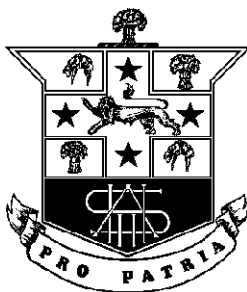


HURLSTONE AGRICULTURAL HIGH SCHOOL



GENERAL MATHEMATICS

2008

YEAR 12

ASSESSMENT TASK 3

Examiners ~ S Hackett, G Huxley

GENERAL INSTRUCTIONS

- Reading Time – 3 minutes.
- Working Time – 40 minutes.
- Attempt **all** questions.
- This paper contains two sections
 - **Section 1** – 10 multiple choice questions
Use the answer sheet provided
10 marks
Allow about 10 minutes for this section.
 - **Section 2** – 2 questions worth 15 marks
Show all necessary working
Answer each question in a
separate booklet
30 marks
Allow about 30 minutes for this section.
- Marks may not be awarded for careless or badly arranged work.
- Board approved calculators may be used.
- This examination paper must **NOT** be removed from the examination room.

STUDENT NAME: _____

TEACHER: _____

SECTION 1

10 questions: 1 mark each

Use the answer sheet provided.

(Total 10 marks)

1. Pamela invested \$1000 at the end of each year for ten years. Her investment earned interest at 5.7% per annum compounded annually.

Which value of r should be used when calculating the future value of Pamela's investment?

- (A) 5.7 (B) 0.57 (C) 0.475 (D) 0.057

2. \$2400 is invested at the end of every month for ten years and interest is paid monthly at a rate of 5% p.a. What value of n should be used when calculating the present value of the annuity?

- (A) 10 (B) 12 (C) 120 (D) 520

3. Michael calculates the present value (N) of an annuity. The interest rate is 9% per annum, compounded monthly. In five years time the future value will be \$100 000.

Which calculation will result in the correct answer?

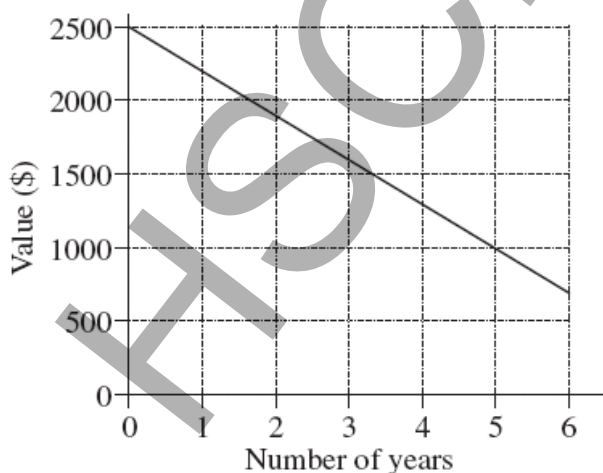
(A) $N = \frac{100000}{(1+0.09)^5}$

(B) $N = \frac{100000}{(1+0.0075)^5}$

(C) $N = \frac{100000}{(1+0.0075)^{60}}$

(D) $N = \frac{100000}{(1+0.09)^{60}}$

4. A computer was purchased for \$2500 and depreciated over six years, as shown in the graph.



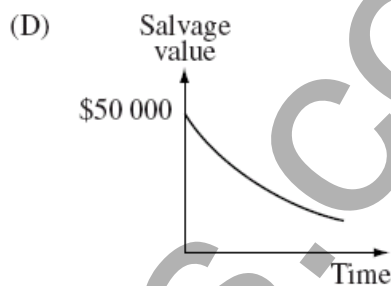
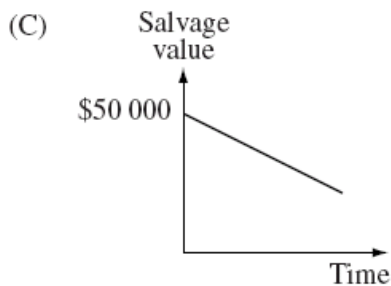
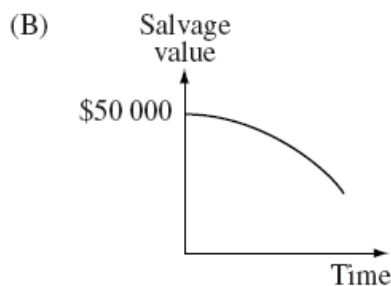
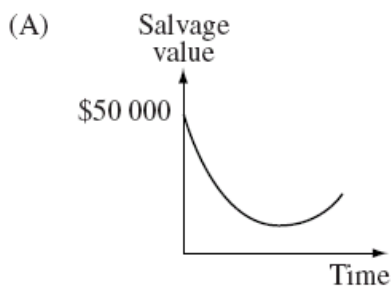
By how much did the computer depreciate each year?

