Randwick Boys' High School

2004 HSC Course
Assessment Task
Component B
Friday July 2nd

Mathematics

Examiner: Ms. J. Ambele.

General instructions

- Working time 45 minutes
- Write in black or blue pen
- Calculators may be used
- Write your name and teacher's name in the space provided

Total Marks - 30 marks

- Attempt all Questions
- Show all necessary working in the space provided.
- Marks may be deducted for careless or badly arranged work

Candidate's Name: .....

Candidate's Teacher: .....

No part of this examination may be removed from the examination room.

Question 2a (continued) **Marks**

His solution is below:

$$\int_{-1}^{4} x(x+1)(x-4)dx = \int_{-1}^{4} (x^3 - 3x^2 - 4x)dx$$

$$= \left[\frac{x^4}{4} - x^3 - 2x^2\right]_{-1}^{4}$$

$$= -29.25$$

His solution is incorrect.

(i) Instead of being asked to find the area bounded by the graph, how could this question have been reworded to make his solution correct? **1**

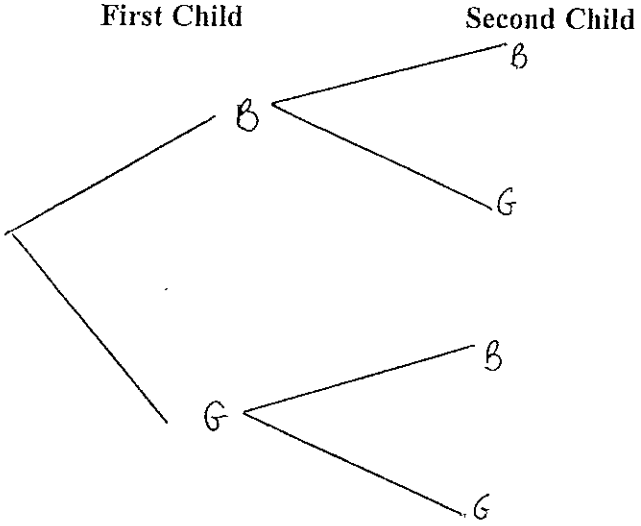
(ii) If the student's answer had been correct, what does the negative value in his answer mean? **2**

(iii) Using integration, find the correct area. **4**

(b) (i) Explain the difference between experimental and theoretical probability. **2**

(ii) The following is a tree diagram for the possible outcomes of the number of boys and girls in a family of two children. **2**

Complete this diagram for a third child on the answer sheet provided on page 3 . Hence, show all the possible outcomes.



(iii) Hence, find the probability of at least two girls. **2**

End of Paper

2004 HSC Assessment Task

Component B Solutions /30

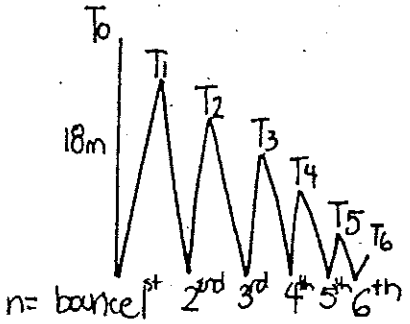
Question 1: /17

8 (a) (i) $T_0 = 18$

T_1 = height after 1 bounce

$T_1 = 18 \times 2/3$ ①

$\therefore T_1 = 12m$



T_2 = height after 2 bounces

$= 18 \times 2/3 \times 2/3$ or $12 \times 2/3$

$= 8m$

$\therefore T_n = 18 \times (2/3)^n$

so $T_6 = 18 \times (2/3)^6$ ①

after 6 bounces $= 1\ 47/81\ m$ ①

(ii) $T_n < 3 \cdot 5$

$T_1 = 2/3 \times 18 = 12m$

$T_6 = 1\ 47/81$

$\therefore T_5 = (2/3)^5 \times 18$ ①

$= 2 \cdot 370370370$

$= 2 \cdot \dot{3}7\dot{0}\ m$

$\therefore$ After 5 bounces the ball rises less than 3·5m ① answer

(iii) $D = 18 + 2(18 \times 2/3) + 2[18 \times (2/3)^2] + 2[18 \times (2/3)^3] + \ldots\ldots$ ①

$= 18 + 2(S_\infty)$

where $S_\infty = \frac{a}{1-r}$ $(a = 12,\ r = 2/3)$

$= \frac{12}{1 - 2/3}$

$= \frac{12}{1/3}$ ①

$= 36$

$\therefore D = 18 + 2(36)$

$= 90m$ ①

9 (b) (i) Price of house − deposit

$= \$(140000 - 50000)$

$= \$90000$ ①

(ii) $A_2 = A_1(1 \cdot 013) - M$ ①

$= [90000(1 \cdot 013) - M](1 \cdot 013 - M)$ ①

$= 90000(1 \cdot 013)^2 - M[1 + 1 \cdot 013]$

(iii) $A_{300} = 90000(1 \cdot 013)^{300} - M[1 + 1 \cdot 013 + 1 \cdot 013^2 + \ldots\ldots + 1 \cdot 013^{299}]$ ①

(iv) For the loan to be repaid after 25 years

$A_{300} = 0$

$0 = 90000(1 \cdot 013)^{300} - M[1 + 1 \cdot 013 + 1 \cdot 013^2 + \ldots\ldots + 1 \cdot 013^{299}]$ ①

Using $S_n = \frac{a(r^n - 1)}{r - 1}$ $a = 1$, $r = 1 \cdot 013$, $n = 300$

$= \frac{1(1 \cdot 013^{300} - 1)}{1 \cdot 013 - 1}$ ① correct substitution

$= 36289 \cdot 47566$ ①

$0 = 90000(1 \cdot 013)^{300} - M[36289 \cdot 47566]$ ①

$\frac{90000(1 \cdot 013)^{300}}{36289 \cdot 47566} = \frac{M[36289 \cdot 47566]}{36289 \cdot 47566}$

$\therefore M = \$1194 \cdot 80$ ① answer