

Important note to candidates

End of paper.

To be provided by the candidate
Standard items: pens, pencils, pencil sharpener, eraser, correction fluid, ruler, highlighters
Special items: drawing instruments, templates, notes on two unruled sheets of A4 paper, and up to three calculators satisfying the conditions set by the Curriculum Council for this examination

Formula Sheet (referred from Section One)
This Question/Answer Booklet
 To be provided by the supervisor

Materials required/recommended for this section

Reading time before commencing work: 10 minutes
 Working time for this section: 100 minutes

Time allowed for this section

Calculator-assumed

Section Two:

NAME: _____	TEACHER: Belonogoff	Benkó	Fletcher	Goh	Langleay	Pui
(Circle one name)	Rigeford	Robinson	Tandy	Tay	White	Whyte



In the town of Margaret River, the annual rainfall is normally distributed with a standard deviation of 380 mm. If there is only a 10% chance that the annual rainfall is greater than 2050 mm, determine the mean annual rainfall.

(c)

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.

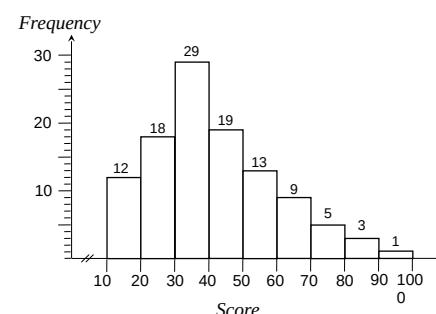
- (b) The annual rainfall in equatorial Batam island, is normally distributed with a mean of 1300 mm and a standard deviation of 250 mm. According to this model, and assuming that the situation does not change, in every one hundred years how many years would you expect the rainfall to be:
- (i) less than 850 mm
 - (ii) more than 1600 mm
 - (iii) between 850 mm and 1600 mm

Instructions to candidates						
Marks available	Suggested time available (minutes)	Number of questions to be answered	Working time available	Section One:	Calculator-free	Section Two:
120				Calculator-assumed	13	13
80					100	100
40					50	50
Determine Question 13 (1,1,1,1,3 marks)	P($X < 55$) where $X \sim N(45, 10^2)$	1.	The rules for the conduct of Western Australian external examinations are detailed in the Year 12 <i>Information Handbook 2010</i> . Sitting this examination implies that you agree to abide by these rules.	Section Two: Write answers in this Question/Answer Booklet. All questions should be answered.	It is recommended that you do not use pencil except in diagrams.	P($30 < X < 60$) where $X \sim N(40, 81)$
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 marked.	Instructions that you are continuing to a particular question.	3.	You must be careful to confine your responses to the specific questions asked and to follow any instructions that start with 'You must ...'.	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.	number of the question(s) that you are continuing to answer at the top of the page. original answer where the answer is continued, i.e. give the page number. Fill in the continuing answer. If you need to use the space to continue an answer, indicate in the planning; If you use spare pages for planning, indicate this clearly at the top of the page.

QUESTION	MARKS AVAILABLE	STUDENT MARK
1	6	
2	3	
3	4	
4	8	
5	8	
6	6	
7	12	
8	8	
9	5	
10	6	
11	3	
12	4	
13	7	
TOTAL	80	

Question 12 (4 marks)

The histogram below shows the distribution of scores achieved by students in a Mathematics exam.



Describe the distribution of marks in this exam.

(v) How long (in months) will it take them to completely pay off the loan?

(iv) Write a recursive formula to determine the amount owing at the start of each month.

(iii) Complete the last 2 rows of the table (round your answers to the nearest cent).

(ii) What is the yearly interest rate?

(i) What is the monthly interest rate?

Month	Balance at start of month	Interest	Repayment	Balance at end of month
1	250 000.00	1 250.00	2 500.00	248 750.00
2	248 750.00	1 243.75	2 500.00	247 493.75
3	247 493.75	1 237.47	2 500.00	246 231.22
4	246 231.22	1 231.16	2 500.00	244 962.37
5	244 962.37	1 224.81	2 500.00	243 687.19
6	243 687.19	1 218.44	2 500.00	242 117.62
7	242 117.62	1 212.03	2 500.00	241 117.65
8	241 117.65	1 205.59	2 500.00	239 823.24
9	239 823.24	1 199.12	2 500.00	238 522.36
10	238 522.36	1 192.61	2 500.00	237 214.97
11	237 214.97	1 186.07	2 500.00	235 901.04
12	235 901.04	1 179.51	2 500.00	234 580.55
13	234 580.55	1 172.90	2 500.00	233 253.45
14	233 253.45	1 166.27	2 500.00	231 919.72
15	231 919.72	1 159.60	2 500.00	230 579.32
16	230 579.32	1 152.90	2 500.00	229 232.21
17				2500.00
18				2500.00

of the loan.

