



CATHOLIC SECONDARY SCHOOLS
ASSOCIATION OF NEW SOUTH WALES

2010 TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION

Mathematics

Morning Session Monday 9 August 2010



General Instructions

- Reading time 5 minutes
- Working time 3 hours
- Write using blue or black pen
- Board-approved calculators may be used
- A table of standard integrals is provided on the back page
- All necessary working should be shown in every question
- Write your Centre Number and Student Number at the top of this page

Total marks - 120

- Attempt Questions 1–10
- · All questions are of equal value

Disclaimer

Every effort has been made to prepare these 'Trial' Higher School Certificate Examinations in accordance with the Board of Studies documents, Principles for Setting HSC Examinations in a Standards-Referenced Framework (BOS Bulletin, Vol 8, No 9, Nov/Dec 1999), and Principles for Developing Marking Guidelines Examinations in a Standards Referenced Framework (BOS Bulletin, Vol 9, No 3, May 2000). No guarantee or warranty is made or implied that the 'Trial' Examination papers mirror in every respect the actual HSC Examination question paper in any or all courses to be examined. These papers do not constitute 'advice' nor can they be construed as authoritative interpretations of Board of Studies intentions. The CSSA accepts no liability for any reliance use or purpose related to these 'Trial' question papers. Advice on HSC examination issues is only to be obtained from the NSW Board of Studies.

6200-1

Total marks - 120

Attempt Questions 1-10

All questions are of equal value.

Answer each question in a SEPARATE writing booklet.

Question 1 (12 marks) Use a SEPARATE writing booklet.

(a) Find the value of $\sin 30^{\circ} - \tan 135^{\circ}$.

1

(b) Factorise $x^3 - 1$.

1

(c) Evaluate $\log_3 63 - \log_3 7$.

2

(d) Write $\frac{5}{2-\sqrt{3}}$ with a rational denominator.

2

(e) Solve |x+3| < 8.

2

(f) Solve simultaneously

2

$$\frac{x}{6} - \frac{y}{4} = 1$$

$$5x + y = 13$$
.

(g) Given the curve $y = ax^2 - 8x + 9$ has a stationary point at x = 2, find the value of

Question 2 (12 marks) Use a SEPARATE writing booklet.

(a) Find the equation of the tangent to the curve $f(x) = 2\sin x$ at the point $(\pi, 0)$.

2

- (b) Differentiate
 - (i) $\frac{1}{(2x+5)^3}$

2

(ii) $x \ln x$.

2

(c) (i) Find $\int \left(1+\sec^2 \pi x\right) dx$.

2

2

(ii) Evaluate $\int_{0}^{\ln 2} e^{3x} dx$. 3 123 34

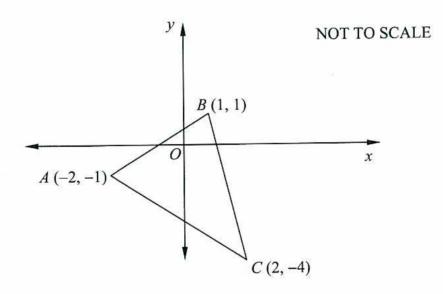
2

(d) Evaluate $\sum_{k=2}^{5} (-1)^k \left(\frac{1}{k}\right)$.

Question 3 (12 marks) Use a SEPARATE writing booklet.

- (a) A factory is testing a new rechargeable battery.

 On the first charging it retains power for 121 hours. It retains power for 88 hours on the second charging and 64 hours on the third.
 - (i) The life of the battery continues to decrease in the same ratio. Find the ratio.
 - What is the total life of the battery if it continues to be charged in this manner?
 (Leave your answer in hours and minutes).
- (b) The diagram shows the points A(-2, -1), B(1, 1) and C(2, -4).



- (i) Calculate the length of the interval AB.
- (ii) Find the equation of the line AB.
- (iii) Show that the perpendicular distance from C to the line AB is $\frac{17}{\sqrt{13}}$.

1

2

1

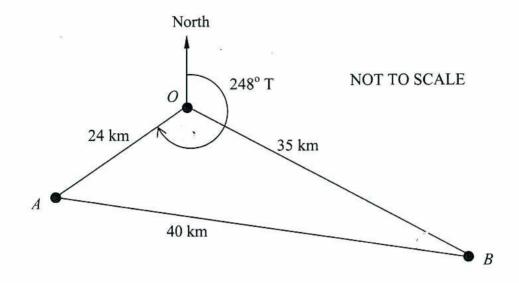
1

(iv) Hence, calculate the area of triangle ABC.

Question 3 continues on page 5

Question 3 (continued)

(c) A section of rainforest is to be designated for a species count. The shape is shown below. The bearing of landmark A from landmark O is 248°T and is 24 km in distance. The distance from landmark A to B is 40 km and from landmark B to O is 35 km.



(ii) Use the cosine rule to show ∠AOB is 83°.
(iii) Hence, calculate the area of this section of the rainforest.
(iii) What is the bearing of landmark O from landmark B?
2

End of Question 3

Question 4 (12 marks) Use a SEPARATE writing booklet.

(a) Solve $\log_3(2x-1) = 2$.

- 2
- (b) There are two groups of people at a party and Minh is blind-folded. In the first group there are 4 men, 3 women and 2 children. In the second group there are 7 men and 5 women.

Minh is spun around and asked to select one person at random.

- (i) Find the probability that Minh approaches a person in the first group and then selects a woman.

1

(ii) Find the probability that a woman from either group is selected.

2

- (c) The first three terms of an arithmetic series are 48, 41 and 34.
 - (i) Find an expression for k^{th} term.

1

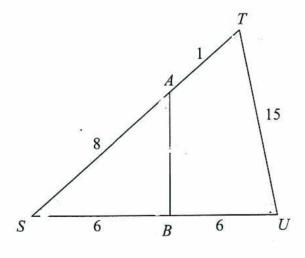
(ii) Find the 45th term.

1

(iii) Find the sum of the first 45 terms.

1

(d)



NOT TO SCALE

(i) Prove triangle SAB is similar to triangle SUT.

3

(ii) Hence, find the length of AB.

Question 5'(12 marks) Use a SEPARATE writing booklet.

- (a) Consider the curve with equation $y = x^4 8x^2 + 16$.
 - (i) Prove that the function is even.

1

(ii) Show that $\frac{dy}{dx} = 4x(x-2)(x+2)$.

2

(iii) Find the stationary points and determine their nature.

3

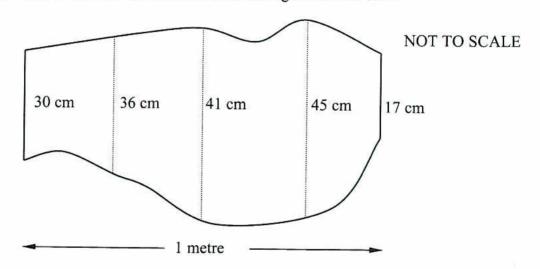
(iv) Sketch the curve showing all important features.

2

(v) Find the values of x for which the curve is decreasing.

1

(b) Suraj needs to estimate the area of the following hole in the wall.



(i) Copy and complete the table below.

1

Distance from left edge (cm)	0		j.	100
Height of hole (cm)	30	36		

(ii) Use Simpson's Rule and all the values from the table to find an approximation for the area of the hole.

Question 6 (12 marks) Use a SEPARATE writing booklet.

(a) The amount of garbage waste W per annum of a small town is known to be increasing exponentially according to the formula $W = W_0 e^{kt}$, where W_0 and k are constants and $t \ge 0$.

In 2003, the garbage waste weighed 180 000 tonnes while in 2010, it weighed 325 000 tonnes.

- (i) Find the value of W_0 and \underline{k} .
- (ii) Estimate the amount of garbage waste in 2050.

