Year 12
2 Unit Component B Assessment Task
March 2000

Question 1 (3 marks)

The six students in the Year 12 Greek class attain marks which form an arithmetic sequence. If the highest score is 97 and the class average is 62, find the other five scores.

Question 2 (3 marks)

Andy wants to find the limiting sum of the following sequence: $-\frac{2}{3}, \frac{5}{6}, -\frac{25}{24}, \ldots$
This is his working out:

$$S_\infty = \frac{a}{1-r}$$

$$= \frac{-\frac{2}{3}}{1-\frac{5}{4}}$$

$$= -\frac{2}{3} \times -\frac{1}{4}$$

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

a. Bryan can see that Andy has made 2 errors in his working out. Rewrite Andy's solution correcting these errors.

b. Claudia says that both boys are wrong because the sequence doesn't have a limiting sum. Explain Claudia's statement.

Question 3 (3 marks)

Give the first 3 terms of any arithmetic series which has $S_8 = 10$.

Question 4 (6 marks)

A certain substance doubles its volume every 5 minutes. At 9:00 am, a small amount is placed in a container and at 10:00 am, the container just fills.

a. At what time was the container $\frac{1}{4}$ full?

b. How full was it at 9:30 am?

Randwick Boys' High School

Mathematics Department
2 Unit Mathematics
Component B
Assessment Task
Year Twelve

20 March 2000

Time allowed : 45 Minutes

Examiners: R. Linaker, D. Yiu

Candidates may attempt all questions.
All necessary working should be shown in every question.
Full marks may not be awarded for careless or badly arranged work.
Some formulae have been given at the end of the paper.

Write your name on every page of your answers.

Student's Name:____________________

Mathematics Class:____________________

THIS IS AN ASSESSMENT TASK

Question 5 **(3 marks)**

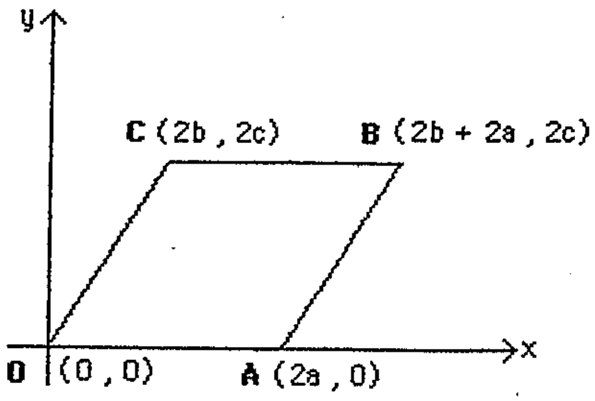
a. What does 'concurrent' mean?

b. You are given the equations of 3 straight lines. Explain how you would show that the 3 lines are concurrent.

Question 6 **(2 marks)**

Explain **two** ways in which you could prove that 3 points form the vertices of a right-angled triangle.

Question 7 **(6 marks)**



a. Find the gradients of OC and AB.

b. State why the quadrilateral OABC is a parallelogram.

c. (i) Find the midpoint of OB.

(ii) Find the midpoint of AC.

d. What geometric result can be proved using your answers to part **c** ?

FORMULAE

For an AP: $T_n = a + (n-1)d$ $\quad S_n = \frac{n}{2}(2a + [n-1]d)$

For a GP: $T_n = ar^{n-1}$ $\quad S_n = \frac{a[r^n - 1]}{r-1}$ $\quad S_\infty = \frac{a}{1-r}$

For two points on a number plane: $m_{AB} = \frac{y_2 - y_1}{x_2 - x_1}$ $\quad$ Mid Point $= \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

David Zhu

2 Unit - 2000.

Q1. $\underline{97-5d}$ $\underline{97-4}$ $\underline{97-3}$ $\underline{97-2d}$ $\underline{97-d}$ $\underline{97}$