Mr and Mrs Smith have borrowed \$250 000 to purchase a unit for their son. They would like to repay their loan at \$2 500 per month. Below is a monthly summary for the first 18 months of the repayment

Question 1. (1,1,2,1,1 marks)

SECTION B APPROVED CALCULATORS PERMITTED FOR THIS SECTION

(a) Estimate the population of black bream in the Swan River in June last year.

In January last year, 150 black bream were tagged and released into the Swan River. In June the same year, during a fishing competition, 40 black bream were caught and 8 of them had tags. The tagged fish were released back into the river.

(b) Does the population of black bream in the Swan River appear to be increasing or decreasing?

Another fishing competition in January this year resulted in 60 black bream being caught. Fifteen of these had tags.

Justify your answer.

Question 2. (1,1,1 marks)

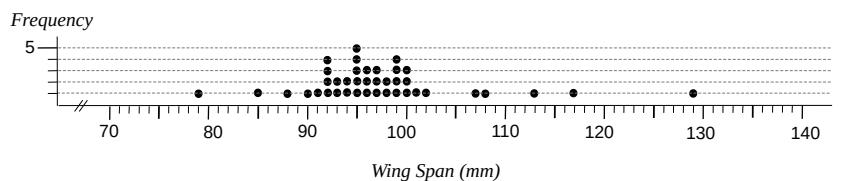
Each year the value of a car depreciates by 15% of its value at the beginning of that year. If the car is initially worth \$20 000, determine:

- (a) an expression for the value, V , of the car after n years.

- (b) the value of the car after 10 years.

- (c) in how many years' time will the value of the car fall below \$1000? (to the nearest year.)

A scientist collects 40 butterflies of a particular species and measures the lengths of the wing span of each one. The lengths, to the nearest millimetre, are shown in the dot frequency diagram below.



- (a) Calculate the mean and standard deviation for this set of lengths.

- (b) What percentage of the lengths lie within one standard deviation of the mean (i.e. $\text{mean} \pm 1 \text{ s.d.}$)?

- (c) Determine the interquartile range for this set of data?

- (d) Is the length of *one* particular butterfly with a wing span of 129 mm considered an outlier in this data set? Explain.

Question 11 (1,2 marks)

Question 10 (3,1,1,2 marks)

(Give your answer in metres per minute.)
 How fast was she „walking“ in the period a few minutes before arriving in school?

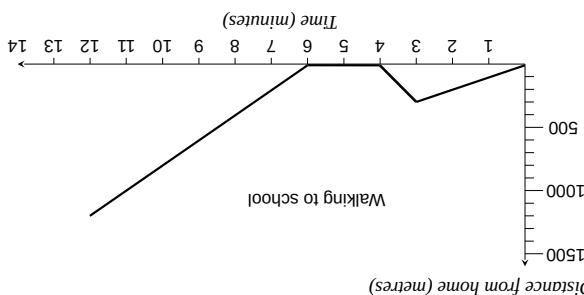
(ii) A when $R = 0.45$ ohms.

(d) What do you think happened in the two-minute period between 4 minutes and 6 minutes?

(c) What did she do and how long did it take?

(b) How far was she from home?

(a) When did Amy realize that she had forgotten her homework?



Amy started walking to school from home at 8.15 a.m. The graph below shows the distance from home against her walking time. This morning the walk to school was unusual.

The resistance, R ohms, to the flow of electricity in a wire varies inversely as the area of cross-section

(a) Given that when $A = 0.15 \text{ cm}^2$, $R = 0.24$ ohms.

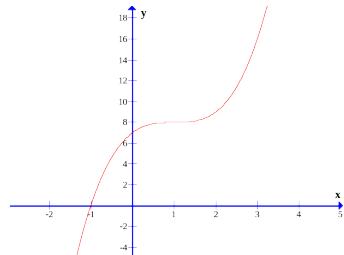
of the wire, A .

Write an equation connecting the two variables R and A .

