

Percentage	Marks available	Time	Number of questions	Number of marks	Section
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Structure of this paper

METHODS UNITS 1 AND 2 CALCULATOR-ASSUMED

it to the supervisor before reading any further.
you do not have any unauthorized material. If you have any unauthorized material with you, hand
over items may be taken into the examination room. It is your responsibility to ensure that

Important note to candidate

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

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

To be provided by the supervisor
Formula sheet (extracted from Section One)

This Question/Answer booklet
to be provided by the supervisor

Materials required/recommended for this section

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

Time allowed for this section

Your name

In words

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Student number: In figures

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

UNITS 1 AND 2 SECTION TWO:

METHODS

Calculator-assumed

MATHEMATICS

Question/Answer booklet

WAEP Semester Two Examination, 2018

INDEPENDENT PUBLIC SCHOOL

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SN78-122-3

	question s available	to be answered	(minutes)		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.
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. Supplementary pages for the use of planning/continuing your answer to a question have been 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.
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.

CALCULATOR-ASSUMED 19 METHODS UNITS 1 AND 2

SN078-122-3

Supplementary page

Question number: _____

(ii) the value approaches as $\rightarrow \infty$. (2 marks)

Question number: _____

Supplementary page

METHODS UNITS 1 AND 2 18 CALCULATOR-ASSUMED

S078-122-3

(i) the value of s_5 . (1 mark)

(b) Another sequence is defined by $s_n = 975(0.2)^{n-1}$. Determine

(ii) the sum of the first 120 terms of this sequence. (2 marks)

(i) the value of s_{120} . (1 mark)

Determine

Question 9 (6 marks) (a) A sequence is defined by $s_{n+1} = s_n - 1.8$, $s_1 = 975$.

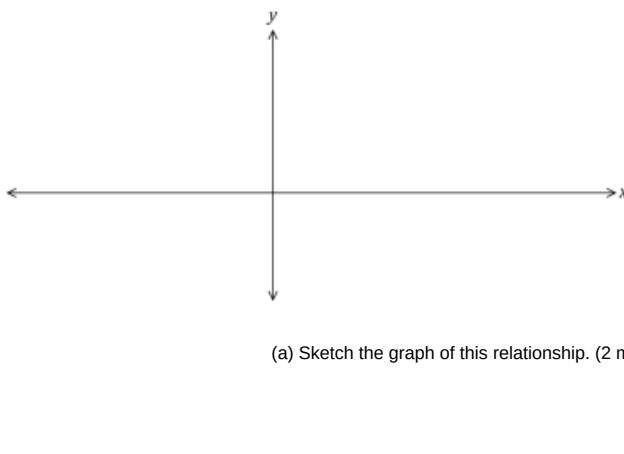
Working time: 100 minutes.

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

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

CALCULATOR-ASSUMED 3 METHODS UNITS 1 AND 2

See next page S078-122-3



SN078-122-3 See next page
METHODS UNITS 1 AND 2 4
CALCULATOR-ASSUMED

Question 10 (6 marks)
The variables \diamond and \diamond are related by the equation $2\diamond + 5\diamond = 15$.

(a) Sketch the graph of this relationship. (2 marks)

(b) Express \diamond in terms of \diamond and briefly explain why \diamond is a function of \diamond . (2 marks)

(c) The domain of \diamond is restricted to $-5 \leq \diamond < 10$. State the range of \diamond . (2 marks)

CALCULATOR-ASSUMED 17 METHODS UNITS 1 AND 2

SN078-122-3

Supplementary page

Question number: _____

Comment on the usefulness of the model for large values of Δt . (1 mark)

Question number: _____

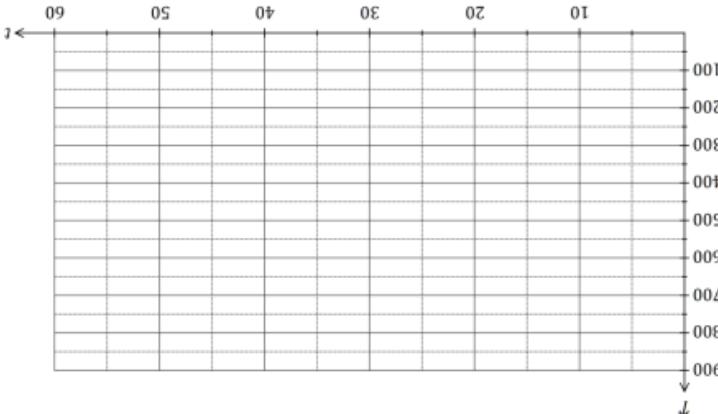
- (i) Determine the time taken for the cast to reach room temperature. (1 mark) (ii)
(d) The temperature of the cast falls to room temperature of 15°C .

