

**JARAMOGI OGINGA ODINGA UNIVERSITY OF ESIENCE AND TECHNOLOGY**

**UNIVERSITY EXAMINATIONS**

**SCHOOL OF HEALTH SCIENCES**

**DIPLOMA IN COMMUNITY HEALTH AND DEVELOPMENT**

**SMA2111: MATHEMATICS 1**

**AUGUST 2013**

**(MAIN CAMPUS)**

**TIME 1HR 30MIN**

**This paper consists of FIVE Questions. Answer QUESTION ONE and any other TWO Questions.**

**QUESTION ONE (Compulsory) (30 Marks)**

- a. A function is defined as  $f(x) = 5x^3 + 6x^2 - 10$  Evaluate  $f(x+2)$
- b. An arc of length  $l$  cm subtends  $\frac{5}{6}\pi$  radians to the centre of a circle of radius 10cm. Determine the area of the sector enclosed between the two radii and the arc length  $l$  of the circle. (3 Marks)
- c. Solve the quadratic equation given below using the completing square method.  
i)  $x^2 + 7x - 2 = 0$  (3Marks)
- d. Prove the trigonometric identity below  
 $(\sin \theta + \cos \theta)^2 = 1 + 2 \sin \theta \cos \theta$  (3 Marks)
- e. Express the surd  $\sqrt{5832}$  in its simplest form (3 Marks)
- f. The fourth term of an AP is 9 while the sixth term is 15. Find the 20<sup>th</sup> term and the sum of the first 50 terms. (3 Marks)
- g. In an hospital, there are 20 nurses in the physiotherapy department. In how many ways can 4 nurses working together be selected to message patient. (3 Marks)
- h. Expand  $(2x + y)^7$  (3 Marks)

i. In a Mathematics Diploma class, the duration in minutes, taken by 10 students to recall the mathematical concepts they learnt in the secondary school syllabus were measured and recorded as shown.

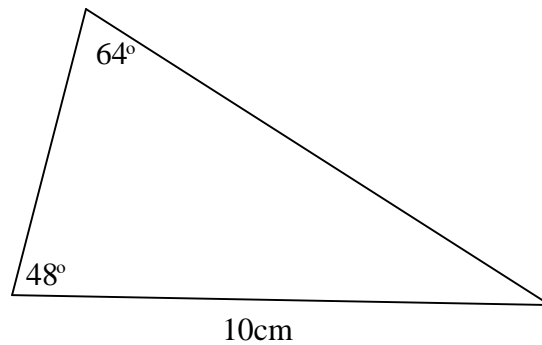
4, 7, 9, 12, 14, 17, 20, 22, 24, 25, 30

Determine the variance of these 'thinking' durations

(3Marks)

j. Determine the perimeter of the triangle below

(3Marks)



## QUESTION TWO (15 MARKS)

a. Define the following terms

- i) Function
- ii) Domain of a function
- iii) Range of a function

(6Marks)

b. A function is defined as  $g(t) = \sqrt{5t^2 - 16}$ .

Determine its inverse

(4 marks)

c. Given that  $g(x) = 2x^2 + x + 11$  and  $h(x) = x + 4$ , determine  $g[h(x)]$

(5 Marks)

**QUESTION THREE (15 MARKS)**

- a. A quadratic equation takes the general form  $ax^2 + bx + c = 0$  where a, b and c are constants. Show that its general solution is given as

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad (7 \text{ marks})$$

- b. Use the laws of logarithms to rewrite

$$\log \frac{abc^2}{d^3}$$

- c. Prove the following trigonometric identity

$$\sec^2 \theta - \cos^2 \theta = \sec^2 \theta + \cos^2 \theta$$

**QUESTION FOUR (15 MARKS)**

- a. In an arithmetical progression the 8th term is 23 and the 11th term is 4 times the 3rd term. Find the sum of the first 10 terms.      4 marks

- b. In a GP the first term is a while the common ratio is r. Prove that the sum of the first n terms is given by

$$S_n = \frac{a(r^n - 1)}{r - 1} \quad (7 \text{ marks})$$

- a. In a GP, the first term is 3 while the common ratio is 4, determine the sum of the first 10 terms.      (4 marks)

**QUESTION FIVE (15 MARKS)**

In a class of 40 students, a survey was conducted on the number of times each student had visited VCT centre for HIV testing and counseling since they attained the age of 18. The following were the responses obtained from each student.

22 ; 46 ; 35 ; 68 ; 67 ; 49 ; 55 ; 44  
44 ; 29 ; 35 ; 34 ; 42 ; 37 ; 40 ; 42  
41 ; 30 ; 59 ; 62 ; 26 ; 47 ; 45 ; 37  
23 ; 29 ; 56 ; 51 ; 38 ; 35 ; 43 ; 47  
46 ; 45 ; 61 ; 53 ; 52 ; 55 ; 48 ; 45

- i. Using classes of 20-29, 30-39,..... up to 60-69. Construct a frequency distribution table.  
(5 marks)
- ii. From the frequency distribution table made in a. (i) above, determine the mean, the median, the variance and the standard deviation of the frequency of the visits.  
(10 marks)