- (A) \$200
(B) \$250
(C) \$300
(D) \$350

5.

A car bought for \$50 000 is depreciated using the declining balance method.

Which graph best represents the salvage value of the car over time?



6. The area of the equatorial plane of a sphere is 6.5cm^2 . The curved surface area of the sphere is:

- (A) 13.0cm^2 (B) 19.5cm^2 (C) 26.0cm^2 (D) 32.5cm^2

7. A large round cake has a diameter of 30cm. The top is iced and the cake is cut into 10 wedges. The area of icing on each wedge is closest to:

- (A) 71cm^2 (B) 94cm^2 (C) 188cm^2 (D) 283cm^2

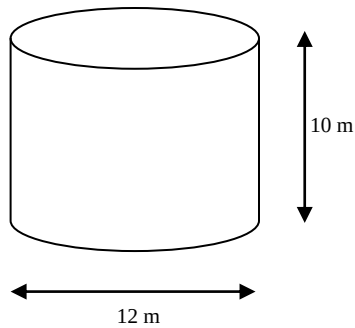
8.

A	36	60	
B	24	45	
		20	32 C
		0	

Given the above notebook entry, the area of the field is closest to:

- (A) 1206m^2 (B) 1950m^2 (C) 2910m^2 (D) 1284m^2

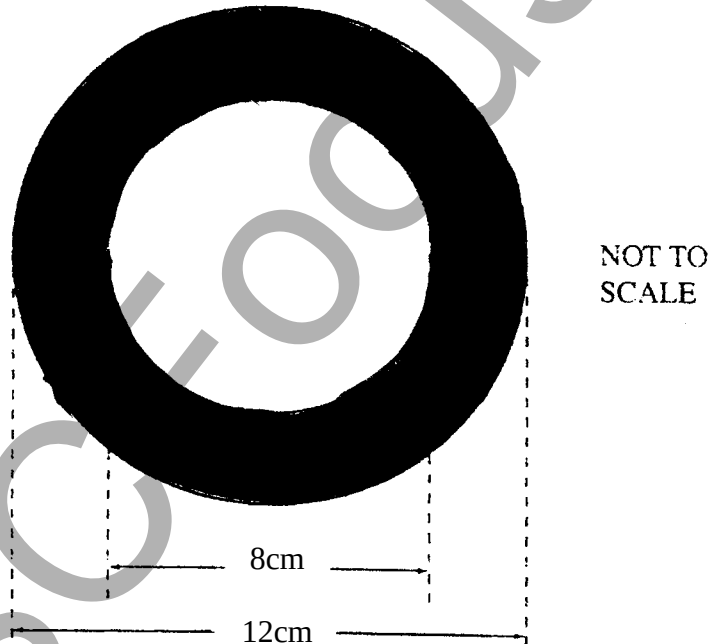
9. The cylinder shown below is open at the top and closed at the bottom.



Which expression can be used to calculate the surface area of the cylinder?

- (A) $2 \times \pi \times 6 \times 10 + 2 \times \pi \times 6^2$
(B) $2 \times \pi \times 6 \times 10 + \pi \times 6^2$
(C) $2 \times \pi \times 12 \times 10 + \pi \times 12^2$
(D) $\pi \times 6^2 \times 10 + \pi \times 6^2$

10.