2

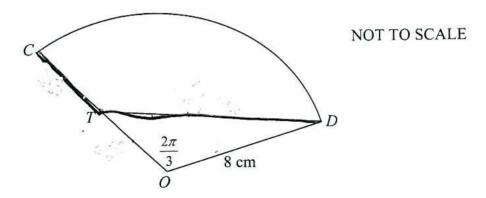
2

1

2

3

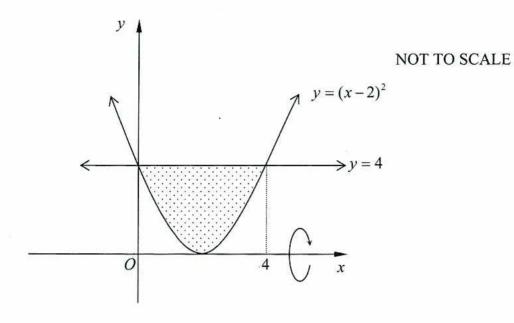
- (iii) At what rate will the garbage waste be increasing during 2050?
- (b) Consider the curve $y=3\cos 2x$ in the domain $-\pi \le x \le \pi$.
 - (i) State the amplitude of the curve.
 - (ii) Sketch the curve in the given domain.
- (c) In the diagram, CD is an arc of a circle with radius 8 cm and centre O. T is the midpoint of OC. Angle COD is $\frac{2\pi}{3}$.



Find the perimeter of CTD in exact form.

Question 7 (12 marks) Use a SEPARATE writing booklet.

(a) The shaded region bounded by the graph $y = (x-2)^2$ and the line y = 4 is rotated about the x-axis to form a solid of revolution as shown in the diagram.



Find the volume of the solid formed. Leave your answer in exact form.

4

1

2

1

2

- (b) The velocity, \dot{x} , in m/s of a particle moving in a straight line is given by $\dot{x} = 1 2\sin t$ for $0 \le t \le 2\pi$, where t is the time in seconds. The particle is initially at x = 2.
 - (i) Find the initial velocity.
 - (ii) At what time(s) is the acceleration zero?
 - (iii) Find the maximum velocity of the particle during this period.
 - (iv) Find the first time the particle changes direction during this period.
 - (v) Hence, or otherwise, find the distance travelled by the particle between t = 0 and the first time the particle changes direction.

Question 8 (12 marks) Use a SEPARATE writing booklet.

(a) The quadratic equation $x^2 - 4Ax + 6B = 0$ has two different real roots α and β .

(i) Show that $2A^2 > 3B$.

- (ii) Find the range of values of B if the sum of the roots is equal to the product of the roots.
- (b) Helen borrows \$25 000 from her local bank. The loan plus interest and charges are to be repaid at the end of each month in equal monthly instalments of \$\overline{F}\$ over five years. Interest is charged at 6% p.a. and is calculated on the balance owing at the beginning of each month. Furthermore, at the end of each month a bank charge of \$15 is added to the account balance.

Let A_n be the amount owing after n months.

(i) Write down an expression for A_1 .

(ii) Deduce that the amount owing after three months is given by

$$A_3 = 25\ 000 \times 1.005^3 - (F) - 15)(1 + 1.005 + 1.005^2).$$

- (iii) Hence write an expression for A_n .
- (iv) Find Helen's monthly instalment \$F, correct to the nearest cent.

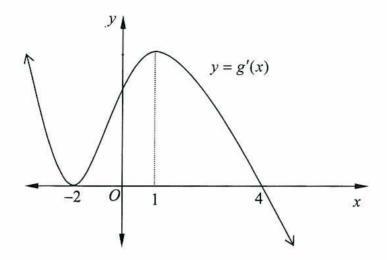
Question 9 (12 marks) Use a SEPARATE writing booklet

(a) Use the table of standard integrals provided to find $\frac{d}{dx}(\sec x)$.

1

3

(b) The graph of y = g'(x) is shown below.



Copy the graph onto your writing booklet.

There are two stationary points on y = g(x).

Determine their x-coordinates and nature.

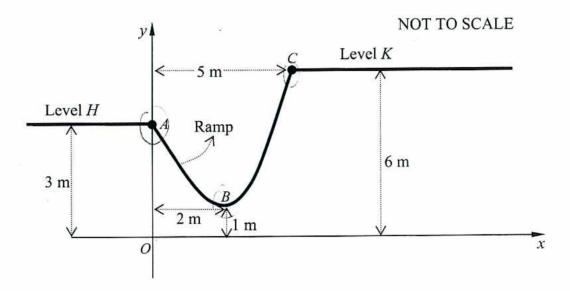
On the same diagram, draw a possible sketch of y = g(x) showing all important features.

Question 9 continues on page 12

Question 9 (continued)

(c) The city council of Gausstown has decided to build a skateboard ramp for its teenagers. The structure will consist of two levels, H and K and the ramp itself as shown in the diagram. The engineers believe that if the ramp has a gradient of 3 or greater at any point, it will be too dangerous to use.

Below is a cross-section of the proposed ramp.



The ramp ABC is given by the equation $y = \frac{8x^2}{15} - \frac{31x}{15} + 3$ for $0 \le x \le 5$.

- (i) Use the information given in the cross-section to write down the coordinates of the points B and C. The point A is (0,3).
- (ii) Determine the maximum gradient possible of the ramp over this domain.

2

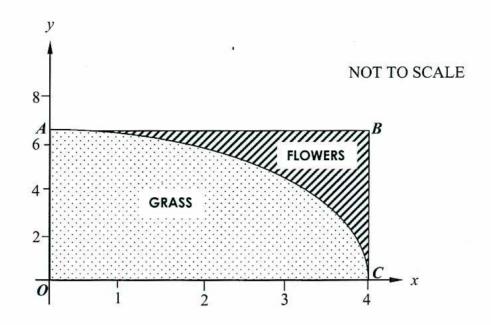
2

2

(iii) What is the greatest height that Level K may be constructed so that the ramp is deemed safe? Give your answer correct to 1 decimal place.

End of Question 9

Question 10 (12 marks) Use a SEPARATE writing booklet.



The diagram above represents a rectangular garden OABC. The garden's width AB is 4 metres and its length OA is $4 \log_e 5$ metres.

The garden is divided into two sections by a curve having the form $y = 4 \log_e (ax + b)$.

The lower section contains grass while the upper section contains flowers.

(i) Find the area of the garden *OABC* in exact form.

1

(ii) Show that a = -1 and b = 5.

2

(iii) Show that the area of the grassed section is given by

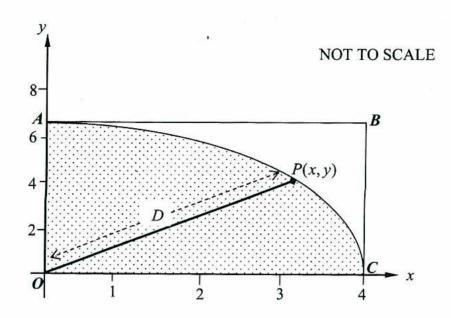
3

$$\int_{0}^{4\log_e 5} \left(5 - e^{\frac{y}{4}}\right) dy$$
 and find this area in exact form.

(iv) Using part (i) and part (iii) to show that the area of the flower section is (16-4log_e 5) m².

Question 10 continues on page 14

Question 10 (continued)



A sprinkler system is to be installed by using a straight line hose from the origin O to a point P(x, y) on the curve.

(v) Show that the distance, D, from the origin O to P is given by

$$D^2 = x^2 + 16 \left[\log_e (5 - x) \right]^2$$
.

(vi) Prove that
$$\frac{dD^2}{dx} = \frac{2x^2 - 10x + 32\log_e(5 - x)}{x - 5}$$
.

(vii) Hence, establish that the minimum length of straight line hose occurs when x is approximately equal to 3.63 metres.

End of Question 10

End of Paper

EXAMINERS

Kimon Kousparis (convenor) Casimir Catholic College, Marrickville

Magdi Farag LaSalle Catholic College, Bankstown

Kathleen Roffey Trinity Catholic College, Auburn / Regents Park

Svetlana Onisczenko Sydney Grammar School, Darlinghurst



2010 TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION CATHOLIC SECONDARY SCHOOLS ASSOCIATION MATHEMATICS - SUGGESTED SOLUTIONS

awarded in line with the quality of responses. These guidelines are suggested and not prescriptive. This is not intended to be an exhaustive list but rather an indication of the considerations that These marking guidelines show the criteria to be applied to responses along with the marks to be students could include in their responses.

