



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY**  
**SCHOOL OF BIOLOGICAL AND PHYSICAL SCIENCES**  
**UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF**  
**EDUCATION (SCIENCE)**  
**1<sup>ST</sup> YEAR 1<sup>ST</sup> SEMESTER 2013/2014 ACADEMIC YEAR**  
**MAIN**

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**COURSE CODE: SMA 2111**

**COURSE TITLE: MATHEMATICS I**

**EXAM VENUE: LAB 7**

**STREAM: (SBPS)**

**DATE: 16/04/14**

**EXAM SESSION: 2.00 – 4.00 PM**

**TIME: 2.00 HOURS**

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**Instructions:**

- 1. Answer Question 1 (compulsory) and ANY other 2 questions**
- 2. Candidates are advised not to write on the question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

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

- a. Three sets P, Q and R are given as  $P = \{23, 27, 30, 33, 35, 40, 45, 47, 49\}$ .  
 $Q = \{13, 17, 19, 23, 31, 35, 37, 41, 46, 47\}$  and  $R = \{27, 29, 30, 33, 35, 46, 47, 48\}$

Determine  $(P \cap Q) \cup (Q \cap R)$  (3 marks)

- b. A function is defined as  $f(x) = 5x^3 + 6x^2 - 10$  Evaluate  $f(-10)$  (3marks)

- c. Solve the quadratic equation given below using the factorization method.

$$2x^2 - 11x + 12 = 0 \quad (3 \text{ marks})$$

- d. Prove the trigonometric identity below

$$(\sin \theta + \cos \theta)^2 = 1 + 2\sin \theta \cos \theta \quad (3 \text{ marks})$$

- e. Express the surd  $\frac{2\sqrt{5} - 2\sqrt{3}}{10\sqrt{5} - 4\sqrt{3}}$  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. Expand  $(2x + y)^8$  (3 Marks)

- h. Solve the triangle whose dimensions are given as

$$a = 4\text{cm}, c = 8\text{cm}, B = 40^\circ \quad (5 \text{ marks})$$

- i. Sketch the general graph of the function  $f(\theta) = \sin \theta$  (4marks)

**QUESTION TWO (15 MARKS)**

- a. Define the following terms  
i. Function  
ii. Domain of a function  
iii. Range of a function

(3 marks)

- b. A function is defined as  $g(t) = \frac{t^2 + 4}{3t^2 - 10}$ . Determine  $g^{-1}(t)$  (4 marks)

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

- i.  $g[h(x)]$   
ii.  $h[g(x)]$  (8 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 by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

(7 marks)

- b. Solve the quadratic equation  $2x^2 + 14x - 4 = 0$  using the completing square method. (4 marks)
- c. The length of a rectangle is 3m longer than its width. Given that its area is  $40\text{m}^2$ . Determine its perimeter (4 marks)

### QUESTION FOUR (15 MARKS)

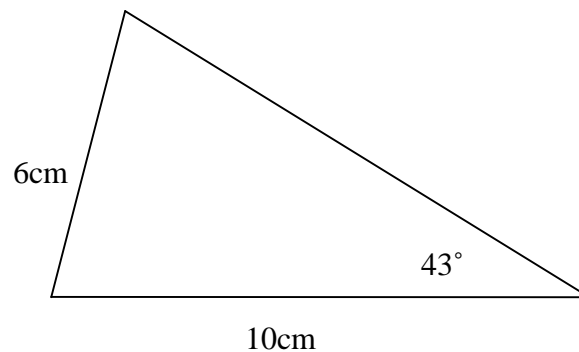
- a. In a Geometric progression (G.P), the first term is  $a$  while the common ratio is  $r$ . Show that the sum of the first  $n$  terms,  $S_n$  is given by

$$S_n = \frac{a(r^n - 1)}{r - 1} \quad (5 \text{ marks})$$

- b. In a G.P, the third term is 48 while the 5th term is 768. Determine the sum of the first 10 terms. (4 marks)
- c. In an Arithmetic Series, the 10<sup>th</sup> term is 59 while the 20<sup>th</sup> term is 119. Determine
- The first term and the common difference (3 marks)
  - The sum of the first 100 terms (3 marks)

### QUESTION FIVE (15 MARKS)

- a. Define an angle of one radian (2 marks)
- b. Convert the following angles in radians into degrees (2 marks)
- 45 radians (2 marks)
  - $6.5f$  radians (2 marks)
- c. Determine the perimeter of the triangle below (5Marks)



- d. Prove the trigonometric identity below

$$\cot \theta + \tan \theta = \frac{1}{\sin \theta \cos \theta} \quad (4 \text{ marks})$$