$62 \quad 97-5d + 97-4d + 97-3d + 97-2d + 97-d + 97$

$64 = \dfrac{582-15d}{6}$

$\cancel{384}\ 372 = 582 - 15d$

$15d = \cancel{198}\ 210$

$d = \cancel{14.18}\ 14$

$T_1 = 27 \quad T_2 = 41$

$T_3 = 5\cancel{5} \quad T_4 = \cancel{70}\ 69 \quad T_5 = \cancel{84}\ 83$

Q2 a) $S_\infty = \dfrac{a}{1-r}$

$= \dfrac{\frac{-2}{3}}{1-(-5/4)}$

$\frac{-5}{6} \times \frac{3}{2}$

$= \dfrac{-2}{3} \times \dfrac{4}{9}$

$= \dfrac{-8}{27}$

b) A limiting sum has ration of between -1 and 1 and the ratio for Andy's working is $\frac{5}{4} = 1\frac{1}{4}$ which is greater tic 1 ∴ no limiting sum.

Q3 $S_8 = 10$

$S_8 = 10 = \frac{8}{2}(2a + (7)d)$

$10 = 4(2a+7d)$

$10 = 8a + 28d.$

$2a + 7d = \frac{10}{4}$

$d = \dfrac{\frac{\cancel{10}\,5}{\cancel{4}\,2} - 2a}{7}$

$= \dfrac{5-4a}{17}$

$a,\ a+d,\ a+2d$

$a,\ a+\frac{5-4a}{14},\ a+2\left(\frac{5-4a}{14}\right)$

using $a=1$

$1,\ 1\frac{1}{14},\ 1\frac{1}{7}$

$d = 1 - 1\frac{1}{14} = \frac{1}{14}$

$= 1\frac{1}{7} - 1\frac{1}{14} = \frac{1}{14}$

$S_8 = \frac{8}{2}[2 \times 1 + (7)\frac{1}{14}\ 2$

$= 4[2 + \frac{1}{2}$

$= 10$

∴ true.

Q4) $r = 2$

$V,\ 2V,\ 4V,\ 8V,\ 16V,$

$T_{12} = \cancel{a}\,r^{11}$

$= V\,2^{11}$

$= \dfrac{2048V}{4}$

$= 512$

$T_n = 512V$

$\ln V 2^{n-1} = \ln 512 V$

$n-1 \ln 2 = \ln 512$

$n-1 = 9$

$n = 10.$

9.50 am

b) $T_6 = V2^5$

$= 32V$

$\dfrac{32V}{2048V}$

$= \frac{1}{64}$ full.

Q5:

a) ~~Co~~ Con Current is a point where many lines goes through.

b) take line$_1$ and line$_2$, then simultaneously equate them to find the pt of intersection then using line$_3$ and line$_1$, repeat the process to find points of intersection if line$_1$, line$_2$ line$_3$ share the same point of intersection they are concurrent.

Q6. Method 1.

Join the 3 points and find the gradients of the 3 lines if after multiplying 2 of the lines the result is -1 then it is $90°$. (right-angled)

Method 2

Pythagoras!

Q7.

a) $M_{OC} = \dfrac{2c-0}{2b-0}$

$= \dfrac{\cancel{2}c}{\cancel{2}b} = \dfrac{c}{b}$

$M_{AB} = \dfrac{2c-0}{2b+\cancel{2a}-\cancel{2a}}$

$= \dfrac{2c}{2b} = \dfrac{c}{b}$

b) Gradients of opposite sides are equal

c) i) $Midpt_{OB} = \left(\dfrac{\cancel{2}b+\cancel{2}a}{\cancel{2}}, \dfrac{\cancel{2}c}{\cancel{2}}\right)$

$= (b+a, c)$

ii) $Mid_{AC} = \left(\dfrac{2a+2b}{2}, \dfrac{2c}{2}\right)$

$= (a+b, c)$

d) Using part c its possible to prove OABC is a parallelogram as diagonals of parallelograms bisect each oth.