John Wollaston Anglican Community School

Semester One Examination, 2020

Question/Answer booklet

MATHEMATICS METHODS UNIT 1

Section One: Calculator-free

If required by your examination administrator, please place your student identification label in this box

WA student number: In figures | | | | | | | | |

In words _____

Your name _____

Time allowed for this section

Reading time before commencing work: five minutes
Working time: 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 material. 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 examination
Section One: Calculator-free	8	8	50	52	35
Section Two: Calculator-assumed	13	13	100	98	65
				Total	100

Instructions to candidates

1. The rules for the conduct of examinations are detailed in the school handbook. Sitting this examination implies that you agree to abide by these rules.
2. Write your answers in this Question/Answer booklet preferably using a blue/black pen.
   Do not use erasable or gel pens.
3. You must be careful to confine your answers to the specific question asked and to follow any instructions that are specific to a particular question.
4. 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.
5. It is recommended that you do not use pencil, except in diagrams.
6. Supplementary pages for planning/continuing your answers to questions are provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.
7. The Formula sheet is not to be handed in with your Question/Answer booklet.

Markers use only		
Question	Maximum	Mark
1	5	
2	4	
3	5	
4	7	
5	8	
6	7	
7	8	
8	8	
S1 Total	52	
S1 Wt (×0.6731)	35%	
S2 Wt	65%	
Total	100%	

See next page

Supplementary page

Question number: _____

DO NOT WRITE IN THIS AREA AS IT WILL BE CUT OFF

Question 8 **(8 marks)**

(a) Determine an exact value for $\cos 103° \cos 58° + \sin 103° \sin 58°$. (2 marks)

(b) Determine all possible values of $\tan \theta$ when $\sin \theta = \frac{2}{3}$. (3 marks)

(c) Determine an exact value for $\sin 75°$. (3 marks)

End of questions

DO NOT WRITE IN THIS AREA AS IT WILL BE CUT OFF

Section One: Calculator-free **35% (52 Marks)**

This section has **eight** questions. Answer **all** questions. Write your answers in the spaces provided.

Working time: 50 minutes.

Question 1 **(5 marks)**

The point $M(-2, 5)$ is the midpoint of point $A(-6, 3)$ and point B.

(a) Determine the coordinates of point B. (2 marks)

(b) Determine the equation of the straight line that passes through point $C(4, -1)$ and is perpendicular to the line through points A and M. (3 marks)

See next page

Question 2 **(4 marks)**

The expansion of $(x+1)^{11}$ is

$$x^{11}+11x^{10}+55x^9+165x^8+330x^7+462x^6+462x^5+330x^4+165x^3+55x^2+11x+1.$$

(a) Determine the number of combinations of 7 objects taken from a set of 11 distinct objects. (1 mark)

(b) Consider the simplified expansion of $(x+1)^{12}$. The first four terms in descending powers of x are

$$x^{12}+px^{11}+qx^{10}+rx^9.$$

(i) State the number of terms in the complete simplified expansion. (1 mark)

(ii) Determine the value of each of the coefficients p, q and r. (2 marks)

Question 7 **(8 marks)**

Solve the following equations for x.

(a) $x^2+20x-21=0$. (2 marks)

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

(c) $x^3-2x^2-11x+12=0$. (3 marks)

DO NOT WRITE IN THIS AREA AS IT WILL BE CUT OFF

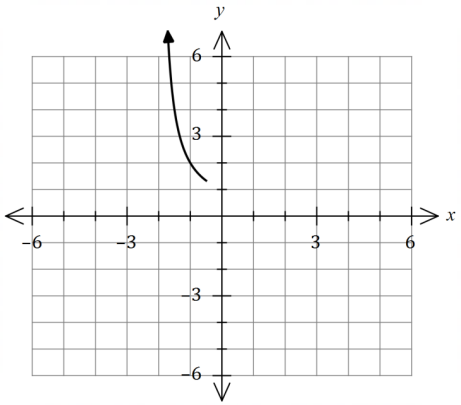
Question 6 **(7 marks)**

(a) The variable V is inversely proportional to the variable t, so that when $t = 3.6$, $V = 10$.

(i) Explain how V will change as t increases. (1 mark)

(ii) Determine t when $V = 3$. (2 marks)

(b) Part of the graph of $y = \frac{a}{x+2}$ is drawn below.



(i) Determine the value of a. (1 mark)

(ii) Draw the remainder of the graph. (3 marks)

Question 3 **(5 marks)**

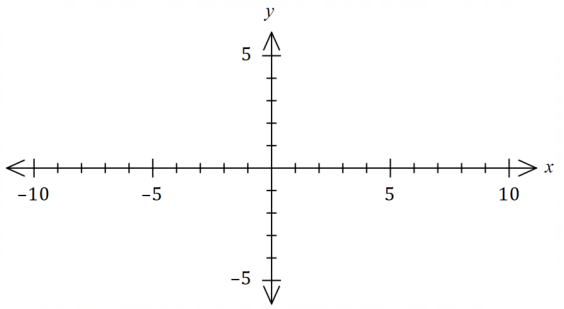
Functions f and g are defined by $f(x) = 4x^2 - 4x + 5$ and $g(x) = 2x^2 - 8x + 6$.

(a) Determine the discriminant of f and the discriminant of g. (2 marks)

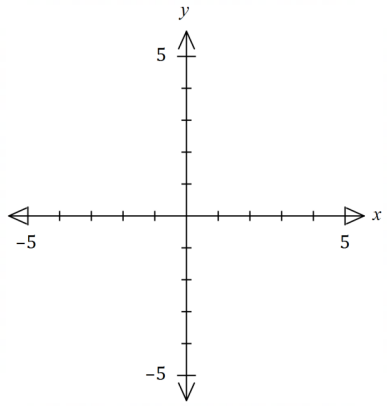
(b) State, with justification, which function has no zeros and determine all zeros of the other function. (3 marks)

Question 4 **(7 marks)**

(a) Sketch the graph of $y^2 = x$ on the axes below. (2 marks)



(b) Sketch the graph of $(x + 1)^2 + (y - 1)^2 = 4$ on the axes below. (3 marks)



(c) Explain whether y is a function of x in the relationship graphed in (a). (2 marks)

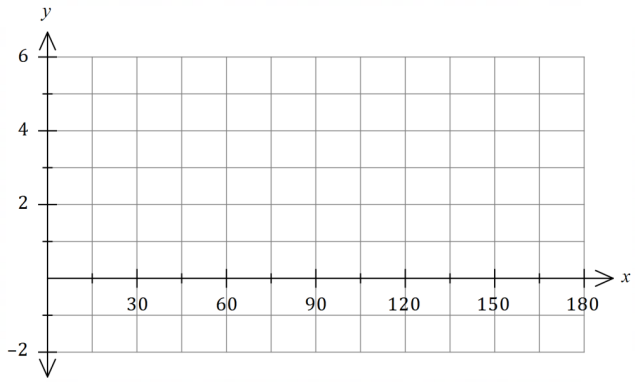
Question 5 **(8 marks)**

(a) A periodic function is defined by $f(x) = 2 - 2\sin(3x)$.

(i) State the amplitude of the function. (1 mark)

(ii) State the period of the function in degrees. (1 mark)

(iii) Sketch the graph of $y = f(x)$ on the axes below. (3 marks)



(b) Solve the equation $2\cos(x - 15°) = \sqrt{3}$ where $0 \leq x \leq 360°$. (3 marks)

DO NOT WRITE IN THIS AREA AS IT WILL BE CUT OFF