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

**UNIVERSITY EXAMINATIONS**

**SCHOOL OF HEALTH SCIENCES**

**DIPLOMA IN COMMUNITY HEALTH AND DEVELOPMENT**

**SMA2111: MATHEMATICS 1**       **April 2014**

**KISUMU LEARNING CENTRE**       **TIME 1HR 30MIN**

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

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

    a. Three sets P, Q and R are given as $P=\{13, 17, 20, 23, 25, 30, 35, 37, 39\}$.

        $Q=\{13, 17, 19, 23, 25, 27, 31, 36, 37\}$ and $R=\{17, 19, 20, 23, 25, 36, 37, 38\}$

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

    b. A function is defined as    $f(x)=\dfrac{3x^2+6x-3}{2x+20}$    Evaluate    $f(3)$

                                (3marks)

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

        $5x^2-27+10=0$

    d. Prove the trigonometric identity below

        $(\sin_n - \sin_n \cos^2{}_n = \sin^3{}_n$           (3 Marks)

    e. Express the surd $\dfrac{2\sqrt5-2\sqrt3}{10\sqrt5-4\sqrt3}$ in its simplest form

                                  (3 Marks)

  f. In a G.P, the third term is 48 while the 5th term is 768. Determine the sum of the first 10 terms.          (3 Marks)

  g. Expand $(2x+3y)^5$          (3 Marks)

  h. Solve the triangle whose dimensions are given as

        *a=4cm, b=8cm, c=7cm*           (5 marks)

    i. Copy and complete the table below

| Angle in degrees | $27^o$ | | $345^o$ | |
|---|---|---|---|---|
| Angle in radians | | $3.142^c$ | | $2.25^{\ c}$ |
| Sec | | | | |

                              (4 marks)

i.

## QUESTION TWO (15 MARKS)

a. A function is defined as $f(x) = 5x^3 + 6x^2 - 10$
   Evaluate i) $f(0)$  ii) $f(-3)$  iii $f(4+h)$

b. Determine the inverse of the following functions

   i) $g(t) = \sqrt{5t^2 - 16}$

   ii) $f(z) = 7z^3 - 7$

c. Given that $h(x) = 4x - 1$ and $g(x) = 3x^2 + 5x + 7$ determine

   ii) $h \circ g$  iii) $g \circ h$

   i. **(6 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 the equation has the two possible roots given by

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

b. Solve the quadratic equation $6x^2 + 42x - 12 = 0$ using the completing square method. (4 marks)

c. Expand $(3x - y)^6$ (4 marks)

## QUESTION FOUR (15 MARKS)

a. The terms of an arithmetic sequence is given as
   $a, a + d, a + 2d, a + 3d + .................... + l$,
   where $a$ is the first term, $d$ the common difference and $l$ is the last term
   Show that the sum of the first $n$ terms of the sequence is given as

   $$S_n = \frac{n}{2}[a + l] \quad \text{(7 marks)}$$

b. In an A.P the sum of the first two terms is 14 while the sum of the fifth and sixth terms is 62. Determine the $20^{th}$ term ( 4 marks)
c. 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)


## QUESTION FIVE (15 MARKS)

a. Define an angle of one radian hence show that 1 radian is equivalent to $53.29°$ (5 marks)

b. Derive the sine formula (6 marks)

c. Prove the trigonometric identity below
$$\sec^2 θ \cos ec^2 θ = \sec^2 θ + \cos ec^2 θ$$ (4 marks)