MATER DEI
COLLEGE
FAITH WITH COURAGE

Semester Two Examination, 2020

Question/Answer booklet

MATHEMATICS APPLICATIONS UNITS 1&2

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.

See next page

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 weekly time sheet for a part time worker is shown below.

Day	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Hours worked	-	-	2.5	4.5	5	4	-

The worker is paid $20 per hour, with time and a half paid for weekend shifts.

(a) Determine the gross weekly pay for this worker. (3 marks)

(b) The following week the gross weekly pay for the worker came to $270 but as he met a performance target, he was awarded a 15% bonus. Determine the amount of his bonus. (2 marks)

See next page

Question 2 **(5 marks)**

The table below displays a selection of variables and sample responses from a study dataset.

Visits to clinic	Gender	Height	Blood group	BMI	Feeling happy?	Number of siblings	Income level
2	F	1.66	AB	19.2	Disagree	2	Low
4	M	1.82	O	18.4	Strongly agree	0	High
5	M	1.74	B	32.7	Strongly disagree	1	V High
1	F	1.80	AB	24.1	Agree	2	Medium

(a) Give the name of a variable from the table that is classified as

(i) categorical and nominal. (1 mark)

(ii) numerical and discrete. (1 mark)

(iii) categorical and ordinal. (1 mark)

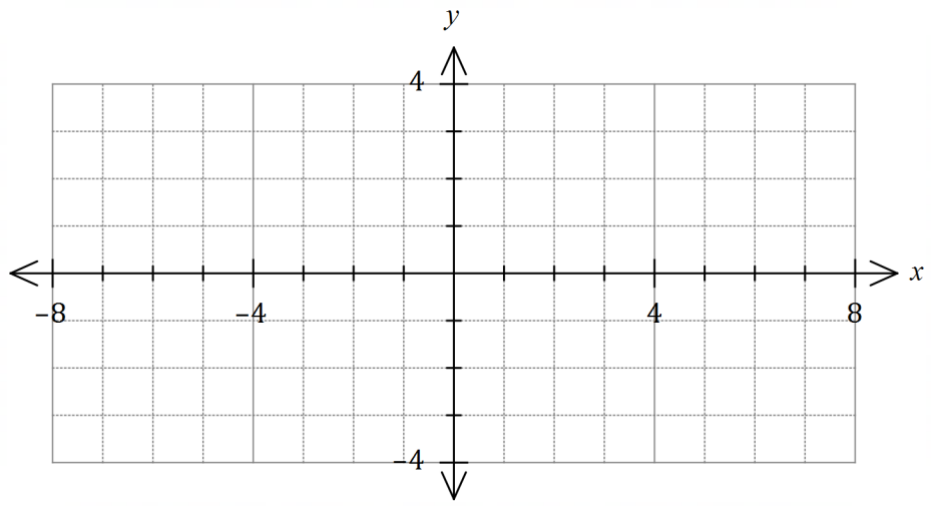
(b) The BMI variable is to be replaced with a Body Type variable according to the following table:

BMI	< 18.5	$18.5 - 24.9$	$25 - 29.9$	≥ 30
Body Type	Underweight	Normal	Overweight	Obese

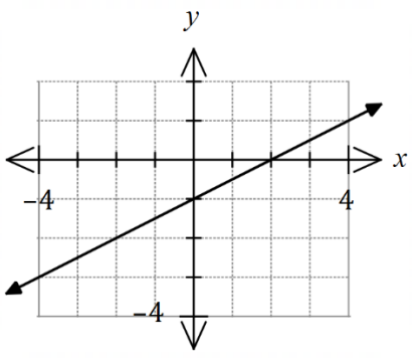
Explain whether Body Type will have the same variable classification as BMI. (2 marks)

Question 3 **(7 marks)**

(a) Construct the graph of $x + 2y = 4$ on the axes below. (3 marks)



(b) The graph of $y = a + bx$ is shown at right.



(i) Determine the value of the constant a and the value of the constant b. (2 marks)

(ii) State with justification whether the graph of $y = a + bx$ passes through the point with coordinates $(30, 16)$. (2 marks)

See next page

Question 4 **(8 marks)**

(a) A mixture of linear and non-linear equations are shown below. From the equations below, circle any that represent a linear equation. (2 marks)

$$2x = 9, \qquad x^2 = 9, \qquad 2(x+1) = 3^x, \qquad 3x = 2(x+1), \qquad x - 2 = 5x.$$

(b) Solve the equation $2(2x + 3) - 5 = 3 - 3(3 - x)$ for x. (2 marks)

(c) Ana, Bo and Cole are reading the same book. Ana has read x pages, Bo has read 30 more pages than Ana and Cole has read twice as many pages as Bo. The mean number of pages read by the three friends is 42.

