



MATER DEI
COLLEGE
FAITH WITH COURAGE

Semester Two Examination, 2017

Question/Answer booklet

**MATHEMATICS
APPLICATIONS
UNITS 1 AND 2**
Section Two:
Calculator-assumed

If required by your examination administrator, please
place your student identification label in this box

Student Number: In figures

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In words

Your name

Time allowed for this section

Reading time before commencing work: ten minutes
Working time: one hundred minutes

Materials required/recommended for this section

To be provided by the supervisor

This Question/Answer booklet
Formula sheet (retained from Section One)

To be provided by the candidate

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: drawing instruments, templates, notes on two unfolded sheets of A4 paper, and up to three calculators approved for use in this examination

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	6	6	50	52	35
Section Two: Calculator-assumed	13	13	100	98	65
Total					100

Instructions to candidates

- 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.
- 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.
- Additional working space pages at the end of this Question/Answer booklet are for planning or continuing an answer. If you use these pages, indicate at the original answer, the page number it is planned/continued on and write the question number being planned/continued on the additional working space 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 to be handed in with your Question/Answer booklet.

Markers use only		
Question	Maximum	Mark
7	5	
8	6	
9	6	
10	6	
11	9	
12	8	
13	7	
14	10	
15	7	
16	9	
17	8	
18	9	
19	8	
S2 Total	98	
S2 Wt ($\times 0.6633$)	65%	

Section Two: Calculator-assumed**65% (98 Marks)**

This section has **thirteen (13)** questions. Answer **all** questions. Write your answers in the spaces provided.

Working time: 100 minutes.

Question 7**(5 marks)**

Six variables are listed below.

- A Height of trees
- B Hair colour
- C Country of birth
- D Movie rating using a scale of 1 to 5 stars
- E Daily minimum temperature
- F Driver's licence number

- (a) In the spaces below, write the letter corresponding to **one** of the above of variables that is
- (i) a categorical variable that can be classified as ordinal. (1 mark)

 - (ii) a numerical variable that can be classified as continuous. (1 mark)

 - (iii) a categorical variable that can be classified as nominal. (1 mark)
- (b) Give an example of a numerical variable that is not listed above and can be classified as discrete. Explain why it has this classification. (2 marks)

Question 8**(6 marks)**

From the top of a 38 m tall building, the angle of depression to a small dog sitting on a path, level with the base of the building, is 23° .

- (a) Draw a neat diagram to represent the information above; hence calculate the distance the dog is from the base of the building. **(3 marks)**

The dog walks 35 m directly towards the building and then stops.

- (b) Draw a neat diagram to represent this information; hence determine the angle of elevation from the dog to a window positioned 11 m below the top of the building. **(3 marks)**

Question 9**(6 marks)**

- (a) If concrete can be bought for \$260 per cubic metre, calculate the cost per square metre to make a rectangular concrete slab measuring 6.2 m by 8.5 m and with a uniform thickness of 14 cm. (3 marks)

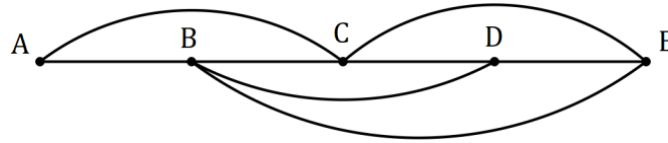
- (b) After pouring another rectangular concrete slab, the builder wanted to check that the corners of the slab were right-angled. The builder measured the diagonal of the slab to be 9.7 m and the sides of the slab to be 7.2 m and 6.5 m.

Use your knowledge of mathematics to determine whether the corners of the slab were right-angled. (3 marks)

Question 10

(6 marks)

The network below shows direct bus services between five city landmarks, A, B, C, D and E . For example, a direct bus service exists between A and C but not between A and D .



