Rossmoyne Senior High School

WA Exams Practice Paper E, 2015

Question/Answer Booklet

MATHEMATICS APPLICATIONS UNIT 1
Section One: Calculator-free

SOLUTIONS

Student Number: In figures | | | | | | | | |

In words _____

Your name _____

Time allowed for this section
Reading time before commencing work: five minutes
Working time for this 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	7	7	50	52	35
Section Two: Calculator-assumed	12	12	100	96	65
			Total	148	100

Instructions to candidates

1. The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2015*. 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.

See next page

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

This section has **seven (7)** questions. Answer **all** questions. Write your answers in the spaces provided.

Working time for this section is 50 minutes.

Question 1 **(8 marks)**

(a) The distance travelled by a body is given by $s = ut + \frac{1}{2}at^2$. Determine the distance travelled when

(i) $u = 3,\ t = 2$ and $a = 10$. (2 marks)

$$\begin{aligned} s &= 3 \times 2 + \tfrac{1}{2} \times 10 \times 2^2 \\ &= 6 + 20 \\ &= 26 \end{aligned}$$

(ii) $u = 9.5,\ t = 10$ and $a = 4.6$. (2 marks)

$$\begin{aligned} s &= 9.5 \times 10 + \tfrac{1}{2} \times 4.6 \times 10^2 \\ &= 95 + 230 \\ &= 325 \end{aligned}$$

(b) The variables R and p are related by the formula $R = \dfrac{24}{10 - p}$. Determine

(i) the value of R when $p = 0$. (1 mark)

$$\begin{aligned} R &= \frac{24}{10} \\ &= 2.4 \end{aligned}$$

(ii) the value of R when $p = 7.6$. (1 mark)

$$\begin{aligned} R &= \frac{24}{10 - 7.6} \\ &= \frac{24}{2.4} \\ &= 10 \end{aligned}$$

(iii) the value of p when $R = 24$. (2 marks)

$$\begin{aligned} 24 &= \frac{24}{10 - p} \\ 10 - p &= 1 \\ p &= 9 \end{aligned}$$

Question 2 **(9 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	300
Euro	6.70	13.40	33.50	67.00	201.00
Indian Rupee	515	1030	2575	5150	15450
Malaysian Ringgit	29	58	145	290	870
Vanuatu Vatu	860	1720	4300	8600	25800

(a) State the Indian Rupee exchange rate for one Australian Dollar. (1 mark)

51.50 Rupee

(b) How many Malaysian Ringgit could be bought for A$50? (1 mark)

145 Malaysian Ringgits

(c) How many Australian Dollars are 257.50 Indian Rupees worth? (1 mark)

$5

(d) Which is worth more – 1000 Vanuatu Vatus or 1000 Indian Rupees? Justify your answer. (2 marks)

1000 Indian Rupees, as the exchange rate is lower (515 < 860) and so will buy more Australian Dollars.

(e) How many Euros could be bought for 450 Australian Dollars? (2 marks)

201
67
33.50
301.50

(f) How many Australian dollars are 8758 Malaysian Ringgits worth? (2 marks)

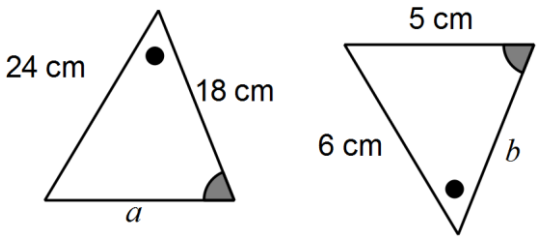
8700 -> A$3000
58 -> A$20

Total A$ 3020

See next page

Question 3 **(8 marks)**

(a) The two triangles shown are similar. Determine the values of the pronumerals a and b. (3 marks)

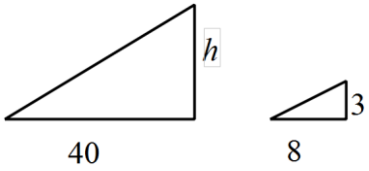


Length scale factor: $\frac{24}{6} = 4$

$a = 5 \times 4 = 20$ cm

$b = 18 \div 4 = 4.5$ cm

(b) A building casts a shadow of 40 m while the shadow of a 3 m tall lamp post is 8 m long. Determine the height of the building. (3 marks)



$\frac{40}{8} = 5$

$h = 5 \times 3$
$= 15$

(c) A photograph that is 10 cm long is enlarged so that the same side now measures 15 cm. If the area of the original photograph was 80 cm^2, determine the area of the enlarged photograph. (2 marks)

Length scale factor: $\frac{15}{10} = 1.5$

New area:

$80 \times 1.5 \times 1.5 = 120 \times 1.5 = 180$ cm^2

Question 4 **(5 marks)**

A plan of the ground floor of a house has a scale of 1 : 100. The actual dimensions of the dining room in the house are 4.5 m by 6 m.