Question 1 (12 marks)

(a) (1 mark)

Outcomes Assessed: P3

Targeted Performance Bands: 2-3

	the correct answer.
--	---------------------

Sample answer sin 30° – tan 135°

BLANK PAGE

 $=\frac{1}{2}-(-1)$

13

Outcomes Assessed: P3 (b) (1 mark)

Targeted Performance Bands: 2-3

Correctly factorises the expression.

Criteria

Mark

Sample answer x^3-1 $=(x-1)(x^2+x+1)$

The information contained in this document is intended for the professional assistance of leaching stall, it does not constitute achies to students. Further it is not the intention of CSSA by provide sporting nation professional final HSS asserts. Rather the purpose is to provide isoches with information so that they can better explore, understand and apply HSS marking requirements, as established by the KSH Board of Studes. However, they are application or the KSH Board of Studes. However, they are application or the profession or profession or answer. The CSSA asserties no listality or responsibility for the accuracy, comprehenses or usefulness of any Marking Guidelines provided for the Triat HSC papers.

DISCUAINER.
The instruction on the document is intended for the protessional assistance of leading staff. If does not consistive advice to students. Further it is not the intention of ICSSA to provide specific making outcomers, as established by the ICSIA busines. So provide leadings with internation as that they can be the explore, understand and appt HSC internation proteinments, as established by the ICSIA busines.

No parameter or warrantly is raise or impost the application or an exploration or assurer. The CSSA assures no lishtly or responsibility for the application or underlatess or underlates of any Maring Gardelines provided for the Trial HSC papers.

(c) (2 marks)

Outcomes Assessed: H3

Targeted Performance Bands: 3-4

	Criteria	Marks
1	Correctly applies logarithms to simplify the expression.	-
I.	Gives the correct answer.	-

Sample answer

$$\log_3 63 - \log_3 7 = \log_3 \left(\frac{63}{7}\right)$$

$$= \log_3 3^2$$

$$=2\log_3 3$$

(d) (2 marks)

Outcomes Assessed: P3

Targeted Performance Bands: 3-4

Criteria	Ma
Multiplies by the conjugate.	
Gives the correct answer, with a rational denominator.	Jo. 1

Sample answer

$$\frac{5}{2 - \sqrt{3}} \times \frac{2 + \sqrt{3}}{2 + \sqrt{3}}$$

$$= \frac{10 + 5\sqrt{3}}{4 - 3}$$

$$= 10 + 5\sqrt{3}$$

(e) (2 marks)

Outcomes Assessed; P3, P4

Targeted Performance Bands: 2-3

Cincina	THE PERSON
Writes TWO correct inequations.	-
Gives the correct answer.	-

Sample answer

DISCUAINER.

The information contained in this document is intended for the professional assistance of leaching staff. It does not conclude advice to students. Further it is not the intention of the information containing outcomes for all possible Irial HSC answers. Rather the purpose is to provide teachers with information so that they can befor explore, undestand and apply HSC making requirements, as established by the NSM Reard of Studens.

No guarantee or warranty is requirement, and the application or use of CSSA Maring Custelines in relation to any spoof trible carn question or answer. The CSSA assumes or warranty is executable the accuracy, completions or useful CSSA Maring Custelines provided for the Irial HSC papers.

2

(f) (2 marks)

Targeted Performance Bands: 3-4 Outcomes Assessed: P3, P4

Marks Eliminates ONE variable by correctly. Gives the correct answers for x and y.

Sample answer

$$\frac{x}{6} - \frac{y}{4} = 1$$
 ①
$$5x + y = 13$$
 ②
Multiply equation ① by 12, $2x - 3y = 12$ ③
Multiply equation ② by 3, $15x + 3y = 39$ ④
Adding equations ③ and ④, $17x = 51$
Therefore, $x = 3$
Substitute back into equation ②, $y = -2$

(g) (2 marks)

Outcomes Assessed: P7

Targeted Performance Bands: 3-4

Criteria	Mari
Correct derivative.	
Gives the correct answer.	

Sample answer

$$y = ax^2 - 8x + 9$$
$$\frac{dy}{dx} = 2ax - 8$$
$$3x - 3 \frac{dy}{dx} = 0$$

at
$$x = 2$$
, $\frac{dy}{dx} = 0$

$$4a - 8 = 0$$
$$4a = 8$$

$$a=2$$

DSCLAIMER
The information contained in the document is infanded to the professional assistance of leaching staff it does not constitute advice to students. Further it is not the intention of CSSA to provide specific marking outcomes for all possible Trial HSC answers. Rether the purpose is to provide leachers with information so that they can before explicit, understand and apply HSCS marking requirements, as established by the HSVB basen of Shudies.

No parameters or warranty is made or implied with respect to the application or use of CSSA Marking Guidelines provided for the Trial HSC papers.

Question 2 (12 marks)

(a)(2 marks)

Outcomes Assessed: P7, P8

Targeted Performance Bands: 3-4

Criteria	Marks
Differentiates correctly and determines the gradient at $(\pi, 0)$.	-
Uses the equation of a line to determine the tangent.	-

Sample answer

 $f(x) = 2\sin x$

 $f'(x) = 2\cos x$ $f'(\pi) = 2\cos \pi$

Substituting into the equation of a line,

 $y-0=-2(x-\pi)$ $y = -2x + 2\pi$

(b) (i)(2 marks)

Outcomes Assessed: P7, P8

Targeted Performance Bands: 2-4

	Criteria	Marks
-	Differentiates using the chain rule but has ONE mistake.	_
_	Gives the correct answer.	_

Sample answer

$$\frac{d}{dx} \left(\frac{1}{(2x+5)^3} \right) = \frac{d}{dx} \left[(2x+5)^{-3} \right] = -3(2x+5)^4 \times 2$$

$$= \frac{-6}{(2x+5)^4}$$

(b) (ii)(2 marks)

Outcomes Assessed: P7, P8, H3

Targeted Performance Bands: 3-4

	CHICHE	
1	Differentiates using the product rule but has ONE mistake.	-
1	Gives the correct result.	-

Sample answer

$$\frac{d}{dx}(x\ln x) = x\left(\frac{1}{x}\right) + \ln x$$

$$= 1 + \ln x$$

DISCUAINER.
The information on take document is intended for the professional assistance of leading staff, it does not consistate achieve to students. Further it is not the intention of The information contained in this cocument is intended to the processes to provide isochers with information is that they can better explore, understand and apply HSC, making requirements, are stablished by the MSW Reard of Studes.

We parameter and apply HSC making requirements, are stablished by the MSW Reard of Studes.

No parameter and apply HSC making in the profession or use of CSSA Maring Guidelines in relation to any sportific as an expension of answer. The CSSA assumes on teaching the maching the processing of answer. The CSSA assumes to leading the respiratory of the actuary, completeness of making Guidelines provided for the Trial HSC papers.

