MATHEMATICS APPLICATIONS UNIT 1

Section Two:

Calculator-assumed

Your name _____

Teacher's name _____

Time allowed for this section
Reading time before commencing work: ten minutes
Working time: one hundred 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 (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, which can include scientific, graphic and Computer Algebra System (CAS) calculators, are permitted in this ATAR course 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	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.

DO NOT WRITE IN THIS AREA AS IT WILL BE CUT OFF

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

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

Working time: 100 minutes.

Question 9 **(6 marks)**

A salesperson with an annual salary of $82 200 is paid monthly.

(a) Calculate their monthly pay, before any deductions are made. (1 mark)

(b) Every month their employer withholds 24% of the amount that their monthly pay exceeds $1800 for tax. Determine the monthly tax withheld. (2 marks)

(c) Their employer contributes an amount equal to 9.5% of their annual salary into a superannuation fund each year. Calculate this annual contribution. (1 mark)

(d) The salesperson is offered an alternative contract where they are paid a reduced salary of $40 000 plus a commission of 1.25% on all sales they make. If the salesperson expects to make sales worth $3 750 000 over the next year, determine whether they will earn more or less if they switch to the alternative contract. Justify you answer. (2 marks)

Question 10 **(8 marks)**

(a) A design for a button consists of a circle of radius 16 mm with five circles of radius 4.3 mm removed, as shown below. Determine the area of the shaded region. (3 marks)
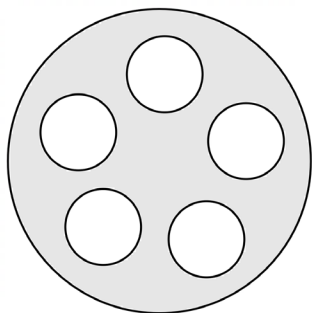
(b) Another design consists of a sector of a circle of diameter 22 mm, as shown below.

    70°
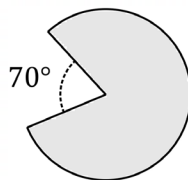
    (i) Determine the area of the sector. (3 marks)

    (ii) Determine the perimeter of the sector. (2 marks)

Question 11 **(6 marks)**

The following table shows the exchange rates advertised by a bank for one Australian dollar:

Country (currency)	India (rupee, rs)	Hungary (forint, ft)	Switzerland (franc, fr)
Buy rate	59.12	251.2	0.7042
Sell rate	54.15	221.3	0.6585

When a person wants foreign currency, the bank will sell it to them using the sell rate. When a person wants to exchange foreign currency for Australian dollars, the bank will buy the currency from that person using the buy rate.

(a) An Australian collector of cars has found a model they are after in India for 4 250 000 rs and another in Hungary for 19 500 000 ft. Both sellers require payment in their local currency. Determine the price of each car in Australia dollars, rounding your answers to the nearest $100. (3 marks)

(b) A traveller changed 3500 Australian dollars into Swiss francs with this bank, spent 1800 fr whilst away in Switzerland and changed the remaining francs back into Australian dollars on their return. Determine the number of Australian dollars they received. (3 marks)

DO NOT WRITE IN THIS AREA AS IT WILL BE CUT OFF

Question 12 **(8 marks)**

The table below shows the GST inclusive prices for chocolate sauce sold by a supermarket in three different sizes:

Size	Small	Medium	Large
Contents (mL)	350	560	900
Price ($)	2.10	3.08	5.31

(a) Determine the price per 100 mL for each size and hence explain which represents the best value, if price was the only consideration. (3 marks)

(b) The wholesale price paid by the supermarket for a box of 24 large-size sauces is $108, including GST. Determine the percentage profit it makes when selling this size. (3 marks)

(c) The rate of GST is 10%. Determine the amount of GST included in the price of a medium-size chocolate sauce. (2 marks)

Question 13 (8 marks)

An investor owns the following portfolio of stocks.

Stock	LRT	WPC	FMG	WES
Number of shares owned	6500	500	600	400
Share price ($)	1.19	19.64	23.80	51.30
Percentage dividend (%)	0	1.6	7.2	3.2
Earnings per share ($)	0.63	0.64	2.02	1.43

(a) Determine the value of the shares the investor owns in the lowest priced stock.