METHODS UNITS 1 AND 2 16 CALCULATOR-ASSUMED

Supplementary page

SN78-122-3 End of questions

(c) State the name of this type of function. (1 mark)



(b) Graph the temperature of the cast against time on the axes below. (4 marks)

required to achieve this volume. (4 marks)

(c) Use calculus to determine the maximum volume of the pyramid and state the dimensions

(a) Determine the fall in temperature of the cast during the first 5 minutes. (2 marks)

The temperature T of a cast taken out of an oven cools according to the model $T = 84 + (0.4)^{-t}$, where t is the time in minutes since the cast was removed from the oven. T is measured in $^\circ\text{C}$.

Question 11 (9 marks)

(b) Show that the volume of the pyramid is given by $V = 180 \Delta t^2 - 4 \Delta t^3$. (2 marks)

CALCULATOR-ASSUMED 5 METHODS UNITS 1 AND 2
See next page SN78-122-3

Question 12 (8 marks)

(a) Calculate the area of the minor segment that subtends an arc of 72° in a circle of diameter 170 cm. (2 marks)

(ii) the sheep actually has the disease if the test indicates that it does. (4 marks)

(b) A chord of length 26 cm subtends an angle of $\frac{\theta}{17}$ at the centre of a circle. Calculate the radius of the circle. (2 marks)

(c) Parallelogram $\square \square \square \square \square \square$ has side $\square \square \square = 28$ cm, side $\square \square \square = 19$ cm and an area of 400 cm^2 .

Determine the lengths of the diagonals of $\square \square \square \square \square \square$. (4 marks)

(b) Two sheep are randomly selected for the test from those on the station. Determine the probability that just one of the sheep is diagnosed correctly. (2 marks)

Question 21 (8 marks)

A pyramid with a rectangular base of length $\square \square$ and width $\square \square$ has perpendicular height h . The length of the base is three times its width and the sum of the width, length and height is 180 cm.

(a) Calculate the length, height and volume of the pyramid when $\square \square = 15$ cm. (2 marks)

A mobile phone retailer classified recent sales of 625 phones by the age of customer and if the phone was bought outright or on a plan. A summary of the data is shown in the table below.

Total				625
Bought on a plan	◆◆◆	152	◆◆◆	
Bought outright	◆◆◆	108	◆◆◆	232
Age under 30	Ageed 30 or over	Total		

Question 13 (8 marks)

(a) Determine the values of α , β and γ shown in the table. (3 marks)

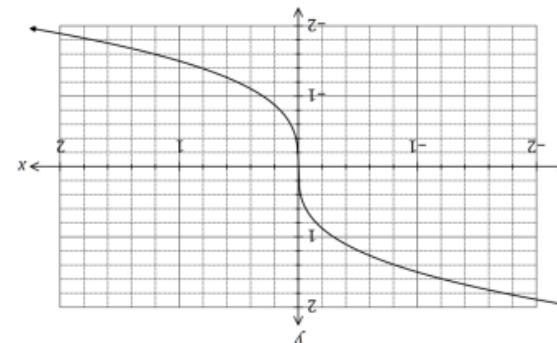
(b) A recent sale is selected at random from those recorded above. Event Φ occurs if the customer was aged under 30 and event Ψ occurs if the phone was bought outright.

Determine the following probabilities:

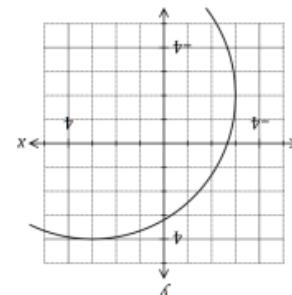
(i) $P(\Phi \cap \Psi)$. (1 mark)

estimate Φ (-0.5). (2 marks)

(i) Draw the tangent to the curve when $\Phi = -0.5$. (1 mark) (ii) Use the tangent to



(b) The graph of a power function $\Phi = \Phi(x)$ is shown below.