Outcomes Assessed: H5, H8 (c) (i)(2 marks)

Targeted Performance Bands: 3-4

	Criteria	Marks
Finds the	correct trigonometric primitive but has ONE mistake.	1
Gives the	ves the correct answer.	_

Sample answer

$$\int (1 + \sec^2 \pi x) dx = x + \frac{1}{\pi} \tan \pi x + c$$

(c) (ii)(2 marks)

Targeted Performance Bands: 3-4 Outcomes Assessed: H3, H8

CHELIA	MAINS
 Performs the integration correctly.	1
 Substitutes to give the correctly answer.	1

Sample answer

$$\int_{0}^{1/3} e^{3x} dx = \left[\frac{e^{3x}}{3} \right]_{0}^{1/3}$$

$$= \left(\frac{e^{3\ln 2}}{3}\right) - \left(\frac{e^0}{3}\right)$$

(d) (2 marks)

Targeted Performance Bands: 2-4 Outcomes Assessed: P3, H5, H9

	Criteria	Marks
_	Determines the terms of the sum correctly.	1
	Gives the correct answer	1

Sample answer

$$\sum_{k=2}^{5} (-1)^k \left(\frac{1}{k}\right) = (-1)^2 \left(\frac{1}{2}\right) + (-1)^3 \left(\frac{1}{3}\right) + (-1)^4 \left(\frac{1}{4}\right) + (-1)^5 \left(\frac{1}{5}\right)$$

$$= \frac{1}{4} - \frac{1}{4} + \frac{1}{4} - \frac{1}{4}$$

13

The information contained in this document is intended for the professional assistance of leaching staff it does not constitute advice to students. Further it is not the intention of CSSA to provide specific making automates for all possible that HCS answers. Better the purpose is to provide teachers with information so that they can better explore, undestand and apply HCS marking prejaments, as established by the NSM Board of Studies.

No guarantee or warranty is made or mybold with respect to the application or so of CSSA Marking Guidelines provided for the Trial HCS papers.

Question 3 (12 marks)

(a) (i) (1 mark)

Outcomes Assessed: P3, H5

Targeted Performance Bands: 2-3

Mark	_
Criteria	Determines the ratio correctly.

Sample answer

$$r = \frac{t_2}{t_1}$$

$$=\frac{00}{121}$$

$$=\frac{88}{121}$$

(a) (ii) (2 marks)

Outcomes Assessed: P3, H5

Targeted Performance Bands: 2-3

Substitutes correctly into the limiting sum formula.	-
Determines the answer correctly, in hours and minutes.	-

Sample answer

$$S_{\infty} = \frac{121}{1 - \frac{8}{11}}$$

$$= \frac{121}{\frac{3}{11}}$$

$$= \frac{1331}{3}$$

(b) (i) (1 mark)

= 443 hours and 40 minutes

Outcomes Assessed: P3, P4

Targeted Performance Bands: 3-4

	Criteria	Ma
 Uses the distance formu 	nula to find the correct answer.	-

Sample answer

$$AB = \sqrt{(1+1)^2 + (1+2)^2}$$

 $=\sqrt{2^2+3^2}$

DISCLAMER.
The terminant of the document is intended for the professional assistance of eaching staff it does not constitute advice to stadent. Further it is not the intention of The terminant or constitute and countries for all possible Tital HGC answers. Plante the purpose is to provide lead-tiers with information so that they can before cuptore, understand and apply HGC infortion proteinments, as established by the NSW Board of SMores.

We parameter and and apply HGC infortion proteinments are additionally being the application or and CSSM Advisor, Guidelmes in relation to any spords that missed to the application or answer. The CSSM assumes no biselful you are accepted with inspect to the application of any Making Guidelmes provided for the Trial HGC papers.

Outcomes Assessed: P3, P4 (b) (ii) (2 marks)

Targeted Performance Bands: 3-4

	Critéria	Marks	
•	 Uses the gradient formula to give the correct answer. 	-	
•	 Substitutes correctly into the equation of a line to give the correct answer. 	-	

Sample answer

$$m = \frac{1+1}{1+2}$$

$$y - 1 = \frac{2}{3}(x - 1)$$

$$3y - 3 = 2x - 2$$

 $\therefore 2x - 3y + 1 = 0$

(b) (iii) (1 mark)

Outcomes Assessed: P3, P4

Targeted Performance Bands: 3-4

Substitutes correctly into the perpendicular distance to give the correct

Sample answer

Perpendicular distance =
$$\frac{|\chi(2) - 3(-4) + 1|}{\sqrt{\beta^2 + 3^2}}$$

$$=\frac{|4+12+1|}{\sqrt{13}}$$

= 17

(b) (iv) (1 mark)

Outcomes Assessed: P3, P4

Targeted Performance Band: 3-4

Mark	I	
Criteria	Finds the area correctly.	

Sample answer

Area =
$$\frac{1}{2} \times \sqrt{13} \times \frac{17}{\sqrt{13}}$$

 $=8\frac{1}{2}$ units²

The information contained in this occurrent is intended for the professional assistance of head-rule, all il does not constitute advise to students. Further it is not the whenton of CSSA to provide speake making outcomes for all possible Ties HCS, arouses it to provide teachers with information to that help can be understand and apply HSC marking requirements, as established by the NSW Board of Studes.

Who guaranties or warranty for immigrate the register of the NSW Board of Studes.

Who guaranties or warranty in migrated to the application or used of SSSA Making Guidelines in installed to an amplication or amover. The CSSA assumes to helding for responsiblely for the accuracy, completeness or usefulness of any Making Guidelines provided for the Tital HSC pages.

(c) (i) (1 mark)

Outcomes Assessed: P3, P4

Targeted Performance Band: 3-4

Criteria	sine rule correctly to give the answer.
	e Co
	Applies th
8	1

Sample Answer

$$\cos(\angle AOB) = \frac{24^2 + 35^2 - 40^2}{2 \times 24 \times 35}$$

$$\angle AOB = \cos^{-1} \left(\frac{24^2 + 35^2 - 40^2}{2 \times 24 \times 35} \right)$$
= 83°

(c) (ii) (1 mark)

Outcomes Assessed: P3, P4

Targeted Performance Band: 3-4

Sample Answer

nple Answer
$$A = \frac{1}{2} \times 24 \times 35 \times \sin 83^{\circ}$$
= 416.8693...

 $= 417 \, \text{km}^2$

(c) (iii) (2 marks)

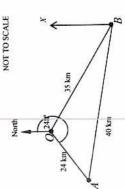
Outcomes Assessed: P3, P4

Targeted Performance Band: 3-4

	Criteria	Marks
	Correctly determines the size of the angle between the North line and the interval AB	-
	IIICI VAI AD.	
1	Determines the correct bearing.	_

Sample Answer

The angle between the North line and the interval AB is $248 - 83 = 165^{\circ}$.



Therefore the bearing of O from B ZXBO= 15° (co-interior angles). is 360-15 = 345 T.

The information contained in the document is intervied for the professional assistance of teaching staff it does not constitute arbors to achieve it is not the interview of the region of containing and possible. This HSC answers Selfare to purpose is to provide instruments and interview and their regions of the HSW Board of Staffer to propose is to provide instruments are destablished by the HSW Board of Staffer to provide instruments are selfared by the HSW Board of Staffer to provide instruments are not account to the parameter of the selfared with regions to the application or use of CSSA Markay Guidelines involved in any specific that invarience are assisted to responsibility for the accuracy, completeness or usefuress of any Markay Guidelines provided for the HIP HSP inverse. DISCLAIMER

00

Question 4 (12 marks)

(a) (2 marks)

Outcomes Assessed: H3

Targeted Performance Band: 3-5

Mark

Criteria	Marks
Writes as an exponential equation.	1
Gives the correct answer.	1

Sample Answer

$$\log_3(2x-1) = 2$$
$$3^2 = 2x - 1$$

$$9 = 2x - 1$$

x = 5

(b) (i) (1 mark)

Outcomes Assessed: H5, H9

Targeted Performance Band: 3-4

Criteria	-
Crit	Gives correct answer.

Sample Answer

Group 1: 4 men, 3 women, 2 children

Group 2: 7 men, 5 women

$$P(Group 1, woman) = \frac{1}{2} \times \frac{3}{9}$$

$$= \frac{1}{6}$$

(b) (ii) (2 marks)

Targeted Performance Band: 3-4 Outcomes Assessed: H5, H9

Criteria	Mar
Girac the TWO probabilities	
-	
Gives the correct answer.	A CONTRACTOR OF THE PROPERTY O

Sample Answer

P(choosing a woman) = probability of choosing a woman from group 1 OR group 2

$$= \frac{1}{6} + \frac{1}{2} \times \frac{5}{12}$$

$$= \frac{3}{8}$$

DISCLAMER The interaction of the document is retarded for the protessional assistance of leaching staff. It does not consistute achieve to students. Further it is not the interaction of CSSA to provide specific making outcomes for all possible Tital HSQ answers. Refers the purpose is to provide leachers with information so that they can believe explore, understand and apply HSQ making patientness, as established by the HSW based of Studies. Southers. We guarantee or warranty is make or misped with mapped to the application or use of CSSA Making Guidelines in relation to any specific trial exam question of answer. The CSSA assumes no leaking or expressibility for the accuracy, completeness or usefulness of any Matring Guidelines provided for the Tital HSC papers.

