

WA Exams Practice Paper B, 2015

Question/Answer Booklet

MATHEMATICS APPLICATIONS UNITS 1 AND 2

Section One:
Calculator-free

SOLUTIONS

Student Number: In figures

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In words

Your name

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 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	8	8	50	52	35
Section Two: Calculator-assumed	13	13	100	98	65
Total				150	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.
3. 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.
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. **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.
6. It is recommended that you **do not use pencil**, except in diagrams.
7. The Formula Sheet is **not** to be handed in with your Question/Answer Booklet.

Section One: Calculator-free

35% (52 Marks)

This section has **eight (8)** questions. Answer **all** questions. Write your answers in the spaces provided.

Working time for this section is 50 minutes.

Question 1

(5 marks)

- (a) Classify each of the following variable types A to L by writing its letter in the most relevant column of the table below. (4 marks)

- A. Town of birth
- B. Number of floors in an apartment building
- C. Preferred weather: cold, mild, warm, hot
- D. Daily maximum temperature
- E. Favourite food
- F. Personal membership number of an association
- G. Weight of a dog
- H. Number of students per class
- I. Distance between two towns
- J. The five most popular names of girls
- K. Number of countries travelled to during a holiday

Ordinal categorical	Nominal categorical	Continuous numerical	Discrete numerical
C F	A E J	D G I	B H K

- (b) A student has collected some nominal categorical data and is considering using a box plot to display it. Explain whether or not this is an appropriate choice. (1 mark)

Not an appropriate choice as box plots are only suitable for numerical data.

Question 2**(6 marks)**

The table below shows the equivalent amount of foreign currency for various amounts of Australian dollars.

Foreign currency	Australian Dollars (A\$)				
	10	20	50	100	250
US Dollar	8.65	17.30	43.25	86.50	216.25
Japanese Yen	950	1900	4750	9500	23750
New Zealand Dollar	11.20	22.40	56.00	112.00	280.00
Thai Baht	280	560	1400	2800	7000

- (a) How many New Zealand dollars could be bought for A\$20? (1 mark)

NZ\$ 22.40

- (b) How many Thai Baht could be bought for A\$130? (2 marks)

$$\begin{array}{r}
 2800 \\
 560 \\
 280 \\
 \hline
 3640
 \end{array}$$

- (c) How many Australian dollars are 173 US dollars worth? (1 mark)

A\$ 200

- (d) How many Australian dollars are 95950 Japanese Yen worth? (2 marks)

95000 -> A\$1000
 950 -> A\$10
 Total A\$ 1010

Question 3

(8 marks)

(a) The perimeter of a rectangle is given by the formula $P = 2(L + W)$.

(i) Find P when $L = 1.5$ cm and $W = 2.5$ cm.

(1 mark)

$$\begin{aligned} P &= 2 \times (1.5 + 2.5) \\ &= 2 \times 4 \\ &= 8 \text{ cm} \end{aligned}$$

(ii) Find W when $P = 62$ cm and $L = 14$ cm.

(1 mark)

$$\begin{aligned} 62 &= 2 \times (14 + W) \\ 31 &= 14 + W \\ W &= 17 \text{ cm} \end{aligned}$$

(b) The statement 'in a class of 28 students there are 4 more boys than girls' can be written as the equation $x + (x - 4) = 28$.

(i) Explain what the variable x represents.

(1 mark)

The number of boys in the class.

(ii) How many boys are there in the class?

(1 mark)

16 boys

(c) Solve for x the equations

(i) $2x + 1 = 3(x + 1)$.

(2 marks)

$$\begin{aligned} 2x + 1 &= 3x + 3 \\ x &= -2 \end{aligned}$$

(ii) $2x + \frac{x}{3} = 14$.

