



Western Australian Certificate of Education Examination, 2012

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

Number of additional
answer booklets used
(if applicable):

Time allowed for this section

Reading time before commencing work: five minutes

Working time for section: fifty minutes

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 tape/fluid, 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 total exam
Section One: Calculator-free	7	7	50	50	33 $\frac{1}{3}$
Section Two: Calculator-assumed	12	12	100	100	66 $\frac{2}{3}$
Total				150	100

Instructions to candidates

1. The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2012*. Sitting this examination implies that you agree to abide by these rules.
2. Write your answers in the spaces provided in this Question/Answer Booklet. 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.
3. **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.
4. It is recommended that you **do not use pencil**, except in diagrams.
5. The Formula Sheet is **not** handed in with your Question/Answer Booklet.

See next page

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

This section has **seven (7)** 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(s) that you are continuing to answer at the top of the page.

Suggested working time: 50 minutes.

Question 1**(8 marks)**

One hundred people were categorised on the basis of hair colour and gender as follows:

	Brunettes	Blondes	Redheads	Total
Men	26		4	40
Women		21		
Total	58			

- (a) Complete the two-way table above. (2 marks)
- (b) What is the probability that a person selected at random from the group is
- (i) a blonde man? (1 mark)
- (ii) a redhead? (1 mark)
- (iii) a brunette or a woman? (2 marks)
- (iv) a man, given that their hair colour is brunette? (2 marks)

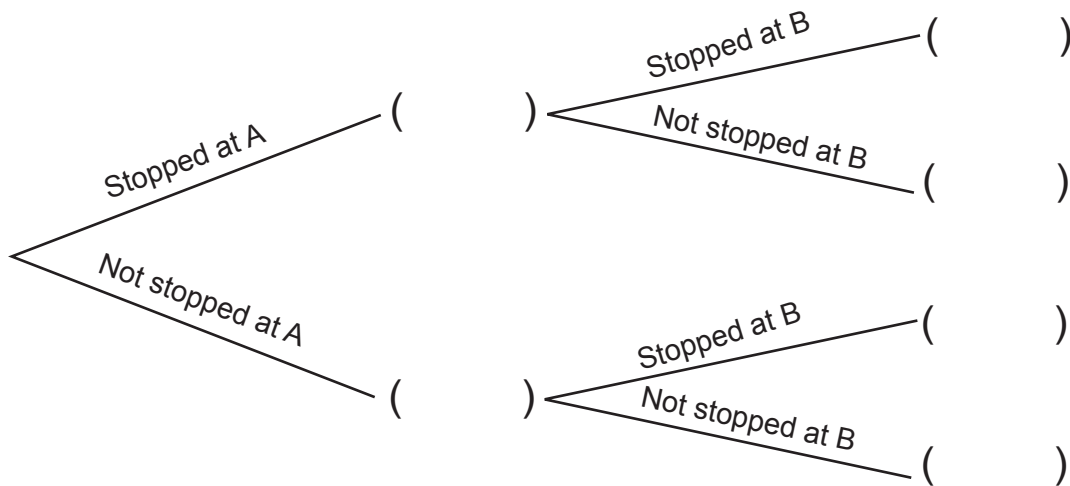
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Question 2

(7 marks)

A teacher travelling to school has to pass through two sets of traffic lights A and B that operate independently of each other. The probabilities that he will be stopped at these lights are $\frac{2}{7}$ and $\frac{1}{6}$ respectively, with corresponding delays of 1 minute and 3 minutes. Without these delays his journey takes 30 minutes.

- (a) Complete the tree diagram, entering the appropriate probabilities in the given brackets. (2 marks)



- (b) Determine the probability that
- (i) the journey takes no more than 30 minutes. (1 mark)
 - (ii) the teacher encounters just one delay. (2 marks)
- (c) One morning the teacher has only 32 minutes to reach school on time. Determine the probability that he will be late. (2 marks)

Question 3

(6 marks)

- (a) In triangle PQR , the length of the side PQ is 4 cm, $\sin R = 0.4$ and $\sin Q = 0.3$.

Determine the exact length of the side PR .

(3 marks)

- (b) In triangle ABC , $a = 15$ cm, $b = 13$ cm and $c = 4$ cm.

Given that the area of the triangle is 24 cm^2 determine the value of $\sin B$.

(3 marks)

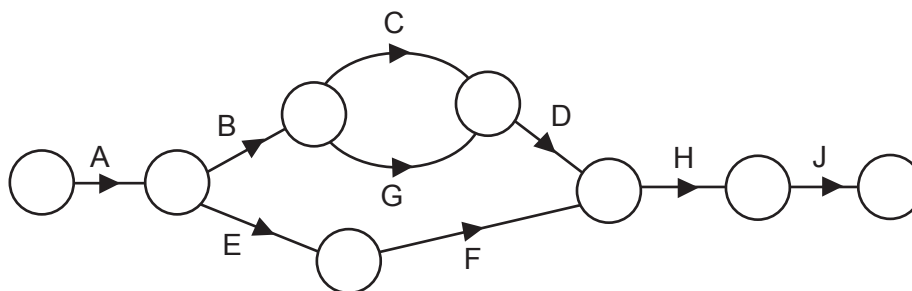
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Question 4

(7 marks)

A small airline running a shuttle service between the city and a large rural town wishes to minimise the time taken to ‘turn the aircraft around’ (the turnaround time) at each destination in order to maximise the number of flights each day. The table below lists all activities that must be carried out each time the aircraft lands in order for it to be ready for the next take-off.

