FORT STREET HIGH SCHOOL

ASSESSMENT # 2

2001

MATHEMATICS

EXTENSION I + Answers

Time allowed : 50 MINUTES
(includes 5 minutes reading time)

DIRECTIONS TO CANDIDATES
- Attempt ALL questions.
- ALL questions are of not of equal value.
- All necessary working should be shown in every question. Marks may be deducted for careless or badly arranged work
- Board approved calculators may be used.
- Each question is to be started on a **new page**
- The marks allocated for each question are indicated

Name : _____ Class Teacher : _____

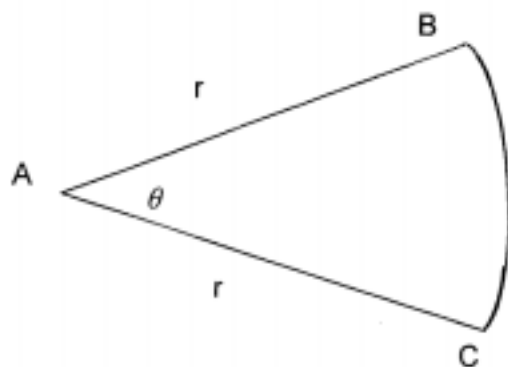| Q	1 /7	2 /7	3 /9	4 /11	Total
Mark					/34

Question One

a) Find the exact value of $\cos\dfrac{\pi}{6} - \cos\dfrac{7\pi}{6}$ (1)

b) Differentiate $x \sin x$ (1)

c) The perimeter of sector ABC is 12 metres. Find an expression for the area of the sector in terms of θ.

(2)

d) i) Draw the graphs of $y = 4\cos x$ and $y = 2 - x$ on the same set of axes for $-2\pi \le x \le 2\pi$.
ii) Explain why all the solutions of the equations $4\cos x = 2 - x$ must lie between $x = -2$ and $x = 6$ (3)

Question Two

a) Find $\displaystyle\int_0^1 (2x-1)^4 \, dx$ (2)

b) Use Simpson's Rule with three function values to give an estimate of $\displaystyle\int_0^1 4^x \, dx$. (2)

c) The area under the curve $y = 2x - x^2$ between $x = 0$ and $x = 2$ is rotated about the x-axis through one complete revolution. Find the volume of the solid so formed. (3)

Question Three

a) The Self Defence Institute has 2 clubs, Karate and Judo. The number of members in each club is 17 and 13 respectively and the total number of members in both clubs is 25. **(4)**

i) If one member of the Self Defence Institute is chosen at random, what is the probability that he plays judo but not karate?

ii) If 2 members of the Self Defence Institute are chosen at random, what is the probability that at least one of them plays both karate and judo?

b) Use mathematical induction to show that $4 \times 6^n + 1$ is divisible by 5, for $n \geq 1$. **(5)**

Question Four

On the 1st of January 1999 the number of sheep in a country was 5 million. This number increased at the rate of 0.8% per month on the existing number. However, each month the country was selling 20,000 sheep to other countries.

a) Show that the number of sheep in stock in this country after n months will be $2.5 \times 10^6 \left(1 + 1.008^n\right)$ **(5)**

b) When will the number of sheep in the stock be expected to just exceed 6 million? **(3)**

c) As a result of a severe drought in this country during March 1999, the rate of increase of sheep, in that month fell to 0.7%.

In order to not to be affected by this drought, that is to maintain the same number of sheep in stock, the country sold fewer sheep on the 1st April 1999.

How many fewer sheep did the country sell on that day? Give your answer to the nearest sheep. **(3)**