Which of the following expressions will give the area, in square centimetres, of the cross-section (shaded area) of the pipe?

- (A) $\pi(12 - 8)^2$ (B) $\pi(12^2 - 8^2)$ (C) $\pi(6 - 4)^2$ (D) $\pi(6^2 - 4^2)$

SECTION 2

2 questions: 15 marks each
(Total 30 marks)

Question 11 (15 marks) *(start a new booklet)*

- (i) Use the future value formula to find A when $M = \$700$, $r = 0.05$ and $n = 15$. **1 mark**
- (ii) Use the present value formula to find N if $M = \$1250$, $r = 0.007$ and $n = 180$. **1 mark**
- (iii) The future value of an annuity is \$120 000, when $r = 0.005$ and $n = 192$.
Calculate the value of the regular payment M needed to achieve this future value.
Answer to the nearest cent. **2 marks**
- (iv) Carlo used the future value formula to calculate the future value of his annuity.
The first line of his calculation was:
- $$A = 850 \times \left(\frac{1.0075^{168} - 1}{0.0075} \right)$$
- (a) How much was Carlo paying per contribution period into his annuity? **1 mark**
- (b) For how many compounding periods was Carlo investing in this annuity? **1 mark**
- (c) Were these compounding periods likely to be monthly, half-yearly or yearly?
Give a reason for your answer. **1 mark**
- (v) Charlie has just won some money in the lottery.
He wants to invest some of the money so he can give his daughter some money when she finishes the HSC in 6 years time.
How much should Charlie invest today at 9% p.a. compounding yearly so that she will have \$15 000 in 6 years time? **2 marks**

(vi)

Present Value Table

n = number of repayment periods.

r = interest rate per period.

	<i>Interest rate (r) per period</i>		
n	1%	6%	12%
1	0.99	0.94	0.89
2	1.97	1.83	1.69
6	5.79	4.92	4.11
12	11.26	8.38	6.19
24	21.25	12.55	7.78

Brittany borrowed \$3 000 for her holiday.

The bank interest was 12% p.a., with repayments made monthly, over 2 years.

- (a) This present value table shows the value of the expression $\frac{(1+r)^n - 1}{r(1+r)^n}$.

Use the present value table provided to calculate the amount Brittany will have to repay each month. Answer correct to the nearest cent.

2 marks

- (b) How much will Brittany repay altogether over the 2 years?

1 mark

- (vii) Garth's new tractor cost him \$140 000.

He plans to use a declining balance depreciation rate of 25% p.a. to calculate the salvage value each year.

- (a) How much can he claim as a tax deduction on the tractor at the end of the first year?

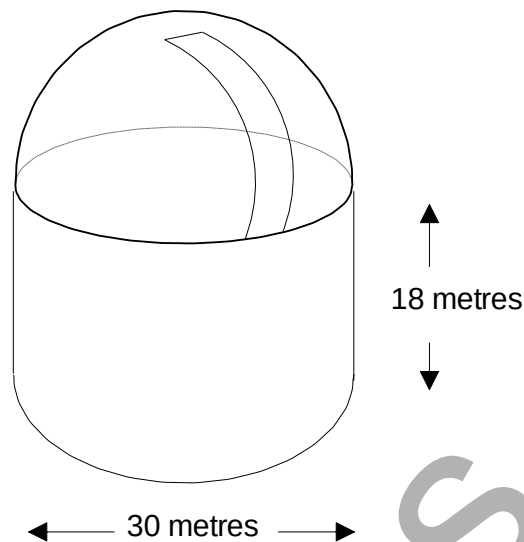
1 mark

- (b) Calculate the salvage value of the tractor after 5 years.