(a) Represent this information in a 5×5 matrix M , with row and column headings in alphabetical order. (2 marks)

(b) Calculate M^2 , state the value of entry $M^2_{3,2}$ and explain what this value means. (3 marks)

(c) In how many ways is it possible to use three bus services to start a journey at D and finish at A ? (1 mark)

Question 11**(9 marks)**

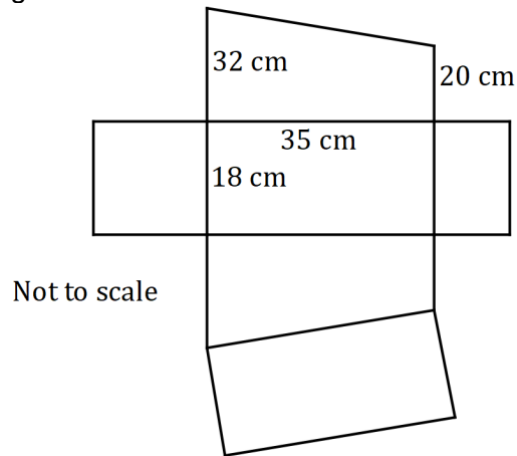
A young person won \$15 000. Not needing the money immediately, they bought 600 TTD shares, 900 AAG shares and placed the remaining \$4 800 in a deposit account.

- (a) During the first year, dividends were paid of 55 cents per share for AAG and of 4.5% on the value of the TTD shares, which were priced at \$11.80 at the time. Calculate the total dividend paid. (3 marks)
- (b) The deposit account paid 3.5% per annum interest, compounded annually. Calculate the interest that would accumulate in the account
- (i) during the first year. (1 mark)
- (ii) during the second year. (2 marks)
- (c) After two years the young person valued the total of their shares, the dividends received and the money in the deposit account at \$16 340.50. Calculate, to one decimal place, the percentage increase in the value of their winnings. (3 marks)

Question 12

(8 marks)

The net shown below, made from four rectangles and two trapeziums, is folded to form a scale model of a shed with a sloping roof.



(a) Calculate the volume of the completed model.

(3 marks)

(b) Determine the total surface area of the completed model.

(5 marks)

Question 13**(7 marks)**

The number of nights that visitors booked into a hotel for on the first day in May this year are summarised in the table below.

Number of nights	1	2	3	4	5	6	7	8	9
Frequency	21	25	12	10	4	8	3	0	1

- (a) For this data, determine
- (i) the total number of nights booked by visitors. (1 mark)

 - (ii) the mean number of nights booked. (1 mark)

 - (iii) the standard deviation of the number of nights booked. (1 mark)
- (b) Briefly comment on the distribution of this data. (1 mark)
- (c) Identify, with justification, whether the data contains an outlier. (3 marks)

Question 14

(10 marks)

The spreadsheet below shows the wages sheet for some of the staff at a restaurant that is closed on Mondays and Tuesdays. Employees are paid time-and-a-quarter on Saturdays and time-and-a-half on Sundays.

Employee	Base Pay Rate (\$ per hour)	Rate	Hours worked					Weekly Pay (\$)
			Wed	Thu	Fri	Sat	Sun	
			1	1	1	1.25	1.5	
Ahn	17.50		7	8	8	0	0	A
Billy			0	0	0	8	8	334.40
Chris	22.90		6	6	6	6	0	B
Dhu	17.50		0	6	C	0	4	245.00
Eosin	22.90		0	6	6	6	6	652.65

(a) Calculate the total wages paid to employees on Wednesday. (2 marks)

(b) Determine the values of A, B and C in the table. (4 marks)

(c) The restaurant is liable for payroll tax at a rate of 5.5% of all staff payments. Calculate the payroll tax the restaurant must pay this week for the five employees. (2 marks)

(d) Determine Billy's base rate of pay. (2 marks)

Question 15**(7 marks)**

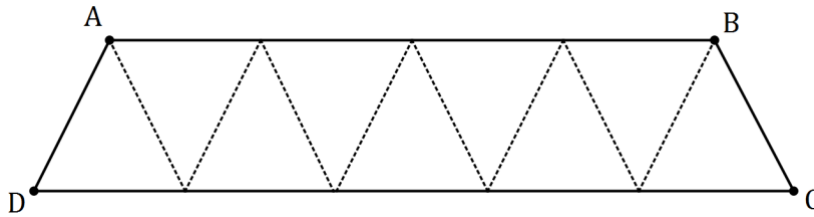
A scientific study showed that the lengths of housefly wings are normally distributed with a mean and standard deviation of 4.55 mm and 0.39 mm respectively.