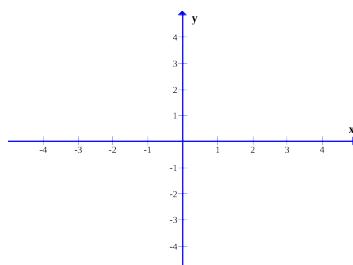
Question 3 (2,1,1 marks)

Question 4 (4,4 marks)

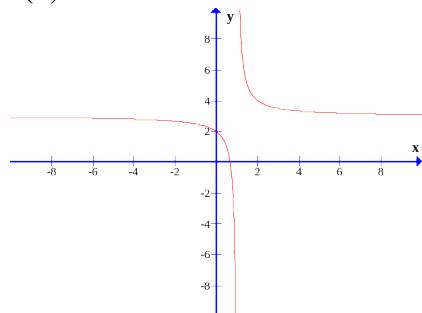
(i)



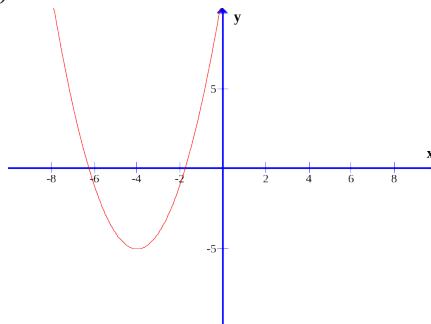
(ii)



(iii)



(iv)



(a) Match the graphs of the above curves with the following equations:

$$y = \sqrt{x+a}$$

$$y =$$

$$\frac{1}{x+b} + c$$

$$y = (x+d)^3 + e$$

$$y = f^x + g$$

$$y = (x+h)^2 + j$$

Write the equation in the table provided below.

Graph (i)	Graph (ii)	Graph (iii)	Graph (iv)

looks towards the lighthouse and then towards the ship these two directions make an angle of 42° with each other. If the captain on the ship looks towards the observation position and then towards the lighthouse these two directions make an angle of 110° with each other. (The ship, the lighthouse and the observation position may all be assumed to be at sea level).

(i) Draw a clearly labelled diagram below to show the situation.

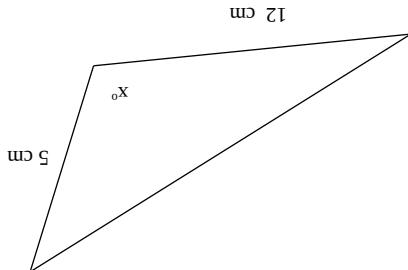
(ii) How far is the ship from the lighthouse?

a	b	c	d	e	f	g	h	j
---	---	---	---	---	---	---	---	---

- (b) Hence, find the unknowns (i.e. a, b, c, d, e, f, g, h, j) related to each equation respectively and write your answer in the table provided below. (Write n/a if not applicable.)

A coastal observation position is known to be 3 km from a lighthouse. The coastguard in the observation position is in radio and visual contact with a ship in distress at sea. If the coastguard

(Diagram not drawn to scale)

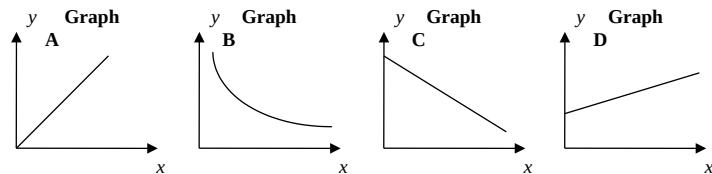


- (a) Determine the possible value/s of x (in degrees) given that the triangle has an area of 22.3 cm^2 .

Question 5 (1,1,1,1,2,2 marks)

(a)

The graphs below represent four different relationships between the variables x and y .



(d) Simplify, and hence evaluate:

(i)
$$\frac{3^{n+2} + 18}{10 + 5 \times 3^n}$$

(i) Which graph(s) represent a direct proportion between x and y ?

(ii) Which graph(s) represent an inverse proportion between x and y ?

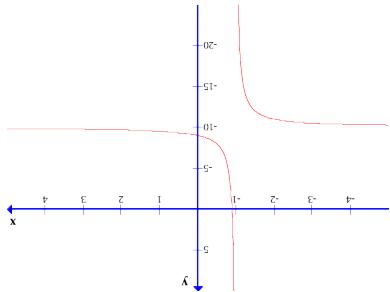
(iii) Suggest an equation that would represent:

(I) Graph B

(ii)
$$\frac{3(2^{n+1}) - 4(2^{n-1})}{2^{n+1} - 2^n}$$

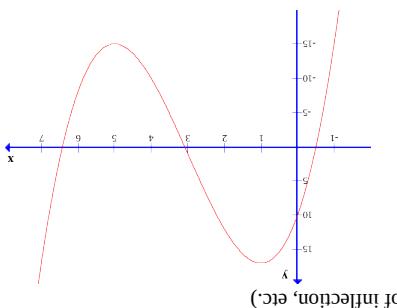
(II) Graph D

Question 8 (2,2,2,marks)



- (c) The hyperbolic curve below has both horizontal and vertical asymptotes. State the value/s of x and y for which the asymptotes occur.