(c) (i) (1 mark)

Outcomes Assessed: H5

Targeted Performance Band: 3-4

Mar	_
Criteria	Gives the correct answer in simplest form.

Sample Answer

$$48 + 41 + 34 + \dots$$
 $d = -7$, $a = 48$

$$T_k = a + (k-1)d$$

$$T_k = 48 + (k-1)(-7)$$

 $T_k = 48 - 7k + 7$
 $T_k = 55 - 7k$

$$T_k = 55 - 7k$$

(c) (ii) (1 mark)

Outcomes Assessed: H5

Targeted Performance Band: 3

Mark	
Criteria	
	Gives the correct answer.

Sample Answer

$$T_{45} = 55 - 7(45)$$

$$T_{45} = -260$$

(c) (iii) (1 mark)

Outcomes Assessed: H5

Targeted Performance Band: 3-4

Criteria Gives the correct answer.

Sample Answer

$$S_n = \frac{n}{2}(a+l)$$

$$S_{45} = \frac{45}{2}(48 + (-260))$$

$$S_{45} = -4770$$

10

The information contained in this obcurrent is intervied for the professional assistance of leading staff, it does not constitute advice to students. Further it is not the intention of CSSA is provide specific matring outcomes for all prosable Time HSG arcelers. Rather the purpose is to provide lead-times information so that they can holder explore, understand any apprehensions, as established by the NSM Board of Statiss.

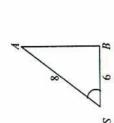
No guarantee or warranty is made or impice with respond to the application or used CSSA Matring Guideless in maticion to any specific that insam question is arceled to the application or useful resist of any Matring Guideless growing for the Time HSG papers. DISCLAIMER

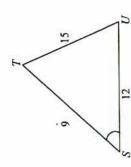
Outcomes Assessed: P2, H2 (d) (i) (3 marks)

Targeted Performance Band: 4-5

5	EL S	CH INTA
Gives the common angle.		1
hen		_
Gives the correct conclusion.		_

Sample Answer





 $\angle ASB = \angle UST$ (common angle)

$$\frac{SB}{ST} = \frac{6}{9} = \frac{2}{3}$$
 $\frac{SA}{SU} = \frac{8}{12}$:

$$\frac{SA}{SU} = \frac{8}{12} = \frac{2}{3}$$
 (Sides are in the same proportion)

.. Triangles ASB and STU are similar as two sides are in same proportion and the included angles are equal.

(d) (ii) (1 mark)

Outcomes Assessed: P2, H2

Targeted Performance Band: 4

Mark

_	1
_	
	1
	1
	1
	1
	1
	ı
9,5	Š
1	
1	3
1	ú
1	3
1	2
1	3
1	
1	_

Mark

Sample Answer

$$\frac{AB}{UT} = \frac{SB}{ST}$$
 (matching sides of similar triangles are in the same proportion)

$$\frac{AB}{15} = \frac{2}{3}$$
 $AB = 10 \text{ uni}$

$$\frac{B}{A} = \frac{2}{3}$$
 $AB = 10$ units

DSSLAMER.
The internation contained in this document is intervold for the professional assistance of leading staff. If does not constitute ashee to students, Further it is not the internation of CSSA to provide spoolic marking outcomes for all possible final HSS assesses. Rether the purpose is to provide isolations with internation so that they can before explore, understand and apply HSS. making notementaries, as establishing the RNM Board of Studies.
We guarantee or warranty is made or invited with respect to the approach on the of CSSA Marking Guideines in relation to any specific trial exam question or areave. The CSSA seasons no installed to the approach completeness or usefulness of any Marking Guideines provided for the Trial HSC papers.

Ouestion 5 (12 marks)

(a) (i) (1 mark)

Outcomes Assessed: P2

Targeted Performance Band: 3-4

CHELIA	Mark
() () () () () () () () () ()	

Sample Answer

For an even function, f(-x) = f(x).

$$f(x) = x^4 - 8x^2 + 16$$

$$f(-x) = (-x)^4 - 8(-x)^2 + 16$$

= f(x) : function is even. $=x^4 - 8x^2 + 16$

(a) (ii) (2 marks)

Outcomes Assessed: P7, H6

Targeted Performance Band: 3-5

ntiates correctly.	
common factor.	

Sample Answer

$$y = x^4 - 8x^2 + 16 \quad \therefore \frac{dy}{dx} = 4x^3 - 16x$$
$$= 4x(x^2 - 4)$$
$$= 4x(x - 2)(x + 2)$$

(a) (iii) (3 marks)

Targeted Performance Band: 3-5 Outcomes Assessed: H6

 Determines the nature of the THIRD stationary point. Determines the nature of TWO stationary points. Finds TWO stationary points.

Criteria

Marks

Sample Answer

For stationary points $\frac{dy}{dx} = 0$:: 4x(x-2)(x+2) = 0 :: x = 0, x = -2 or x = 2

:. the stationary points are (0,16), (-2,0) & (2,0)

Also for the nature of the stationary points, $\frac{d^2y}{dx^2} = 12x^2 - 16$

At x = -2, $\frac{d^2y}{dx^2} = 32 > 0$: (-2, 0) is a MINIMUM stationary point

Since the curve is even, the y-axis is an axis of symmetry, :: (2, 0) is also a MINIMUM stationary At x=0, $\frac{d^2y}{dx^2} = -16 < 0$:: (0, 16) is a MAXIMUM stationary point

(a) (iv) (2 marks)

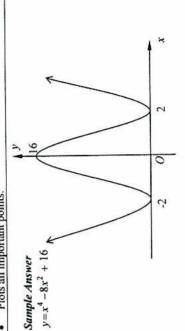
Outcomes Assessed: P6, H6, H9

Targeted Performance Band: 3-5

|--|

Criteria

Marks



13

The information contained in this document is riserded for the professional assistance of leading staff ill does not consistute astice in statements. Further it is not the intention of CSSA to provide specific matring outcomes for all possible That HSC answers. Retire the purpose is to provide leadiness with information so that they can better explore, understand and apply HSC marking requirements, as established by the NSW Board of Studies. to granties or warranty is maple or mysiod with respect to the apprication or use of CSSA Marking Guidelines in relation to any specific trial exam question or answer. The CSSA issumes no liability or responsibility for the accuracy, completeness or usefulness of any Marking Guidelines provided for the final HSC papers.

DISCLAINER.
The information constant of this occurrent is retended for the professional assistance of leaching staff, it does not constitute advice to students. Further it is not the intention of The information constant of advices to all possible final HSC answers. Rather the purpose is to provide leachers with information so that they can before explore, understand and apply HSC, instant greatments as established by the HSCM board of Studies.

We guarantee or warranty is made of infood with respect to the appriation on too of CSSA Maring Guadeines in relation to any spoofficitied examquestation or answer. The CSSA assumes no liability or inscharging the appriation completeness or usefulness of any Marking Cadelines provided for the Trial HSC papers.