(2 marks)

(b) Calculate the total dividend paid on this share portfolio. (3 marks)

(c) The investor plans to buy more shares in two of the four stocks. They will buy the stocks that have the highest price-to-earnings ratio. State, with justification, which two stocks they will buy. (3 marks)
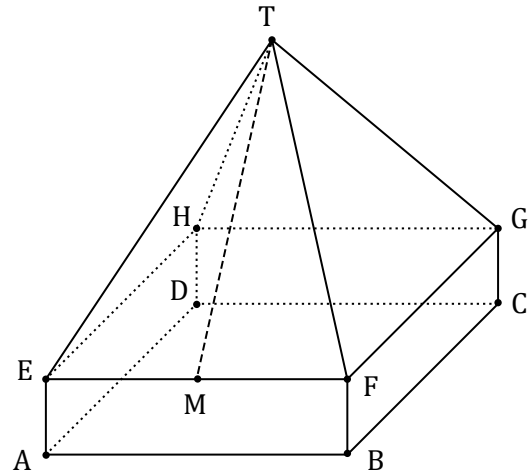
Question 14 (8 marks)

A solid object takes the form shown.

ABCDEFGH is a square prism with sides
AB = BC = 48 cm and height AE = 13 cm.

The apex T of pyramid EFGHT lies 45 cm
directly above the centre of square EFGH.

The four sloping faces of the pyramid are
congruent isosceles triangles, so that the
length from T to M, the midpoint of edge
EF is 51 cm.

(a) Determine the area of one of the triangular faces of the pyramid. (2 marks)

(b) Determine the surface area of the object. (3 marks)

(c) Determine the volume of the object. (3 marks)

Question 15 **(7 marks)**

(a) An investor places $18 750 in a term deposit for 4 years. The term deposit pays interest of 5.5% compounded annually. Determine the total interest the investor will receive.

(3 marks)

(b) A short-term money lender offers simple interest loans at a daily interest rate of 0.0475%. A person borrows $800 from this lender, paying back $350 after 3 weeks and the remainder after a further 24 days. Determine the total interest on this loan. (4 marks)

Question 16   **(8 marks)**

(a)   The plan of a plot of land $PQRS$, not to scale, is sketched below with dimensions in metres. Determine the length of the diagonal PR, the length of side QR and hence the area of the plot.   (4 marks)
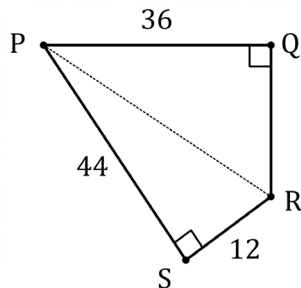
(b)   One end of a 6.5 m long ladder rests against a vertical wall and the other end stands on horizontal ground at a distance of 3.3 m from the foot of the wall.

    (i)   Sketch this situation and determine the height of the top of the ladder above the ground.   (2 marks)

    (ii)   If the foot of the ladder slides 90 cm across the ground and towards the wall, determine, to the nearest centimetre, how far the top of the ladder moves up the wall.   (2 marks)

Question 17 **(8 marks)**

The following spreadsheet was used to calculate the weekly pay of four office assistants. In this pay period, Monday was a public holiday, and the assistants were paid time-and-a-half that day.

	A	B	C	D	E	F	G	H
1	Employee	Base pay rate ($ per hour)	Daily hours worked					Weekly pay ($)
2			Mon	Tue	Wed	Thu	Fri	
3	Andy	25.90	4	7	7	7	7	880.60
4	Bec	31.50	0	4	4	8	0	?
5	Cai	27.25	6	0	8	8	6	844.75
6	Di	22.50	0	6	0	?	8	405.00

(a) Show that the total pay for hours worked on Monday by the assistants came to $400.65.

(2 marks)

(b) Determine the missing value in cell H4 and the missing value in cell F6. (3 marks)

(c) By referring to the value in a spreadsheet cell using its column letter followed by its row number (e.g., B4 refers to the value 31.50 in that cell) write a formula to

(i) recalculate the value in cell H5 when any cell value in the spreadsheet is changed.

(1 mark)

(ii) place in cell H7 that will calculate the total weekly pay for the assistants, and state what this total is. (2 marks)

Question 18 **(7 marks)**

A student who qualifies for a government allowance will receive a maximum payment of $462.50 per fortnight. If the student does any paid work and earns more than $437 per fortnight, the following reductions to the government payment apply:

Earnings	Amount payment reduces by
Between $437 and $524 per fortnight	50 cents for each dollar over $437
More than $524 per fortnight	$43.50 plus 60 cents for each dollar over $524

April qualifies for the allowance and has a casual job that pays her a fixed retainer of $23.50 per week plus $32.50 per hour worked.

