



Western Australian Certificate of Education Examination, 2013

Question/Answer Booklet

MATHEMATICS

3A/3B

Section One: Calculator-free

Please place your student identification label in this box

Student Number: In figures

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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.



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	9	9	50	50	33 $\frac{1}{3}$
Section Two: Calculator-assumed	13	13	100	100	66 $\frac{2}{3}$
Total					100

Instructions to candidates

- The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2013*. Sitting this examination implies that you agree to abide by these rules.
- Write your answers in this Question/Answer Booklet.
- 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.
- 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.
- 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.
- It is recommended that you **do not use pencil**, except in diagrams.
- The Formula Sheet is **not** handed in with your Question/Answer Booklet.

See next page

Section One: Calculator-free**(50 Marks)**

This section has **nine (9)** 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.

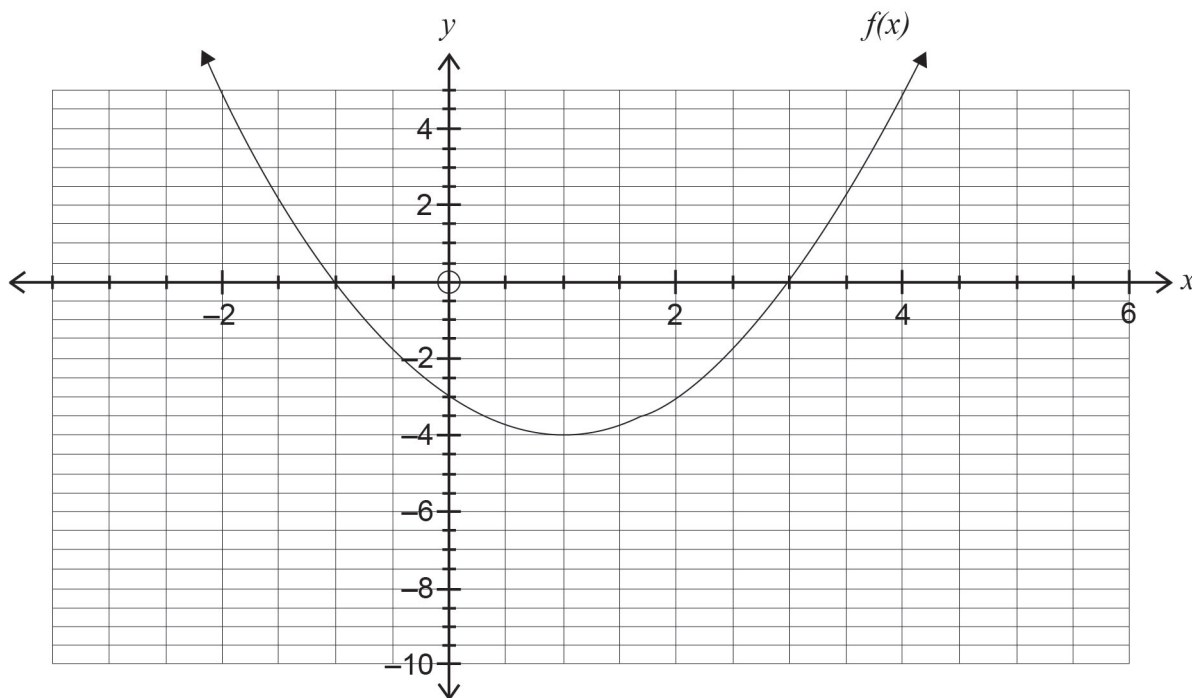
Question 1**(4 marks)**

A recursive sequence is defined by $u_n = pu_{n-1} + q$. Given that $u_1 = -8$, $u_2 = 8$ and $u_3 = 4$, write down **two** equations and solve simultaneously to determine the values of p and q .

Question 2

(9 marks)

The function $y = f(x)$ shown below is transformed to produce $g(x) = -f(x+1)$.



(a) Give the equation of $f(x)$ in the form $y = (x - p)^2 + d$. (2 marks)

(b) (i) Describe the transformations required to produce $g(x)$ from $f(x)$. (2 marks)

(ii) State the coordinates of the turning point of $g(x)$. (1 mark)

(c) On the grid above, draw the function $y = g(x)$, showing the x and y intercepts. (2 marks)

(d) State the domain and range of $y = g(x)$. (2 marks)

Question 3

(5 marks)

- (a) Give a reason why the following statement is false for real numbers.

$$(-4)^{\frac{3}{2}} \times (-4)^{\frac{3}{2}} = (-4)^3 = -64$$

(1 mark)

- (b) In the following, b and c are positive integers. If the statement is correct, write **true** next to the statement. If the statement is false, rewrite the right-hand side of the equation to make the statement true.

(i) $c^2 \times c^{-2} = b^0$

(1 mark)

(ii) $(3bc)^2 = 6b^2c^2$

(1 mark)

(iii) $c^2 \div 3bc = \frac{2c^2}{b}$

(1 mark)

(iv) $2b^{-1} = -2b$

(1 mark)

Question 4

(5 marks)

Determine the gradient of $y = x^2 - 5x - 24$ at the point(s) where it crosses the x -axis.