(ii) $P(\Phi \cup \Psi)$. (1 mark)

METHODS UNITS 1 AND 2 14 CALCULATOR-ASSUMED

(i) the sheep has the disease, but the test indicates that it does not. (2 marks)

(a) A sheep is randomly selected for the test from those on the station. Determine the probability that

of the test is independent of whether a sheep has the disease. It can be assumed that the correct outcome that 0.5% of all sheep on a station have the disease. It is known that a diagnostic test for a disease has a 97% chance of giving the correct outcome and it is known

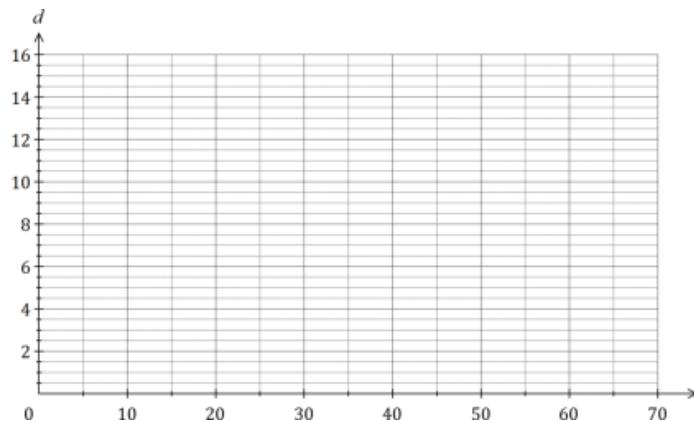
Question 20 (8 marks)

METHODS UNITS 1 AND 2 14 CALCULATOR-ASSUMED

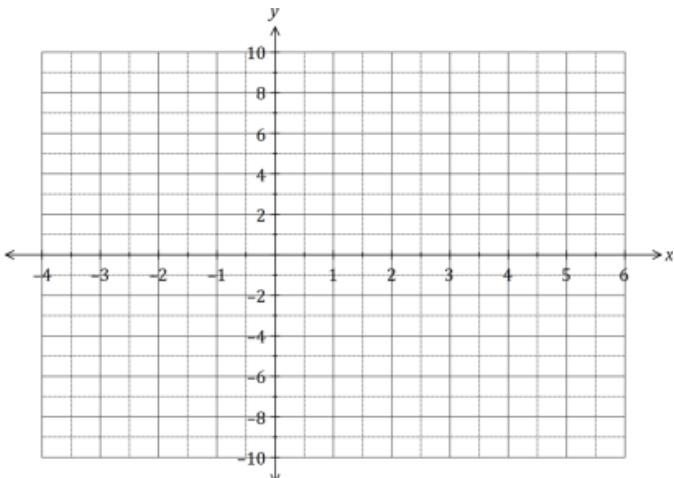
(iii) $\Phi \cap \Psi$. (1 mark) (iv) $\Phi \cup \Psi$. (2 marks)

Question 14 (7 marks) A function is defined by $d(t) = t^4 - t^3$.

- (a) Use the derivative $d'(t)$ to determine the coordinates of all stationary points of the function. (3 marks)



- (b) Sketch the graph of $d = f(x)$ on the axes below. (4 marks)



- (b) How long did the Ferris wheel take to complete one revolution? (1 mark)

- (c) At what time, when the seat was rising, did it first reach a height of 11 metres? (1 mark)

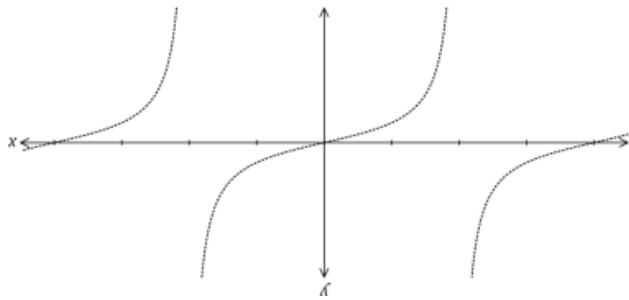
- (d) Determine the change in height of the seat between $t = 130$ and $t = 131$, giving your answer rounded to the nearest cm. (2 marks)

See next page SN078-122-3
CALCULATOR-ASSUMED 13 METHODS UNITS 1 AND 2

Question 19 (7 marks)

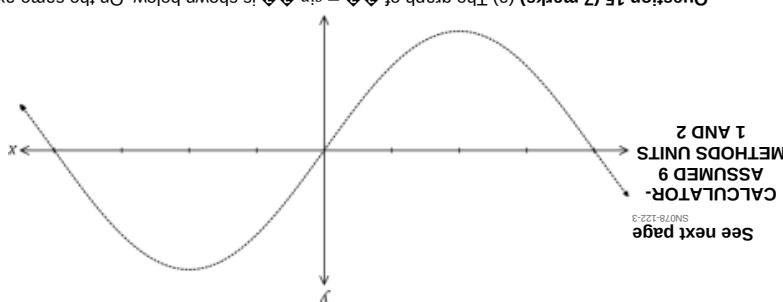
- (a) Part of the circle $x^2 + y^2 = Ax + By + C$ is shown below. Determine the values of the constants A , B and C . (4 marks)