- (a) If a housefly wing is selected at random from those in the study, determine the probability that
- (i) the wing is longer than 5 mm. (1 mark)
- (ii) the wing length is within 0.3 mm of the mean. (2 marks)
- (b) If 99.7% of the wing lengths were between $4.55 - L$ mm and $4.55 + L$ mm, determine the value of L . (2 marks)
- (c) If 300 wings were selected at random, how many would be expected to have lengths less than 4 mm? (2 marks)

Question 16

(9 marks)

Nine equilateral triangles are joined together to make a trapezium $ABCD$ with perimeter of length 132 cm, as shown below.



(a) Explain why the sides of each triangle must be 12 cm long. (2 marks)

(b) Use Heron's rule to calculate the area of **one** of the triangles. (3 marks)

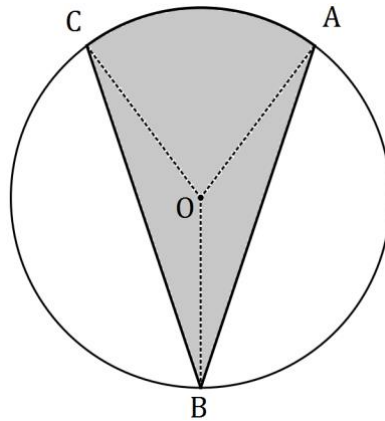
(c) Determine the area of the trapezium. (1 mark)

(d) Determine the length of diagonal AC in the trapezium. (3 marks)

Question 17

(8 marks)

The diagram shows points A, B and C on the circumference of a circle with centre O and radius 18 cm. Angle BOC and angle BOA are both 140° .



- (a) Calculate the area of triangle BOA . (2 marks)

- (b) Determine the size of angle AOC . (1 mark)

- (c) Calculate the area of the shaded region ABC . (3 marks)

- (d) Determine the new area of the shaded region if the radius of the circle was increased from 18 cm to 72 cm. (2 marks)

Question 18**(9 marks)**

Some currency exchange rates advertised by an Australian bank for one Australian dollar are shown in the table below.

Country (currency)	Buy rate	Sell rate
Denmark (kroner)	5.6650	4.7070
Switzerland (franc)	0.8550	0.6910
South Korea (won)	891.7598	779.4543
Thailand (baht)	27.8070	24.2670

- (a) The midrate is the average of the buy and sell rates. Calculate the midrate for Danish kroner. (1 mark)
- (b) If a Thai tourist in Australia wanted to exchange 5 000 baht for Australian currency, explain why the bank would use the buy rate, and calculate how many Australian dollars they would receive. (2 marks)
- (c) The same product, including shipping, can be bought online from a Swiss website for 123 francs or a Danish website for 776 kroner. Compare these prices in dollars for an Australian purchaser and calculate the amount saved by buying from the cheaper site. (3 marks)
- (d) An Australian traveller exchanged \$2 000 into South Korean won, spent 1 250 000 won whilst away and then converted the remainder back into Australian dollars on their return. How much did the traveller receive back? (3 marks)

Question 19**(8 marks)**

Two similar cylindrical containers, both open at the top and full of water, are made from thin steel. The smaller container has an internal radius of 30 cm and height of 25 cm, and the larger a radius of 48 cm.

Neither cylinder, shown below, has a lid.



Not to scale



- (a) Using the fact that the cylinders are similar, determine the height of the large cylinder. (2 marks)
- (b) Calculate the internal surface area (the area in contact with water) of the small cylinder. (2 marks)
- (c) 150 mL of paint was required to coat the inside of the small cylinder. Determine how much paint was required to coat (to the same thickness) the inside of the larger cylinder. (2 marks)

The small cylinder is emptied and water from the large cylinder is then used to refill the small cylinder.

- (d) How many times can the water from the large cylinder be used to completely refill the small cylinder? Justify your answer. (2 marks)

Additional working space

Question number: _____

Additional working space

Question number: _____

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