(a) (v) (1 mark)

Outcomes Assessed: P6, H6, H7

Targeted Performance Band: 3-4

Criteria	Mark
ectly solves the equation $\frac{dy}{dx} < 0$ or gives correct answer from graph	-

Sample Answer

$$\frac{dy}{dx} = 4x(x-2)(x+2)$$

For the curve to be decreasing, $\frac{dy}{dx} < 0$:: 4x(x-2)(x+2) < 0

 $\therefore x < -2$ and 0 < x < 2

(b) (i)(1 mark)

Outcomes Assessed: H4

Targeted Performance Band: 2-3

CINCILA	Mark	
Completes the table correctly.	_	

Sample Answer

Distance from left edge (cm)	>	C	20	()	100
Height of hole (cm)	30	36	41	45	17

(b) (ii)(2 marks)

Outcomes Assessed: H8, H9

Targeted Performance Band: 3-5

Criteria	Marks
substitutes correctly into Simpson's Rule.	-
Gives the correct answer.	-

Sample Answer

Area =
$$\frac{h}{3}(y_0 + y_4 + 4(y_1 + y_3) + 2y_2)$$
, $h = 25$
= $\frac{25}{3}[30 + 17 + 4(36 + 45) + 2(41)]$

 $= 3775 \,\mathrm{m}^2$

14

DISCUAIMENT The document is intended for the professional assistance of leading staff if does not constitute advice to students. Further it is not the intention of The information on that they can be proceed in the processes and apply HSC making outcomes for all possible final HSC assews. Retired the purpose is to provide teachers with information so that they can before cutdensiant and apply HSC making progressing, as established by the HSCW board of Studes.

We guarantee or warranty is made or mindely with respect to the application to a document of the source of the processing o

Question 6 (12 marks)

(a) (i) (2 marks)

Outcomes Assessed: H3, H4

Targeted Performance Band: 4-5

		The state of the s
rrectly shows $W_0 = 18$	=180000.	-
rrectly shows $k = 0.08$	344.	-

Sample Answer

$$180000 = W_0 e^{k(0)}$$
 : $W_0 = 180000$

$$325000 = 180000e^{\iota(7)}$$
 $\therefore e^{7\iota} = 1.806$

(2004 is year 1 .: 2010 is year 7)

 $7k = \log_{10} 1.806$

k = 0.0844 (to three signficant figures)

(a) (ii) (2 marks)

Outcomes Assessed: H3, H4

Targeted Performance Band: 4-5

Criteria	Marks
Correctly substitutes 47 with progress towards the answer.	ı
Correctly determines the amount of parhage waste in 2050.	-

Sample Answer

$$W = 180\,000e^{0.0844\times47}$$

(The year 2050 corresponds to t = 47)

W = 9506745.24 tonnes

(a) (iii) (2 marks)

Outcomes Assessed: H3, H4

Targeted Performance Band: 4-5

Criteria	Marks	- 1
Correctly differentiates to get the rate $\frac{dW}{dt}$.	1	
Correctly substitutes $t = 47$ into $\frac{dW}{dt}$ and has correct answer.	1	

Sample Answer

$$W = 180\,000e^{0.0844t}$$

$$\frac{dW}{dt} = 0.0844 \times 180\,000\,e^{0.0844t}$$

Let
$$t = 47$$
, $\frac{dW}{dt} = 0.0844 \times 180\,000\,e^{0.0844 \times 47}$
 $\frac{dW}{dt} = 802369.3$

During 2050, the garbage rate will be increasing at a rate of 802 369 tonnes per year.

15

The internation contained in the document is introded for the professional assistance of leaching staff it does not constitute ables to students. Further it is not the intention of CSSA to provide specific markers outcomes for all possible Trial HSC assess. Rether the purpose is to provide leachers with intornation to that they can better explore, understand and apply HSC markers greaterings, as established by the NSM HSD and of Studes.

No guarantee or warrant is made or implied with respect to the application or answer. The CSSA kerning Cabilities provided for the incam question or answer. The CSSA assumes no kability or responsibility for the accuracy, completeness or usefulness of any Marking Cabilities provided for the Trial HSC patros.

(b) (i) (1 mark)

Outcomes Assessed: H5

Targeted Performance Band: 2-4

Criteria	amplitude.
	Gives correct

Sample Answer

Amplitude = 3

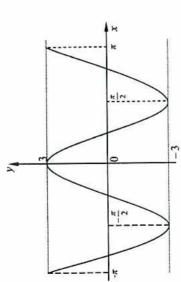
(b) (ii) (2 marks)

Targeted Performance Band: 2-4 Outcomes Assessed: H5

	Criteria	Marks
1	Shows a sketch with the correct shape.	-
1	Shows the correct period and range.	-

Amplitude = 3 Sample Answer

Period = $\frac{2\pi}{n} = \frac{2\pi}{2} = \pi$



(c) (3 marks)

Targeted Performance Band: 3-4 Outcomes Assessed: H4, H9

	Criteria	Marks
	Correctly finds the length DT in exact form.	-
1	Finds the arc length CD.	
1	Gives the correct perimeter in exact form.	-

Sample Answer

Length
$$DT$$

$$OT = 4 \text{ cm (midpoint of } OC)$$

$$DT^2 = 4^2 + 8^2 - 2 \times 4 \times 8 \cos\left(\frac{2\pi}{3}\right)$$

$$DT^2 = 112$$

$$DT = 4\sqrt{7}$$
Perimeter = $DT + \text{arc } CD + CT$

$$= \left(4\sqrt{7} + \frac{16\pi}{3} + 4\right) \text{ cm}$$

DISCLAMER.
The information contained in this document is intended for the professional assistance of leading staff it does not constitute advice to students. Further it is not the intention of The information contained in this document for all possible. That HGS, answers, Rather the purpose is to provide leadings with information so that they can better explore, understand and apply HSC matrixing reputements, as established by the NSIV board of Subsess.
We guarantee or warranty is made or implied with respect to the application or the of CSSA Matrixing Guidelines in relation to any specific trial exam question or answer. The CSSA season is obtained for the Intel HSC papers.

DISCLAIMER The interaction or standard to the professional assistance of leaching staff. It does not constitute advice to student, Further it is not the interaction of the interaction or standard outcomes for all possible final HSC asswers. Pather the purpose is to provide leachers with information so that they can better explore, understand and apply HSC, infantly opportunents, as established by the HSVB band of Stables.

No quarantee or warran'ts invade or implication to the appriation or answer. The CSSA Assumes or warran'ts invade or implication from a providences or usefulness of any Matring Guidelines provided for the Trial HSC papers.

Ouestion 7 (12 marks)

(a) (4 marks)

Targeted Performance Band: 4-5 Outcomes Assessed: H8, H9

Marks Correctly applies Newton-Leibnitz formula/substitution finds V₂ Criteria Calculates the correct volume. Finds V,

Sample Answer
$$V_1 = \pi \times 4^2 \times 4 = 64\pi$$

$$V_2 = \pi \int_0^4 (x-2)^4 dx = \pi \left[\frac{(x-2)^5}{5} \right]_0^4 = \pi \times \left[\frac{(4-2)^5}{5} - \frac{(0-2)^5}{5} \right] = \frac{64\pi}{5}$$

 $\therefore \text{ Total volume is } V_1 - V_2 = 51 \frac{1}{5} \pi \ u^3$

(b) (i) (1mark)

Outcomes Assessed: H5

Targeted Performance Band: 4

Gives the correct answer.

Sample Answer

$$\dot{x} = 1 - 2\sin t = 1 - 2\sin(0) = 1 \text{ m/s}$$

Therefore the initial velocity is 1 m/s.

(b) (ii) (2marks)

Targeted Performance Band: 4-5 Outcomes Assessed: H4, H5

Marks Finds an expression for x̄. Gives the correct answer.

Sample Answer

 $\ddot{x} = -2\cos t$

$$0 = -2\cos t \qquad \therefore t = \frac{\pi}{2}, \frac{3\pi}{2}$$

Therefore the acceleration is zero at $\frac{\pi}{2}s$, $\frac{3\pi}{2}s$.

DISCLAMER.
The intrinsic contained in the document is intended for the professional assistance of leaching staff. It does not constitute advice to students. Further it is not the retention of The intrinsic contained in the New Year between Staff or Discussion and professional and apply HSC intensity explainments, as established by the HSW Reard of Studies.

Independent and apply HSC intensity explainments, as established by the HSW Reard of Studies.

In the guarantee or warranty is made or mysied with respect to the application or use of CSSA Matring Guidelines in resident to any specific or instance. The CSSA assumes no leading or respectably for the accuracy, completeness or usefulnessed any Matring Guidelines provided for the Irisa HSC papers.

