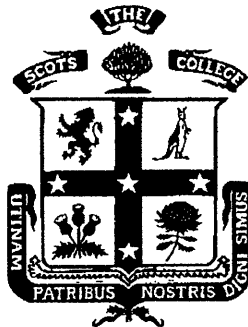


THE SCOTS COLLEGE



YEAR 12

2 UNIT MATHEMATICS

ASSESSMENT 3

7TH JUNE 2006

TIME ALLOWED: 50 MINUTES

INSTRUCTIONS:

- EACH QUESTION IS TO BE DONE ON A SEPARATE PAGE.
- WRITE YOUR NAME AND CLASS CLEARLY ON EACH PAGE.
- EACH QUESTION IS OF EQUAL VALUE.
- CANDIDATES SHOULD ATTEMPT ALL QUESTIONS.
- ALL NECESSARY WORKING MUST BE SHOWN.
- APPROVED CALCULATORS MAY BE USED.

QUESTION 1

[START EACH QUESTION ON A NEW PAGE]

MARKS

- a. Given that the series $S = 5 + 11 + 17 \dots$ is arithmetic,
Find: (i) The 31st term
(ii) The sum of the first 31 terms [4]
- b. Evaluate $\sum_{n=1}^{51} 5 - 2n$ [3]
- c. Find the sum of the first ten terms of the arithmetic series with a fifth term of 19 and a tenth term of 34. [4]
- d. The rungs of a ladder are 0.25 metres apart and the first rung is 0.5m from the ground. A boy climbs the first rung and descends to the ground. He then climbs two rungs and descends to the ground. He continues in this way until he stands on the twentieth rung and descends to the ground. How far has he travelled in all? [4]

QUESTION 2

[START EACH QUESTION ON A NEW PAGE]

- a. (i) Find the first term of the series $1 + \frac{2}{3} + \frac{4}{9} + \dots$ which is less than 0.001.
(ii) How many terms must be added for the sum to first exceed 2.5?
(iii) Explain why the sum can never exceed 3. Show all your reasoning. [6]
- b. A geometric series has a third term of 25 and a sixth term of 0.2. Find the first term. [2]
- c. (i) Express $0.2\dot{3}\dot{4}$ as a series of decimals.
(ii) Hence express $0.2\dot{3}\dot{4}$ as a rational number (a fraction) in lowest terms. [3]
- d. Sam has \$1000 placed in a fund earning 6% per annum, compounding annually, on his first and each subsequent birthday, until he is twenty one. How much does Sam receive the day following his twenty first birthday? [4]

- a. A point moves in a straight line so that its displacement x metres from a fixed point O at time t seconds is given by:

$$x = t^3 - 3t^2 + 4$$

- (i) Find the position of the point when $t = 0$
- (ii) How far does the point travel in the second second?
- (iii) Find the equation for velocity as a function of time t .
- (iv) When is the point stationary?
- (v) At which time is the acceleration zero?

[5]

- b. The initial velocity of a particle is 4 metres/second and the acceleration is given by the equation: $\ddot{x} = 6t - 2$

- (i) Find the equation for velocity as a function of time t .
- (ii) Find the distance travelled by the particle during the first second.
- (iii) Explain why the particle is never at rest.

[5]

- c. A colony of bacteria initially numbers 1200 and after 2 hours numbers 6500. Given that the growth is given by the formula $P = P_0 e^{kt}$

- (i) Evaluate k to four decimal places.
- (ii) Calculate the number in the colony after ten hours.
- (iii) How long will it take for a certain number of bacteria to double?
[Answer to the nearest minute]

[5]