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Question 5

(3 marks)

The activities A to G, their immediate predecessors and the time taken to complete each activity, are shown in the table below.

Activity	Immediate predecessors	Time (days)
A	-	3
B	-	2
C	A,B	5
D	C	3
E	C	1
F	E	3
G	D, F	1

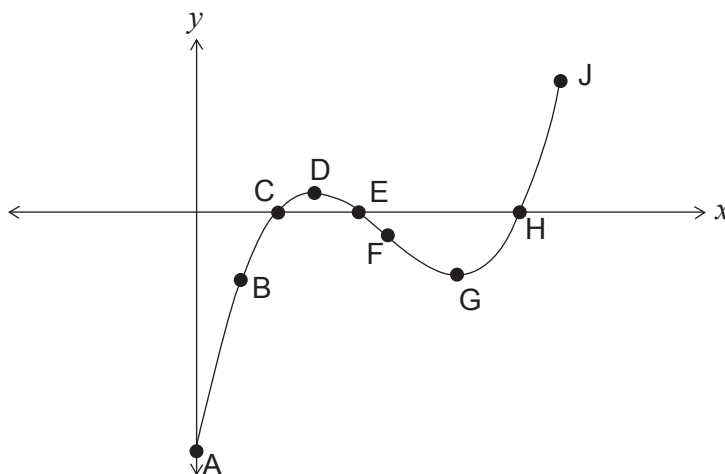
Construct a project network for this information.

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Question 6

(9 marks)

The function $y = (x - 1)(x - 2)(x - 4)$, shown below, has been graphed for the domain $0 \leq x \leq 4.5$. The function has turning points at D and G and a point of inflection at F.



- (a) Determine the coordinates of the y -intercept. (2 marks)

- (b) Which of the points on the graph labelled A to J shows the
 - (i) global maximum? (1 mark)

 - (ii) local minimum? (1 mark)

- (c) Calculate the global maximum for the function. (3 marks)

- (d) Between which two points for the given domain is the function concave up? (2 marks)

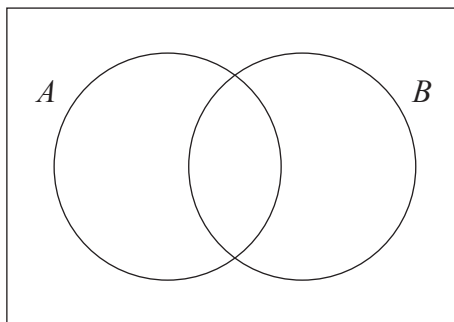
Question 7

(6 marks)

In a Year 12 mathematics class, seven students used a Brand 'A' calculator and eight students used a Brand 'B' calculator. Three students used both brands of calculator and four students used neither brand of calculator.

Let A represent the set of students who used a Brand 'A' calculator and B represent the set of students who used a Brand 'B' calculator.

- (a) Using this information, complete the Venn diagram. (2 marks)



- (b) Determine

(i) $P(A \cup B)$. (1 mark)

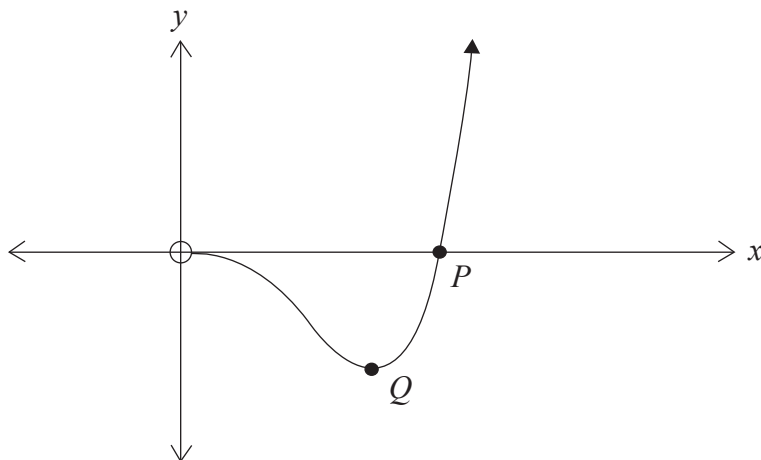
(ii) $P(B \cap \bar{A})$. (1 mark)

- (iii) the proportion of students who used a Brand 'B' calculator, given that they did not use a Brand 'A' calculator. (2 marks)

Question 8

(5 marks)

The function $y = 2x^3(x - k)$, where k is a positive constant, has been graphed below for $x > 0$.



- (a) Given that the point P has coordinates $(2, 0)$, determine the value of k . (1 mark)

- (b) Determine the x -coordinate of the local minimum point Q . (4 marks)

Question 9

(4 marks)

The following set of 14 integers is arranged in ascending order and has a mean of 10.

$$2, 2, 2, p, 5, 6, 9, 11, 11, 13, 14, q, 21, 24$$

- (a) Determine all possible values for p and q . (2 marks)

- (b) Determine the smallest possible value for the interquartile range. (2 marks)

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End of questions

Additional working space

Question number: _____

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*Published by the School Curriculum and Standards Authority of Western Australia
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