(b) (iii) (1mark)

Outcomes Assessed: H4, H5

Targeted Performance Band: 4-5

|--|--|

Sample Answer

Max velocity = 3 m/s from amplitude of \dot{x} or sub $t = \frac{3\pi}{2}$ into \dot{x} .

(b) (iv) (2marks)

Outcomes Assessed: H4

Targeted Performance Band: 4-5

Equates $\dot{x} = 0$ and progress towards answer.	
Comment of the commen	1

Marks

Sample Answer

Particle changes direction when x = 0.

 $\dot{x} = 1 - 2\sin t = 0$

$$\sin t = \frac{1}{2} \implies t = \frac{\pi}{6} \sec$$

(b) (v) (2marks)

Outcomes Assessed: H4, H5

Targeted Performance Band: 4-5

Gives a correct expression for x or the distance travelled	- -
Gives the correct answer	-

Marks

Sample Answer

Distance travelled is given by

$$\int_{0}^{\frac{\pi}{6}} 1 - 2 \sin t \, dt = \left[t + 2 \cos t \right] \frac{\pi}{6}$$

$$= \left[\frac{\pi}{6} + 2 \cos \frac{\pi}{6} \right] - \left[0 - 4 \cos 0 \right] = \frac{\pi}{6} + \sqrt{3} - 2$$

No quaranter or warranty is mobile or implied with negocit to the application or use of CSSA Marking Guidelines in neation to any specific tratlescent greaten or answer. The CSSA assumes no liability or responsibility for the accuracy, completeness or usefutness of any Marking Guidelines provided for the That HSC papers. The information contained in this document is literaded for the professional assistance of leading staff it does not constitute advice to students. Further it is not the intention of CSSA to provide specific marking outcomes for all possible That HSO answers. Rether the purpose is to provide teachers with information so that they can better explore, understand and apply HSC marking requirements, as established by the NSW Board of Studies.

Question 8 (12 marks)

(a) (i) (2marks)

Outcomes Assessed: P3, H2

Targeted Performance Band: 3-4

Sample Answer

Since the roots are real and different $\therefore \Delta > 0$ i.e. $b^2 - 4ac > 0$

$$16A^2 - 24B > 0$$
 ... $2A^2 > 3B$... \mathbb{O}

(a) (ii) (3marks)

Outcomes Assessed: P3, H9

Targeted Performance Band: 3-5

E	Criteria	Marks
Gives correct expression $4A = 6B$.		-
Finds the correct inequality $3B^2 - 2B > 0$.	>0.	-
Gives the correct answer.		1

Sample Answer

Since the sum of the roots is equal to the product of the roots

$$\alpha + \beta = \alpha \beta$$
 : $4A = 6B$: $A = \frac{3}{2}B$: sub into ①

$$\therefore 2\left(\frac{3}{2}B\right)^{2} > 3B \frac{9}{2}B^{2} > 3B \implies 3B^{2} - 2B > 0 \implies B(3B - 2) > 0$$

 \therefore the range of values of B is B < 0 and $B > \frac{2}{3}$.

(b) (i) (1 mark)

Outcomes Assessed: H5

Targeted Performance Band: 3-5

Mark	-
Criteria	
	 Gives the correct answer.

Sample Answer

$$A_1 = 25\ 000\ (1.005) - F + 15$$

= 25\ 000\ (1.005) - (F - 15)

DISCLAMER.

The information contained in this obcurrent is intended for the professional assistance of leaching staff it does not constitute achieve to students. Further it is not the intendent of The information contained in a possible Trial HS2 asswers. Rather the purpose is to provide leachers with internation so that they can better explore, undestand and apply HSC, making projections as establishing by the HSW Board of Studies.

No guarantee or warranty it made or motived with respect to the application and CSSA Metring Guideines in relation to any specific trial exam question or answer. The CSSA assumes no leaking you expressibility for the accuracy, completeness or estatiness of any Marking Guideines provided for the Trial HSC papers.

(b) (ii) (2marks)
Outcomes Assessed: H4, H5

Targeted Performance Band: 3-5

Criteria	Marks
	-
Progress towards A2.	
Shows that $A_3 = 25000 \times 1.005^3 - (F - 15)(1 + 1.005 + 1.005^2)$.	-

Sample Answer

The Answer
$$A_2 = [25000(1.005) - (F - 15)](1.005) - (F - 15)$$

= 25 000(1.005)² - (F - 15)[1 + 1.005]
:: $A_3 = 25 000(1.005)^3 - (F - 15)[1 + 1.005 + 1.005^2]$

(b) (iii) (1mark)

Outcomes Assessed: H4

Targeted Performance Band: 4-5

Criteria	IRIA	-	-
Criteria			
	Criteria		

Sample Answer

mpre Answer
$$A_n = 25\,000(1.005)^n - (F - 15)[1 + 1.005 + 1.005^2 + ... + 1.005^{n-1}]$$

(b) (iv) (3marks)

Outcomes Assessed: H4, H5

Targeted Performance Band: 4-6

3	Targetea I coloniance paris	Marks
	Cincin	
•	Equator 4.0=0	-
•	Lyluaics 760 V.	_
•	Descrees towards finding F	1
•	Hogics toward mining	-
•	Finds the correct value for F.	•

Sample Answer

Let n = 60 and $A_{60} = 0$

$$A_{60} = 25\,000(1.005)^{60} - (F - 15)[1 + 1.005 + 1.005^2 + ... + 1.005^{59}]$$

$$0.0 = 25 000(1.005)^{60} - (F - 15) \frac{1(1.005^{60} - 1)}{1.005 - 1}$$

(F-15)(69.77003) = 33721.25381

F - 15 = 483.32

F = \$498.32

Question 9 (12 marks)

(a) (1 mark)

Targeted Performance Band: 3-5 Outcomes Assessed: H5

Criteria Mark	ver.
	Gives the correct answ

Sample Answer

$$\frac{d}{dx}(\sec x) = \sec x \tan x$$

(b) (i) (3 marks)

Targeted Performance Band: 4-6 Outcomes Assessed: H6, H7

• Correctly determines the MAX stationary point at x = 4• Correctly determines the stationary point at x = -2• Correctly determines the HPOI at x = -2

Marks

Sample Answer

At x = 4 g'(x) = 0 : stationary point. Moving from left to right g'(x) = +0 - ... MAX TP At x = -2 g'(x) = 0 : stationary point. Moving from left to right g'(x) = +0 + .. HPOI

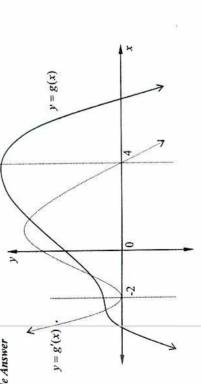
(b) (ii) (3 marks)

Outcomes Assessed: H6, H7

Targeted Performance Band: 4-6

	Criteria	Marks
1 :	Correctly draws the MAX stationary point at $x = 4$.	-
	Gives the correct graph.	-

Sample Answer



The intermitation contained in the document is intended for the professional assistance of leading staff it does not constitute advice to students. Further it is not the intention of CSSA to provide specific marking outcomes for all possible Trial HSC asseses. Rathor the purpose is to provide leadbers with information so that they can better explore. understand and apply HSC, natural requirements, as established by the NSM band of Studies.

We puember or warranty is nature or repleted with miscold in the application or use of CSSA Matring Guidelines provided for the Trial HSC papers.

ssummer on labeling or exportability for the accuracy, completeness or usefulness social Guidelines provided for the Trial HSC papers.

22

Outcomes Assessed: P5. (c) (i) (2 marks)

Targeted Performance Band: 3-5

etermine the coordinates of B.	stermine the coordinates of C.
Correctly 6	Correctly

Marks

Sample Answer

B (2, 1) and C (5,6).

