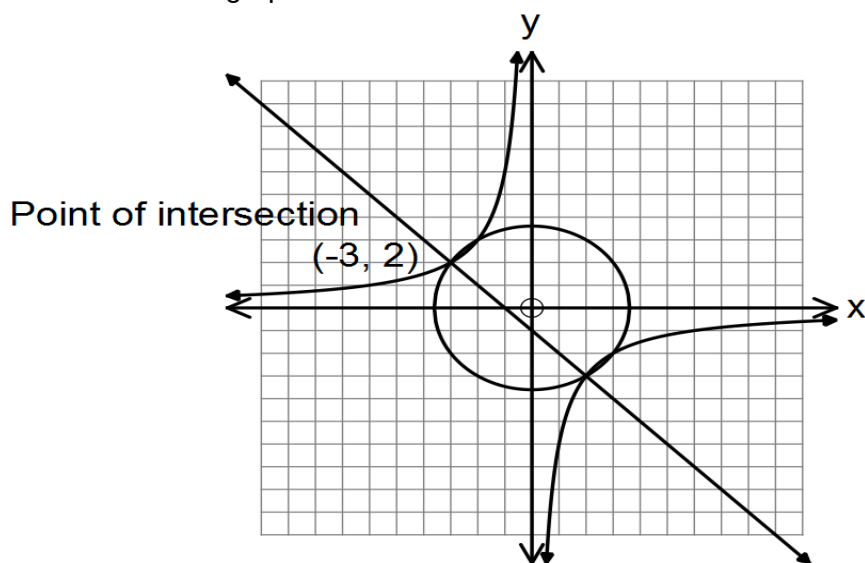
- (i)  $A \cap B \cap C$  (1 mark)

- (ii)  $(A \cup B)'$  (1 mark)

- (iii)  $n(B \cup C)$  (1 mark)

**Question 2 (11 marks)**

Consider the functions graphed below.



**(a)** State the equation for:

(i)  $f(x)$ , the circle with centre at the origin. (2 marks)

(ii)  $g(x)$ , the hyperbola. (2 marks)

(iii)  $h(x)$ , the straight line. (2 marks)

**(b)** Hence, solve the equation  $f(x) = g(x)$ . There are four solutions. (2 marks)

**(c)** The graph  $g(x)$  undergoes the following transformation  $g(2x) + 1$ .

(i) State the coordinates of the point  $(-3, 2)$  after this transformation has occurred. (2 marks)

(ii) The graph  $h(x)$  undergoes the same transformation namely  $h(2x) + 1$ . State the gradient of the transformed function. (1 mark)

**Question 3 (4 marks)**

A circle with the equation  $x^2 + y^2 - 2x - 2y - 23 = 0$  has a diameter MN. Find the coordinates of M if N is the point (4, 5).

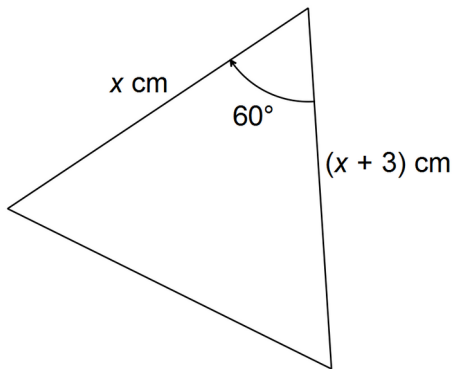
**Question 4 (6 marks)**

(a) Find the exact value of  $(\sin 250^\circ)(\cos 25^\circ) - (\cos 250^\circ)(\sin 25^\circ)$ . (2 marks)

(b) Use the sum of two angles to find the exact value of  $\tan \frac{7\pi}{12}$ . Rationalise the denominator of your solution. (4 marks)

**Question 5 (7 marks)**

Consider the triangle, which is not drawn to scale, shown below.



**(a)** Show that the area of the triangle is given by  $\frac{x}{4}(\sqrt{3}x + 3\sqrt{3}) \text{ cm}^2$ . (2 marks)

**(b)** Given that the length of the unmarked side is 7 cm, find the value of  $x$ . (3 marks)

**(c)** Hence, or otherwise, find the exact area of the triangle. (2 marks)

**Question 6 (5 marks)**

A doctor wishes to tell her patient's family the probability of his condition improving after a certain treatment. Suppose I is the event that the patient's condition improves, O is the event that his condition remains the same and W is the event that his condition worsens.

If  $P(W) = 30\%$  and  $P(O) = 10\%$  find the probability that the patient's condition:

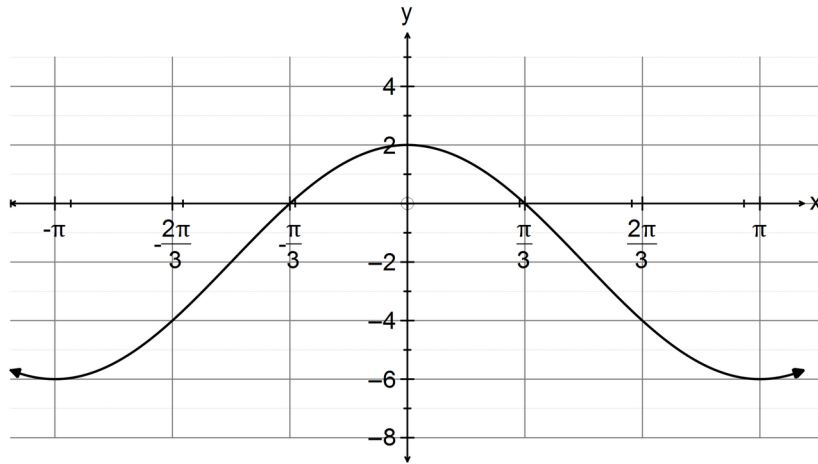
- (a) improves. (1 mark)
- (b) does not improve. (1 mark)
- (c) improves or stays the same. (1 mark)
- (d) Draw a Venn diagram which shows that these three events are mutually exclusive. (2 marks)

**Question 7 (8 marks)**

The graph below can be written  $k(x) = a \cos(x) - b = c \sin(x - d) - b$

**(a)** Determine the values of  $a$ ,  $b$ ,  $c$  and  $d$ .

(4 marks)



**(b)** State the range of  $k(x)$ .

(2 marks)

**(c)** Explain why the graph represents a function and verify your explanation by using the vertical line test on the graph.

(2 marks)



**Question 8 (5 marks)**

Solve for all values of  $\theta$  in the given domain.

(a)  $2 \sin \theta = -1$  where  $0 \leq \theta \leq 360^\circ$  (2 marks)

(b)  $4 \cos^2 \theta - 3 = 0$  and  $\theta \in [0, 2\pi]$  (3 marks)

**End of Questions**

Additional working space

Question number(s): .....

**Additional working space**

Question number(s): .....

WATP acknowledges the permission of School Curriculum and Assessment Authority in providing instructions to students.