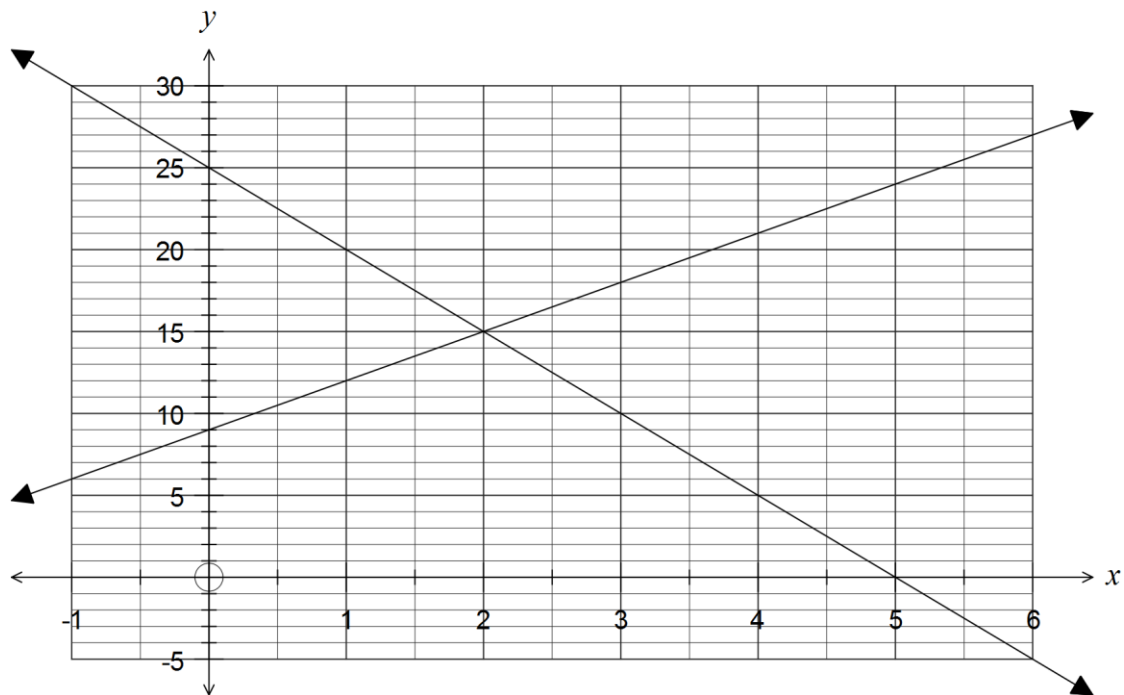
(2 marks)

$$\begin{aligned} 6x + x &= 42 \\ 7x &= 42 \Rightarrow x = 6 \end{aligned}$$

Question 4

(5 marks)

- (a) The line with equation $y = ax + b$ is shown on the graph below.



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

$$a = -\frac{25}{5} = -5$$

- (ii) State the value of b . (1 mark)

$$b = 25$$

- (b) Add the line $y = 3x + 9$ to the axes above. (2 marks)

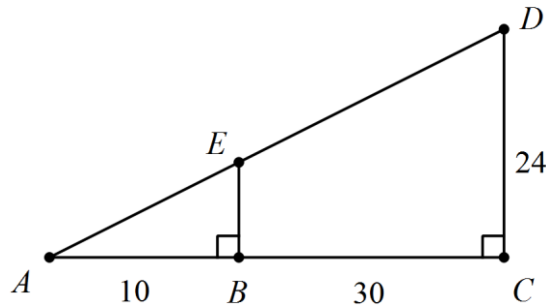
- (c) Use the graph to solve the simultaneous equations $y = ax + b$ and $y = 3x + 9$. (1 mark)

$$\begin{aligned} x &= 2 \\ y &= 15 \end{aligned}$$

Question 5

(7 marks)

- (a) In the diagram shown, $AB = 10$ cm, $BC = 30$ cm and $CD = 24$ cm.



- (i) Explain why $\triangle ABE$ is similar to $\triangle ACD$. (2 marks)

Angle A is common to both triangles and both triangles have a right-angle.
Hence triangles are similar because AAA.