(c) (ii) (2 marks)

Outcomes Assessed: P7, H6, H9

Targeted Performance Band: 3-5

Differentiates correctly	Differentiates correctly.	3	Cuitoria	Marks
Differentiates correctly	Differentiates correctly.	3	ICIIa	-
		Differentiates correctly.		*

Sample Answer

$$y = \frac{8x^2}{15} - \frac{31x}{15} + 3 \dots \oplus$$

$$\therefore \frac{dy}{dx} = \frac{16}{15} x - \frac{31}{15} \dots$$
 Since $0 \le x \le 5$: the maximum gradient occurs when $x = 5$

$$\therefore \frac{dy}{dx} = \frac{16}{15} \times 5 - \frac{31}{15} = 3.27 \text{ (correct to two decimal places)}$$

(c) (iii) (2 marks)

Outcomes Assessed: H2, H5, H6, H9 Targeted Performance Band: 3-5 Establishes that $\frac{dy}{dx} = 3$.

Marks

Gives the correct answer.

Sample Answer

When
$$\frac{dy}{dx} = 3$$
 : sub into ②

31

 $\therefore 3 = \frac{16}{15}x - \frac{2}{1}$

x = 4.75

 $\therefore 45 = 16x - 31$

$$\therefore y = \frac{8 \times 4.75^2}{15} - \frac{31 \times 4.75}{15} + 3 = 5.2$$

.. The height is 5.2 metres.

23

The information contained in the document is treated for the professional assistance of leading staff it does not constitute advice to stations. Further it is not the intention of consistent and outcomes to all long consistent and HSC areaers. Rather the purpose is to provide teachers with information so that they can before coupled and any part HSC intention graphers, as establishing by the HSCH floared to addition.

No guarantee or warrant is made or include with respond to the application or out of CSSA Naturing Guideness in relation to any spooffe that exam question or answer. The CSSA assumes no labelity or responsibility for the accuracy, completeness or usefulness of any Maxing Guideness provided for the ITER HSC Outpers.

Ouestion 10 (12 marks)

(i) (1 mark)

Outcomes Assessed: P4

Criteria Targeted Performance Band: 2-4

Gives the correct answer

Sample Answer

Area of the garden \Rightarrow 4 × 4 log, 5 = 16 log, 5

(ii) (2 marks)

Outcomes Assessed: H3, H9

Targeted Performance Band: 3-5

Marks Correctly determines the values of a and b. Criteria Progress towards the correct answer

Since $y = 4 \log_e (\alpha x + b)$... when x = 4, y = 0 $e^0 = 4a + b$ Sample Answer

 $\therefore b = 5$ $4 \log_e 5 = 4 \log_e b$ $1 = 4a + 5 \qquad \therefore \alpha =$

 $\Rightarrow 0 = 4 \log_e (4a + b)$

 $\therefore 1 = 4a + b \dots \mathbb{O}$

When x = 0, $y = 4 \log_e 5$ Now sub into ①

Outcomes Assessed: H3, H8 (iii) (3 marks)

Targeted Performance Band: 4-6

Mark

	Criteria	Marks
	Establishes correct integral $A = \int_{0}^{4 \ln \delta} (5 - e^{4}) dy$	-
1/2	Integrates correctly	-
451	Illustrates correctly to find the area in exact form.	-
3	Evaluates correctly to this are in course	

Sample Answer

Since
$$y = 4 \log_e (ax + b)$$
 :: $\frac{y}{4} = \log_e(5 - x)$:: $e^{\frac{y}{4}} = 5 - x$:: $x = 5 - e^{\frac{y}{4}}$

.. the area of the grass section is:
$$A = \int_{0}^{4 \ln 5} \left(5 - e^{4}\right) dy$$

: the area of the grass section is:
$$A = \int_{0}^{1} (5 - e^{x}) dy$$

$$A = \left[5y - \frac{e^{x}}{4} \right]_{0}^{4\ln 5} = \left[5y - 4e^{\frac{y}{4}} \right]_{0}^{4\ln 5} = \left[5 \times 4\log_{e} 5 - 4e^{-4} \right] - \left[0 - 4 \times 1 \right]$$

$$= \left[20\log_{e} 5 - 20 \right] + 4$$

(iv) (1 mark)

 $=(20\log_e 5-16)\text{m}^2$.

Outcomes Assessed: H3

Targeted Performance Band: 3-5

Mark Criteria Gives the correct answer.

Sample Answer

Area of the flowers section \Rightarrow 16 $\log_e 5 - (20 \log_e 5 - 16) = (16 - 4 \log_e 5) m^2$.

(v) (1 mark)

Outcomes Assessed: HI, H4.

Targeted Performance Band: 3-5

Mark Criteria Gives the correct answer.

Sample Answer $D^2 = x^2 + y^2$, and since $y = 4 \log_e (\alpha x + b)$ with a = -1 and b = 5 $y = 4 \log_e (5-x)$

 $D^2 = x^2 + 16[\log_e(5-x)]^2$

DISCLAMER.
The information ordinates intended for the professional assistance of leading staff. It does not constitute advice to students. Further it is not the intendent of The information are that they can be find they can be find supposed to provide specific making outdoorses, for all possible That HSC answers. Rather the purpose is to provide isocitient with information are that they can be find explosed.

Lindowsking and apply HSC making representable as established by the NSM beard of SM backs.

Lindowsking and apply HSC making representable to the application or and CSSA Attacks, Guideines in relation to any question or answer. The CSSA Making Calciderines provided for the That HSC papers. The information contained in this document is intended for the professional assistance of leading staff it does not constitute advice to students. Further it is not the intendent of CSSA to provide specific marking outcomes for all PSS answers. Rather the purpose is to provide teachers with information to that they can better explore, understand and appt HSC intendent on purpose to the purpose is to provide teachers, as established by the NSM Board of Studies.

No guarantee or warranty is made or impact with respond to the application or use of CSSA Marking Guidelines in readion to any specific that exam question or answer. The CSSA assumes no liability or responsibility for the accuracy, completeness or usefutness of any Marking Guidelines provided for the Tilad HSC papers.

(vi) (2 marks)

Targeted Performance Band: 3-5 Outcomes Assessed: H3, H5

Marks	-	
Criteria	s the chain rule but has ONE mistake.	t answer.
Int Beten 1 cr) comme	Correctly use	Gives correct answer.

Sample Answer

$$D^{2} = x^{2} + 16[\log_{x}(5 - x)]^{2}$$

$$\therefore \frac{dD^{2}}{dx} = 2x + 16 \times 2[\log_{x}(5 - x)] \times \frac{-1}{5 - x}$$

$$= 2x - \frac{32\log_{x}(5 - x)}{5 - x}$$

$$= 2x + \frac{32\log_{x}(5 - x)}{5 - x}$$

(vii) (2 marks)

 $= 2x^2 - 10x + 32\log_e(5 - x)$

Outcomes Assessed: P8, H6

Marks Criteria Targeted Performance Band: 3-5 • Shows $\frac{dD^2}{dx} \approx 0 \text{ for } x = 3.63.$ Proves a minimum length.

Sample Answer

$$\frac{mple\ Answer}{dD^2} = \frac{2(3.63)^2 - 10(3.63) + 32\log_e(5 - 3.63)}{3.63 - 5} = -0.09 \text{ which is approximately zero.}$$

4	∞	٨
3.63	0	0
m	-5.09	v
×	$\frac{dD^2}{dD^2}$	ax

 \therefore minimum length of hose occurs at x = 3.63.

56

DISCUAINER
The information contained in this document is infanded for the professional assistance of leaching staff. If does not constitute activos to students. Futther it is not the intendent of DISCAs to provide teachers with information so that they can befire explore. CSSAs to provide teachers swift information so that they can befire explore, conditional appropriate appropriate accordance for any thick can be calculated by the NSN Board of Studies.

No guarantee or warranty is made or mighted with respect to the application or use of CSSA Maring Guideness in relation to any specific trial exam question or answer. The CSSA had only discussed to warranty is made or mighted with respect to the application or use of CSSA Maring Guideness in relation to any operation or answer.

BLANK PAGE