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- (b) For the cubic graph reproduced below, give a qualitative description of the function in the spaces below. (Note: calculations are not required.) However, you may wish to consider the following of inflection, etc.)

(b) For the cubic graph reproduced below, give a qualitative description of the function in the spaces below. (Note: calculations are not required.) However, you may wish to consider the following of inflection, etc.)

(ii) What is the greatest height reached?

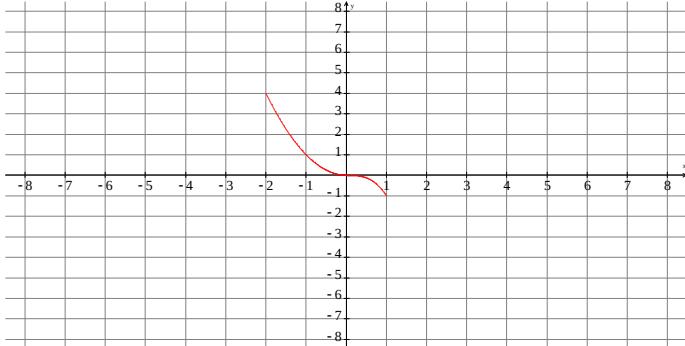
(i) When does its speed drop to zero?
A rocket is fired upwards and its initial speed is 147 metres per second. After 1 second its speed is reduced by 9.8 ms^{-1} . After the next second it is 127.4 ms^{-1} , and each subsequent second its speed is reduced by 9.8 ms^{-1} .

(c) When does its speed drop to zero?

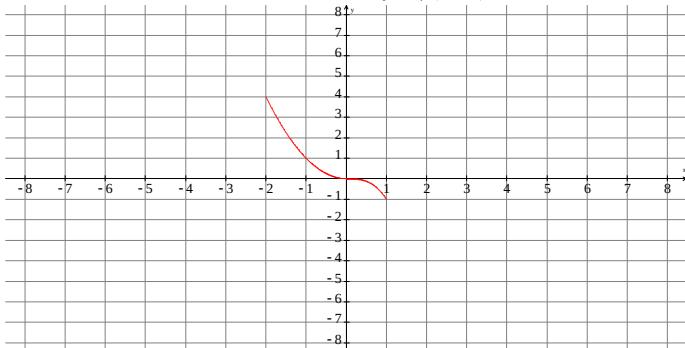
Question 6 (6 marks)

A function $y = f(x)$ is constructed from parts of a cubic and parabolic functions as shown in the diagram below.

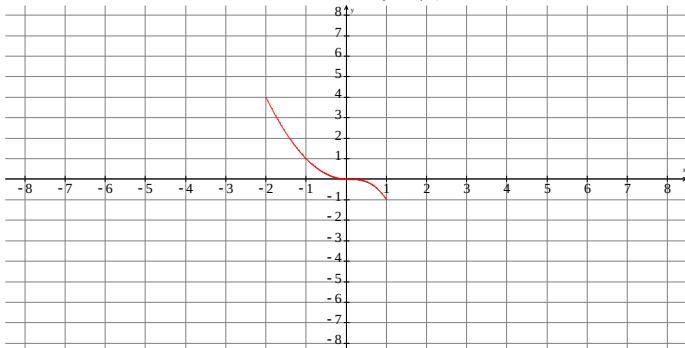
- (a) Show on the axes below the function defined as $y = -f(x)$



- (b) Show on the axes below the function defined as $y = f(x+6) - 2$



- (c) Show on the axes below the function defined as $y = f(0.5x - 2)$



Question 7 (2,2,2,2,2 marks)

- (a) A sequence is defined by $T_{n+1} = 3T_n$ with $T_1 = 5$. Determine the sixth term, T_6 .

- (b) A sequence has the recursive formula $T_{n+1} = (-1)^{n+1} \cdot 2 \cdot T_n$ with $T_1 = 3$. Determine the fifth term.