(i) Use the above information to write an equation in terms of x. (2 marks)

(ii) Determine how many pages of the book Ana has read. (2 marks)

See next page

Question 5 **(7 marks)**

(a) 120 and 86 purchases were made at a shop in the morning and afternoon respectively. In the morning, half of the purchases were made with EFTPOS, 23 were cash and the remainder using a pay later scheme. In the afternoon, 16 were made with cash and the remainder evenly split between EFTPOS and pay later.

Represent the figures for the time of day and payment type in a labelled 2×3 matrix. (2 marks)

(b) Simplify

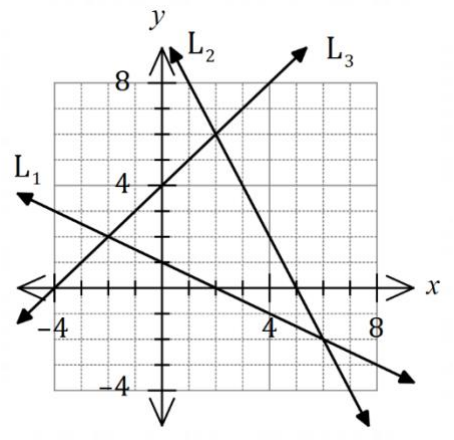
(i) $12I - 3\begin{bmatrix} 4 & 1 \\ -5 & 0 \end{bmatrix}$, where I is the 2×2 identity matrix. (3 marks)

(ii) $\begin{bmatrix} 1 & -2 \\ 3 & 1 \end{bmatrix} \times \begin{bmatrix} 5 & -2 \\ -1 & 4 \end{bmatrix}$. (2 marks)

See next page

Question 6 **(7 marks)**

(a) Three straight-lines L_1, L_2 and L_3 are shown on the graph at right.



Explain how the graph can be used to solve the simultaneous equations

$y = -2x + 10$ and $y = x + 4$

and state their solution.

(3 marks)

(b) A cafe can buy disposable coffee cups from two suppliers, P and Q.
Supplier P charges a delivery fee of $\$8$ plus 3 cents per cup whilst supplier Q has no delivery fee but charges 5 cents per cup. Let y be the total cost in cents of buying x cups from a supplier.

(i) Write an equation relating x and y for supplier P. (1 mark)

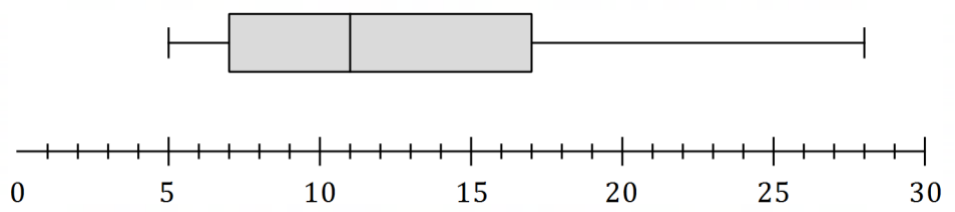
(ii) Write an equation relating x and y for supplier Q. (1 mark)

(iii) Determine the number of cups for which the total cost is the same for both suppliers and state what this total cost is. (2 marks)

See next page

Question 7 **(7 marks)**

The box plot below represents the distribution of the number of flights per day that were subject to a delayed departure at a large airport.



(a) Determine, for this distribution, the

(i) median. (1 mark)

(ii) range. (1 mark)

(iii) interquartile range. (1 mark)

(b) Describe a feature of the box plot that indicates the mean of the distribution will be greater than the median. (1 mark)

(c) Construct a possible ordered list of seven whole numbers that would result in the box plot shown. (3 marks)

Question 8 **(6 marks)**

(a) A formula used to estimate the speed, S km per hour, of a car that skids to a halt is shown below. It uses the length of the skid d m and the friction coefficient f that varies with the type of road and weather.

$$S = 3.5\sqrt{10fd}$$

	f	
Road Type	Wet	Dry
Bitumen	0.50	0.90
Concrete	0.45	0.85
Unsealed	0.35	0.60

Estimate the speed of a car that skidded to a halt over a distance of 13.5 m on a dry unsealed road. (3 marks)

(b) In baseball statistics, slugging average SLG is a measure of the batting productivity of a hitter. It is calculated from the number of singles S, doubles D, triples T, home runs H and at bats AB using the formula

$$SLG = \frac{S + 2D + 3T + 4H}{AB}$$

A hitter who had been at bat 40 times had a slugging average of 0.4. Given that they had hit one home run, one triple, and five singles, determine their number of doubles.

(3 marks)

End of questions

Supplementary page

Question number: _____