(c) The graph of $y = \cos x$ is shown below. On the same axes, sketch $y = 2\sin(x)$



its
asymptotes. (3
marks)

(b) The graph of $y = \tan x$ is shown below. On the same axes, sketch $y = \tan(x - \frac{\pi}{4})$, and all



See next page
SN078-122-3

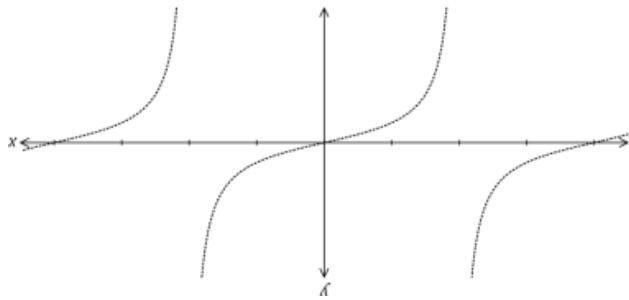
CALCULATOR-
ASSUMED 9
METHODS UNITS →
1 AND 2

Determine the value of θ . (1 mark)

(d) Container A first holds more water than container B at the end of minute t . (1 mark)

Question 15 (7 marks) (a) The graph of $y = \sin 2x$ is shown below. On the same axes, sketch $y = \sin x$

(iii) State, to the nearest ml, how much more water A contains than B at this time. (1 mark)



its
asymptotes. (3
marks)

METHODS UNITS 1 AND 2 CALCULATOR-ASSUMED

(b) The graph of $y = \tan x$ is shown below. On the same axes, sketch $y = \tan(x - \frac{\pi}{4})$, and all

seconds after observations began was given by

$$h = 6.5 \cos(\frac{t}{25}) + 8, t \geq 0.$$

(a) Draw the graph of the height of the seat against time on the axes below. (4 marks)

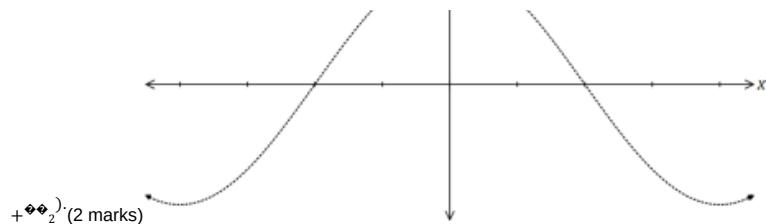
SN078-122-3 See next page

Question 18 (8 marks)

METHODS UNITS 1 AND 2 CALCULATOR-ASSUMED

The height, h metres, above level ground of a seat on a steadily rotating Ferris wheel t

marks)



(c) Justifying your answer with conditional probabilities, comment on whether being in arrears with rates is independent of the suburb the property is in. (3 marks)

SN078-122-3 See next page

METHODS UNITS 1 AND 2 10 CALCULATOR-ASSUMED

Question 16 (8 marks)

A council took a random sample of 154 and 127 properties from suburbs $\diamond\diamond$ and $\diamond\diamond$ respectively. A total of 49 of the properties in the sample were in arrears with their rates, and 27 of these properties were in suburb $\diamond\diamond$. 'In arrears' means that payment of rates is overdue.

- (a) Council officers wanted to choose 5 of the properties that were in arrears. How many different selections of properties are possible? (2 marks)

- (b) Determine the probability that one randomly chosen property from the sample

- (i) is in suburb $\diamond\diamond$ and is in arrears. (2 marks)

See next page SN078-122-3

CALCULATOR-ASSUMED 11 METHODS UNITS 1 AND 2

Question 17 (8 marks)

Two water containers, initially empty, are being filled with water. The amount of water added to container $\diamond\diamond$ each minute follows an arithmetic sequence, with 3 mL poured in during the first minute and 6 mL poured in during the second minute. The amount of water added to container $\diamond\diamond$ each minute follows a geometric sequence, with 2 mL poured in during the first minute and 2.2 mL poured in during the second minute.

- (a) The amount of water poured into container $\diamond\diamond$ during the $\diamond\diamond^{\text{th}}$ minute is given by $\diamond\diamond(\diamond\diamond)^{\diamond\diamond-1}$. State the value of the constants $\diamond\diamond$ and $\diamond\diamond$. (2 marks)

- (b) Determine the total amount of water in container $\diamond\diamond$ at the end of the 25th minute. (2 marks)

- (ii) is not in arrears given that it is in suburb $\diamond\diamond$. (1 mark)