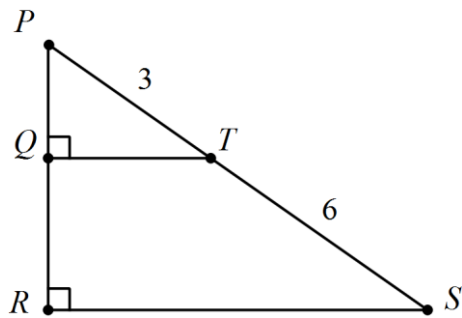
- (ii) Calculate the length of BE . (2 marks)

Scale factor: $\frac{10 + 30}{10} = 4$

$$EB = 24 \div 4$$

$$= 6 \text{ cm}$$

- (b) In the diagram below, $PT = 3$ cm, $TS = 6$ cm and $\triangle PQT$ is similar to $\triangle PRS$.



- If the area of $\triangle PQT$ is 5 cm, determine the area of the trapezium $QRST$. (3 marks)

Scale factor: $\frac{3 + 6}{3} = 3$

Area factor: $3^2 = 9$

$$PRST = 5 \times 9$$

$$= 45$$

$$QRST = 45 - 5$$

$$= 40 \text{ cm}^2$$

Question 6

(7 marks)

Consider the matrices $A = \begin{bmatrix} 2 & -3 \end{bmatrix}$, $B = \begin{bmatrix} 4 \\ -2 \end{bmatrix}$, $C = \begin{bmatrix} 4 & 5 \\ -2 & -3 \end{bmatrix}$ and $D = \begin{bmatrix} -2 & 0 \\ 1 & 2 \end{bmatrix}$.

(a) Calculate

(i) $5A$

(1 mark)

$$\begin{bmatrix} 10 & -15 \end{bmatrix}$$

(ii) $C + D$

(1 mark)

$$\begin{bmatrix} 2 & 5 \\ -1 & -1 \end{bmatrix}$$

(iii) CB

(1 mark)

$$\begin{bmatrix} 4 & 5 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} 4 \\ -2 \end{bmatrix} = \begin{bmatrix} 6 \\ -14 \end{bmatrix}$$

(b) Explain why the following cannot be calculated:

(i) $A + B$

(1 mark)

A and B are different sizes, so cannot be added.

(ii) DA

(1 mark)

Number of columns in D not equal to number of rows in A.

(c) If $\begin{bmatrix} a & 3a \end{bmatrix} \times B = \begin{bmatrix} 4 \end{bmatrix}$, determine the value a .

(2 marks)

$$\begin{bmatrix} a & 3a \end{bmatrix} \times \begin{bmatrix} 4 \\ -2 \end{bmatrix} = \begin{bmatrix} 4 \end{bmatrix} \Rightarrow 4a - 6a = 4 \Rightarrow a = -2$$

Question 7

(7 marks)

Long term parking at an airport is charged on a daily basis according to the following schedule:

Time (Days)	1	2	3	Each additional day
Rate (\$)	20	40	60	11

For example, a person who parked at the airport at 2 pm and arrived back at 5pm the following day would be charged \$40, since their car was parked for more than one day but less than two.

- (a) Determine the charge for a user who parked at 6.35 am on Monday and left at 7.55 pm the following Friday. (2 marks)