(a) Determine the actual area of the dining room, in square metres. (1 mark)

$$\begin{aligned} 4.5 \times 6 &= 4 \times 6 + 0.5 \times 6 \\ &= 24 + 3 \\ &= 27 \text{ m}^2 \end{aligned}$$

(b) Determine the dimensions of the dining room on the plan, giving your measurements in millimetres. (2 marks)

$$\frac{4.5 \times 1000}{100} = 45 \text{ mm}$$

$$\frac{6 \times 1000}{100} = 60 \text{ mm}$$

(c) Another room on the plan measures 38 mm by 52 mm. Determine the actual dimensions of this room in the house, giving your measurements in metres. (2 marks)

$$\frac{38 \times 100}{1000} = 3.8 \text{ m}$$

$$\frac{52 \times 100}{1000} = 5.2 \text{ m}$$

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Question 5 **(7 marks)**

The table below has been created using the formula $C = \frac{2a + 3b}{10}$ to calculate the cost, in dollars, of a product that uses a grams of one ingredient and b grams of another ingredient.

Cost ($)		a (g)				
		4	8	12	16	20
b (g)	2	**P**	2.20	3.00	3.80	4.60
	4	2.00	2.80	**Q**	4.40	5.20
	6	2.60	3.40	4.20	5.00	5.80
	8	3.20	4.00	4.80	5.60	6.40
	10	3.80	4.60	5.40	**R**	7.00

(a) Determine the missing values of P, Q and R in the table. (3 marks)

$P = \$1.40$

$Q = \$3.60$

$R = \$6.20$

(b) Use one example to show that the formula $C = \frac{a}{5} + 0.3b$ could also be used to create the table above. (1 mark)

If $a = 20$ and $b = 10$ then $C = \frac{20}{5} + 0.3(10) = 4 + 3 = \$7.00$ which is the same as in the table.

(c) Use one example to show that the formula $C = 0.2a + \frac{b}{3}$ could **not** be used to create the table above. (1 mark)

If $a = 20$ and $b = 6$ then $C = 0.2(20) + \frac{6}{3} = 4 + 2 = \$6.00$ but should be \$5.80.

(d) Determine the value of a if the cost of the product when $b = 20$ is \$12.40. (2 marks)

$$12.40 = \frac{2a + 3 \times 20}{10}$$
$$124 = 2a + 60$$
$$64 = 2a$$
$$a = 32$$

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Question 6 **(9 marks)**

Four matrices are given by $A=\begin{bmatrix}1 & 2 & 3\\ -1 & 0 & 4\end{bmatrix}$, $B=\begin{bmatrix}3\\ 2\end{bmatrix}$, $C=\begin{bmatrix}2 & -6\end{bmatrix}$ and $D=\begin{bmatrix}2 & -2\\ 0 & 4\end{bmatrix}$.

(a) Name the matrix for which the element in row 1 and column 2 is the number 2 and also state the size of this matrix. (2 marks)

Matrix A, which is a 2 by 3 matrix.

(b) Determine the value of $d_{12} \times a_{23}$. (1 mark)

$-2 \times 4 = -8$

(c) It is possible to calculate one of $BC + D$ or $CB + D$, but not both. State which calculation is not possible and explain why. (2 marks)

$CB + D$ is not possible, as the size of CB is 1 by 1 and the size the $CB + D$ is 2 by 2. Matrices must be the same size to add together.

(d) Determine the missing values p and q if $\begin{bmatrix}4 & p\end{bmatrix} \times A = \begin{bmatrix}7 & 8 & q\end{bmatrix}$. (2 marks)

$$\begin{bmatrix}4 & p\end{bmatrix} \times \begin{bmatrix}1 & 2 & 3\\ -1 & 0 & 4\end{bmatrix} = \begin{bmatrix}7 & 8 & q\end{bmatrix}$$

$4 - p = 7 \Rightarrow p = -3$

$(4)(3) + (-3)(4) = q \Rightarrow q = 0$

(e) Calculate $DB + 2B$. (2 marks)

$$\begin{bmatrix}2 & -2\\ 0 & 4\end{bmatrix} \times \begin{bmatrix}3\\ 2\end{bmatrix} + 2\begin{bmatrix}3\\ 2\end{bmatrix} = \begin{bmatrix}2\\ 8\end{bmatrix} + \begin{bmatrix}6\\ 4\end{bmatrix} = \begin{bmatrix}8\\ 12\end{bmatrix}$$

See next page

Question 7 **(6 marks)**

The radii of two spherical balloons filled with helium are 40 cm and 60 cm.

(a) State, in simplest form, the ratio of their

(i) radii. (1 mark)

$40:60=2:3$

(ii) surface areas. (1 mark)

$2^2:3^2=4:9$

(iii) volumes. (1 mark)

$2^3:3^3=8:27$

(b) One third of the helium in the larger of the balloons is released. Determine the new ratio of their volumes, in simplest form. (3 marks)

$\frac{1}{3}$ released so $\frac{2}{3}$ remains

$27\times\frac{2}{3}=18$

$8:18=4:9$

End of questions

Additional working space

Question number: _____

Additional working space

Question number: _____

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