MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2012/2013

FIRST YEAR FIRST SEMESTER EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN PUBLIC HEALTH WITH INFORMATION TECHNOLOGY (CITY CAMPUS)

SMA 106: MATHEMATICS I

Date: 31ˢᵗ July, 2013   *Time: 11.00 a.m.- 1.00 p.m.*

INSTRUCTIONS:

♦ Answer Question ONE and any other TWO questions.

SMA106: Mathematics 1   Time: 2 Hours

Answer **Question 1** and any other two questions

Question 1 (30 Marks)

a) Expand the binomial expression $(2 + x)^3$. Hence estimate 2.02^3 correct to 2

    decimal places   (6 Marks)

b) A data has a first quartile of 42 and a third quartile of 50. Compute the lower
and upper limits. Should a data value of 65 be considered an outlier?

                                                        (5 Marks)

c) Factorize the quadratic expression $2x^2 + x - 15$. Hence solve the equation
$2x^2 + x - 15 = 0$ (6 Marks)

d) A dry cleaning firm has 12 employees: 7 women and 5 men. Three of the
women and five of the men are 40 and above years old. The remainder are
over 20 years of age and under 40. If a person is chosen at random from
this firm, what is the probability that the person is

    i.   a woman?

    ii.   under 40 years of age?

    iii.   20 years old?   (5 Marks)

e) A female bee hatches from a fertilized egg while a male bee hatches from
an unfertilized egg. Thus a female bee has a male parent and a female
parent while a male bee only has a female parent. Therefore the number of
ancestors of a male bee follows the *Fibonacci* sequence

$$1, 2, 3, 5, 8, 13, \ldots$$

Observe the pattern and write three more terms of the sequence.

                                                        (3 Marks)

f) Solve for x in $Cos\ 2x = -0.5$ for $0^\circ \le x \le 360^\circ$ (5 Marks)

Question 2 (20 marks)

The sales record of a real estate company for the month of May shows the following house prices (rounded to the nearest $1,000). Values are in thousands of dollars.

$$140 \quad 55 \quad 45 \quad 85 \quad 75 \quad 50 \quad 60 \quad 75 \quad 80 \quad 95$$

a) Find the five-number summary for the house prices   (5 Marks)

Five-number summary				

b) Find the mean. Explain why the mean and median are different for this particular set of data.   (4 Marks)

c) Construct a labeled boxplot for the house prices. (Show all your work).

               (8 Marks)

d) Describe the distribution of the house prices.   (3 Marks)

Question 3 (20 Marks)

a) Evaluate the function $y = x^2 - 4x + 3$ for integer values of x from -1 to 5 and display the results in a table: (8 Marks)

x	-1	0	1	2	3	4	5
y							

b) Use the points obtained in (a) to graph the function $y = x^2 - 4x + 3$

               (6 Marks)

c) Use the graph to solve the equation $x^2 - 4x + 3 = 0$ (4 Marks)

d) Use the graph to find the minimum value y can take.   (2 Marks)

Question 4 (20 Marks)

a) A researcher has collected the following sample data: $3, 5, 12, 3, 2$. Evaluate the mean and standard deviation of the sample data (7 Marks)

b) A triangle ABC has dimensions $a = 14cm$, $c = 12.6cm$ and angle $B = 72°$. Find angle A, angle C and side b in the triangle (13 Marks)

Question 5 (20 Marks)

a) Distinguish between a permutation and a combination (4 Marks)

   i. A restaurant offers a choice of 3 starters, 4 main courses and 3 sweets. How many different meals are available? (3 Marks)

   ii. 6 apprentices A, B, C, D, E and F have to be paired into two's in an exercise. In how many ways may this be done? (3 Marks)

b) Using the method of completing squares, solve the equation

$$x^2 - 4x - 12 = 0$$

(6 Marks)

c) Prove the identity

$$\frac{Sin\theta}{Cos\theta} + \frac{Cos\theta}{Sin\theta} = \frac{1}{Cos\theta Sin\theta}$$

(4 Marks)