$$60 + 2 \times 11 = \$82$$

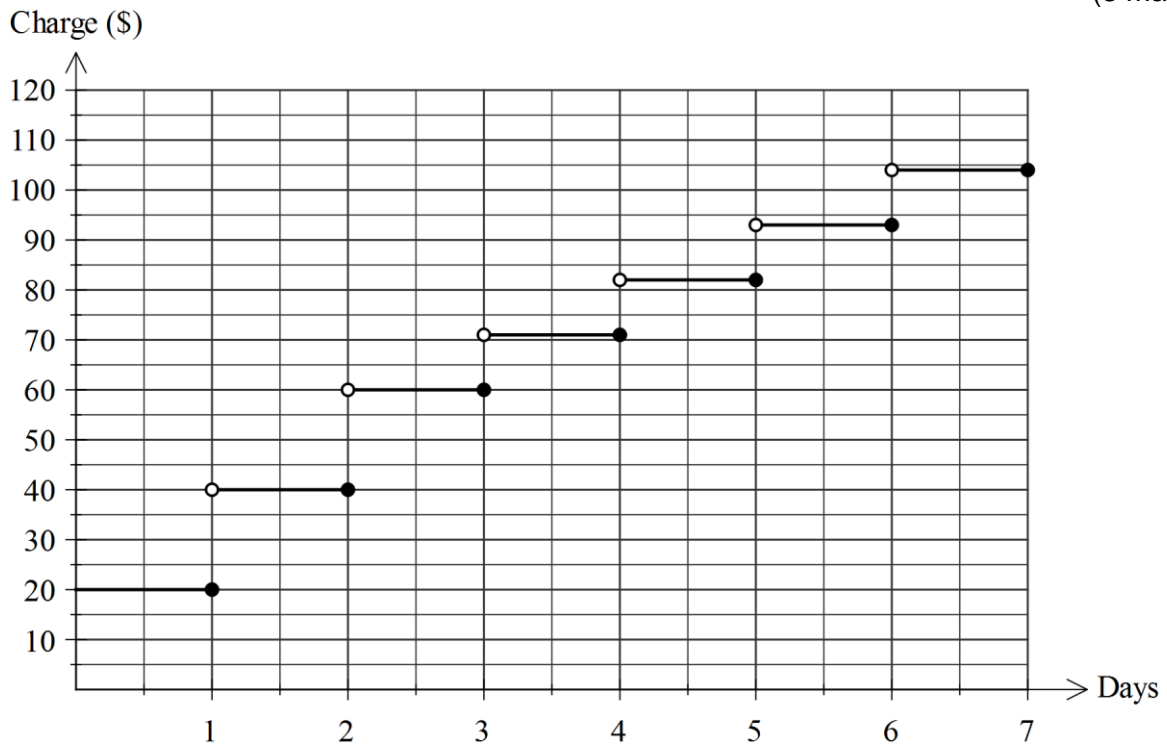
- (b) Determine the number of days a user parked their car, if it cost them \$170. (2 marks)

$$170 - 60 = 110$$

$$110 \div 11 = 10$$

$$3 + 10 = 13 \text{ days}$$

- (c) Complete the step graph below to show the parking charge for stays of up to seven days. (3 marks)



Question 8**(7 marks)**

The number of single and double rooms occupied in a guesthouse on five consecutive nights is shown in the table below.

Guesthouse	Mon	Tue	Wed	Thu	Fri
Single rooms	2	3	1	2	3
Double rooms	3	3	3	2	2

- (a) Represent the information in the table as a two by five matrix R.

(1 mark)

$$R = \begin{bmatrix} 2 & 3 & 1 & 2 & 3 \\ 3 & 3 & 3 & 2 & 2 \end{bmatrix}$$

Single rooms cost \$50 per night and double rooms cost \$100 per night.

- (b) Represent this information in a one by two matrix S.

(1 mark)

$$S = [50 \quad 100]$$

- (c) Determine the product of the matrices found in (a) and (b).

(2 marks)

$$\begin{aligned} SR &= [50 \quad 100] \begin{bmatrix} 2 & 3 & 1 & 2 & 3 \\ 3 & 3 & 3 & 2 & 2 \end{bmatrix} \\ &= [400 \quad 450 \quad 350 \quad 300 \quad 350] \end{aligned}$$

- (d) Explain what the entries in the matrix in (c) represent.

(1 mark)

The total income for each of the five nights

- (e) On which day did the guesthouse take the least income?

(1 mark)

Thursday

- (f) The total income for the five days can be formed by multiplying the matrix product in (c) by another matrix. State a suitable matrix.

(1 mark)

$$\begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$$

Additional working space

Question number: _____

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