2 marks

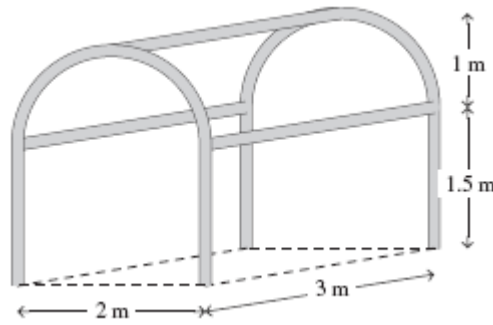
Question 12 (15 marks) **(start a new booklet)**

- (i) An observatory is in the shape of a cylinder with a hemisphere (half of a sphere) on top as shown in the diagram below. There is a slot in the roof for the telescope to view the night sky. The outside diameter of the base is 30 metres and the height of the vertical walls is 18 metres.



- (a) The hemispherical roof is to be tiled in ceramic tiles.
If the slot removes 5% of the original surface area of the roof,
find the area to be tiled, to the nearest square metre. **2 marks**
- (b) Find the internal volume of the observatory building, to the nearest cubic metre. **2 marks**
- (c) Internal equipment takes up 3500 cubic metres, with the remaining volume being air.
An air conditioning unit circulates 120 000 litres of air per minute.
How long would it take to theoretically circulate all the air in the observatory
(to the nearest ten minutes)? (1m^3 contains 1000 litres of air.) **2 marks**

(ii)



Ron's shade house is in the shape of a rectangular prism with a half cylinder on top. It has no base.

(a) Determine the surface area of the shade house (correct to 2 decimal places). **3 marks**

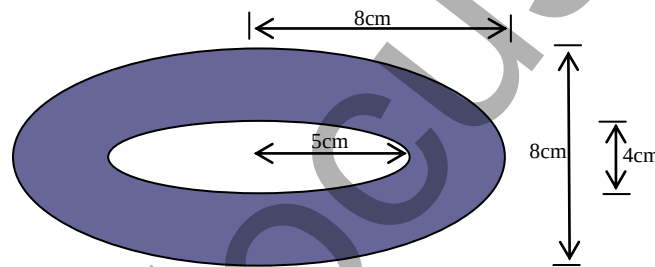
(b) Ron uses poles made from PVC piping to support the shade house. He has 4 vertical poles, 3 horizontal poles and 2 semicircular poles. Each pole is indicated by a dark line on the diagram. Calculate the length of PVC pipe Ron needs for the support poles (to the nearest cm).

2 marks

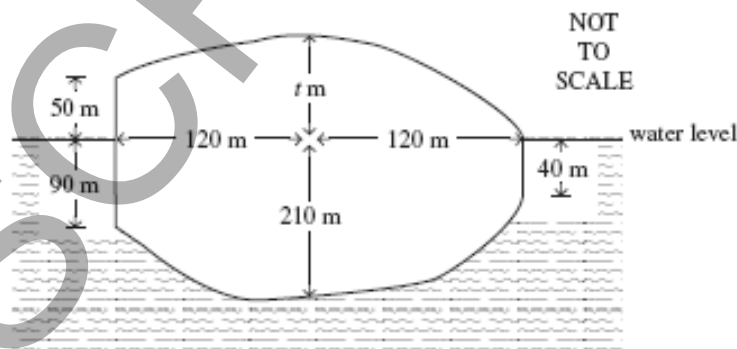
(iii)

Calculate the shaded area (correct to two decimal places).

2 marks



(iv) The diagram shows the cross-section of an iceberg



(a) Use Simpson's rule to show that this area can be given by the expression $40800 + 160t$

1 mark

(b) Given that the area of the cross-section is $52000m^2$, determine the approximate height, t metres, of the top of the iceberg above the water.

1 mark

Answer Sheet

Name _____

Teacher _____

Completely fill the response oval representing the most correct answer

1. A ☐ B ☐ C ☐ D ☐
2. A ☐ B ☐ C ☐ D ☐
3. A ☐ B ☐ C ☐ D ☐
4. A ☐ B ☐ C ☐ D ☐
5. A ☐ B ☐ C ☐ D ☐
6. A ☐ B ☐ C ☐ D ☐
7. A ☐ B ☐ C ☐ D ☐
8. A ☐ B ☐ C ☐ D ☐
9. A ☐ B ☐ C ☐ D ☐
10. A ☐ B ☐ C ☐ D ☐