	Activity	Time (minutes)
A	Engage gate	5
B	Passengers disembark	5
C	Service cabin	5
D	Passengers board	10
E	Unload cargo	12
F	Load cargo	12
G	Service toilets	10
H	Disengage gate	1
J	Push aircraft from gate position	3



- (a) By completing the project network, state the critical path and the minimum turnaround time. (3 marks)

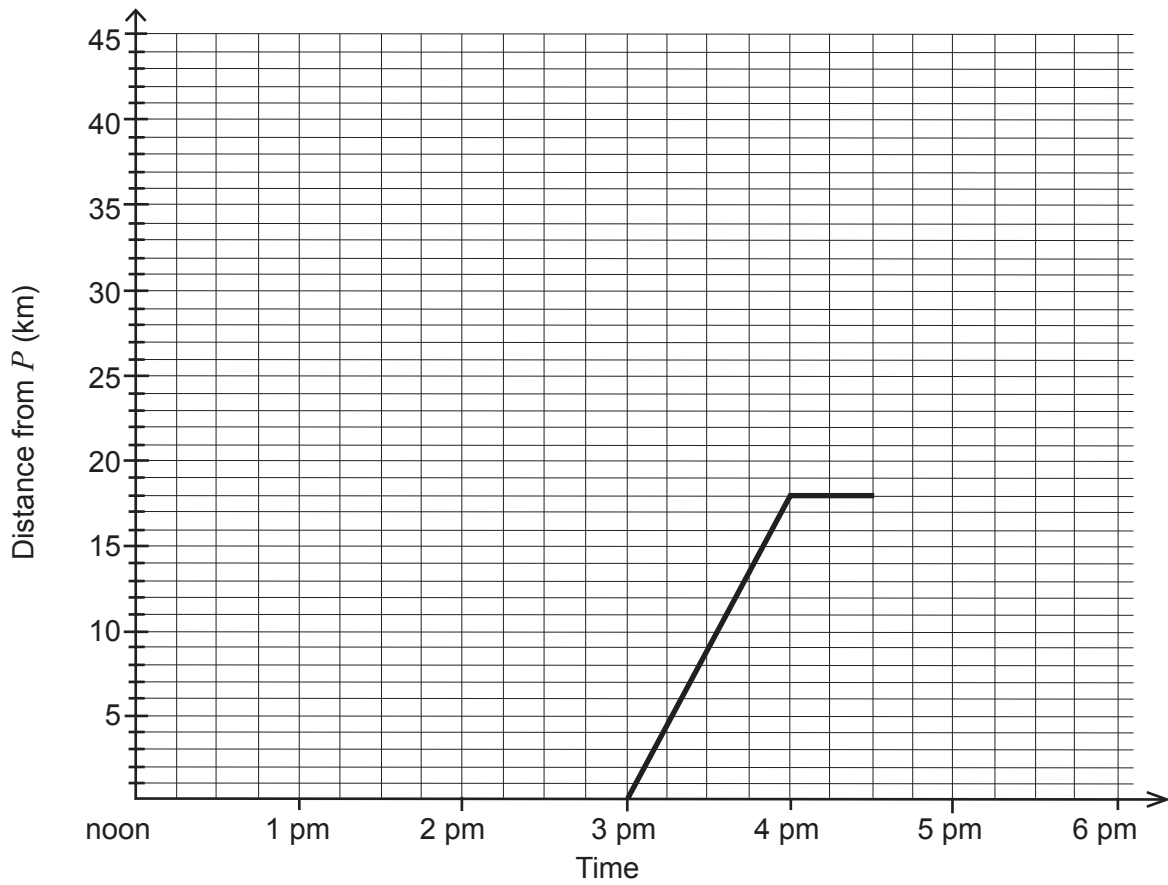
- (b) If passenger boarding time could be reduced by three minutes, what would the minimum turnaround time become? State the new critical path. (2 marks)

- (c) The original toilet servicing and passenger boarding times are each reduced to five minutes. How much time in total would need to be reduced from cargo loading and unloading before this change would make a difference to the minimum turnaround time? (2 marks)

Question 5

(5 marks)

Starting at noon from a point P , a man A walks along a road at a steady 6 km h^{-1} . At 3 pm a cyclist B leaves point P and cycles at a steady 18 km h^{-1} in pursuit of A . After travelling for an hour, B has a tyre puncture which delays him for half an hour. He then continues at 24 km h^{-1} .



Part of B 's journey has been drawn on the graph above.

- (a) Draw the travel graphs that represent the journey for both A and B . (2 marks)
- (b) Determine the time when B catches up with A . (1 mark)
- (c) Determine the time at which a motorist C travelling at a steady 60 km h^{-1} must have left P if he overtakes A and B at the same moment that B catches up with A . (2 marks)

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Question 6

(12 marks)

- (a) For the cubic function $y = 2x^3 + kx^2 + c$, where k and c are constants, $\frac{dy}{dx} = 4$ at the point $(-2, 8)$.

By calculating the values of k and c , determine an equation for y in terms of x . (6 marks)

- (b) For another cubic function $y = 2x^3 - 3x^2 - 4$, determine the coordinates of the local maximum point. (6 marks)

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Question 7

(5 marks)

(a) A recursive sequence is defined by $T_n = T_{n-1} + T_{n-2} + 2$ with $T_1 = 2$ and $T_2 = -2$.

(i) Determine the values of T_3 and T_4 . (2 marks)

(ii) Paul states: *'The sequence will result in a positive two (2) when n is an odd number and will result in a negative two (-2) when n is an even number'*.

Comment on Paul's conjecture. (1 mark)

(b) Pauline states: *'If a , b and c are real numbers such that $(a+b)^2 = c^2$ then $a+b = c$ '*.
Provide a counter example to show that Pauline's conjecture is false. (2 marks)

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