(a) April will work 17 hours per week for the next fortnight. Determine

   (i) her fortnightly earnings. (2 marks)

   (ii) her fortnightly government payment. (3 marks)

(b) Determine the maximum number of hours that April can work in a fortnight before her government payment will start to be reduced. (2 marks)

Question 19 **(8 marks)**

The following diagram, drawn to scale, shows the plan for a new rectangular lawn on a plot of level ground. The lawn is 20 metres wide.
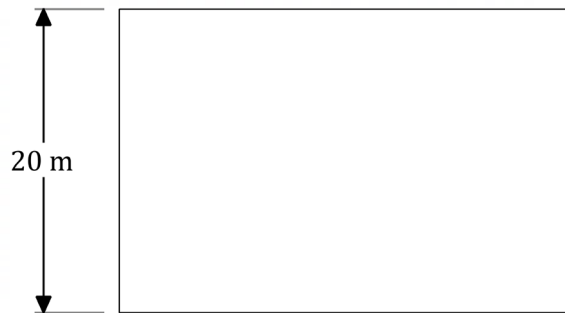
(a) Determine, to the nearest metre, the length of the lawn. (2 marks)

(b) Determine the total cost of turf to cover the lawn, given that suitable turf costs \$13.25 per square metre. (2 marks)

(c) Express the scale factor of the drawing in the form $1:n$. (2 marks)

(d) The turf will be laid on top of a layer of special soil that has a uniform depth of 45 mm. Determine the volume of soil that is required. (2 marks)

See next page

Question 20   **(8 marks)**

When a sum of $1400 is invested at a rate of R percent per annum, compounded every two months, the total interest I accumulated after T years is given by the formula

$$I = 1400\left(\left(1 + \frac{R}{600}\right)^{6T} - 1\right)$$

This formula has been used to create the spreadsheet below.

	A	B	C	D	E	F	G
1	Interest, I		Rate, R				
2			1	2	3	4	5
3	Time, T	1	14.06	28.23	42.53	56.94	71.47
4		2	28.26	57.04	86.35	116.20	146.60
5		3	42.60	86.42	131.50	177.87	225.56
6		4	57.09	116.4	178.02	242.04	?

(a)   When the rate is 3% per annum, determine

     (i)   the total interest accumulated after 3 years.   (1 mark)

     (ii)   the interest accumulated during the fourth year.   (2 marks)

(b)   Determine, to the nearest cent, the total interest after 4 years at a rate of 5% per annum.
                                                        (2 marks)

(c)   If the spreadsheet was extended, determine the value that would appear in cell K8.
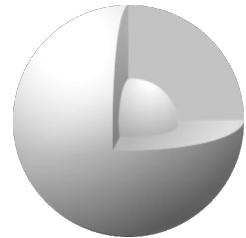   (3 marks)

Question 21 **(8 marks)**

A company makes spherical floats with an external radius of 30 cm for use in boat harbours.

(a) The external surface of a float is coated with a special epoxy paint that costs $95 per square metre. Determine the cost of this paint for one float. (3 marks)

(b) Each float is made from an inner solid steel sphere of radius 12 cm surrounded by a thick layer of polystyrene, as shown in the cutaway diagram.

Given that the weights of one cubic centimetre of steel and polystyrene are 6.2 and 0.025 grams respectively, determine the total weight of materials in one float.

(5 marks)

End of questions

Supplementary page

Question number: _____

Supplementary page

Question number: _____

Supplementary page

Question number: _____

Supplementary page

Question number: _____

Markers use only			
Question	Marker	Maximum	Mark
9	Stillitano	6	
10	Stillitano	8	
11	Stillitano	6	
12	Hamilton-Brown	8	
13	Hamilton-Brown	8	
14	Hamilton-Brown	8	
15	Galbraith	7	
16	Galbraith	8	
17	Galbraith	8	
18	Thompson	7	
19	Thompson	8	
20	Thompson	8	
21	Thompson	8	
Rounding deduction		−1	
Unit deduction		−1	
Section 2 Total		98	