MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS
2018/2019 ACADEMIC YEAR
FIRST/SECOND YEAR FISRT SEMESTER

SCHOOL OF SCIENCE AND INFORMATION SCIENCES
DEPARTMENT OF COMPUTING AND INFORMATION SCIENCES
FOR DEGREE IN BSC. IN STATISTICS WITH COMPUTING

COURSE CODE: STA 1106
COURSE TITLE: COMPUTATIONAL METHODS AND DATA ANALYSIS I

DATE: 5ᵀᴴ DECEMBER, 2018   TIME: 0830 – 1030 HRS

INSTRUCTIONS TO CANDIDATES

  i.   Question ONE in section A is compulsory
 ii.   Answer any OTHER Two (2) Questions from section B
iii.   Use diagrams, example and illustration where necessary
 iv.   All questions in section B have equal marks

SECTION A: COMPULSORY [30 MARKS]

QUESTION ONE

i. Write a C++ to output the following string of characters
    "This is my C++ Program, I enjoy developing programs in C++!"
                                                          [4 Marks]

ii. Write a C++ program that two defines variables for floating-point
    numbers and initializes them with the values
    123.456 and 76.543
    Then display the sum and the difference of these two numbers on
    screen.   **[4 Marks]**

iii. Write a program that reads a sentence and prints out the sentence in
     reverse order using the reverse method of the StringBuffer class. For
     example, the method will display

     "?uoy era woH"   **[4 Marks]**

iv. Write a recursive method to compute the sum of the first N positive odd
    integers.   **[4 Marks]**

v. Provide the syntax for the following control flow
    i.   loops with while,   **[2 Marks]**
    ii. do-while, and   **[2 Marks]**
    iii. for selections with if-else, switch.   **[4 Marks]**

vi. Create a program to calculate the square roots of the numbers
    4   12.25   0.0121

    Then read a number from the keyboard and output the square root of
    this number.   **[8 Marks]**

SECTION B: ATTEMP ANY TWO QUESTIONS [40 MARKS]

QUESTION TWO

i. Write an **if statement** to find the smallest of three given integers
    without using the min method of the Math class.   **[4 Marks]**

ii. Create a C++ program that defines a string containing the following
    character sequence:
    "I have learned something new again!"

and displays the length of the string on screen. Read two lines of text from the keyboard. Concatenate the strings using " * " to separate the two parts of the string. Output the new string on screen.   **[10 Marks]**

iii.   Draw control flow diagrams for the following two switch statements.

```
switch (choice) {
   case   1: a = 0;
             break;
   case   2: b = 1;
             break;
   case   3: c = 2;
             break;
   default: d = 3;
             break;
}
```

```
switch (choice) {
   case 1: a = 0;
   case 2: b = 1;
   case 3: c = 2;
   default: d = 3;
}
```

[6 Marks]

QUESTION THREE

i.   Write a C++ program that takes a shape of a Triangle, and capable of computing the perimeter and area of a triangle, given its three sides a, b, and c, as shown below. Notice that side b is the base of the triangle.
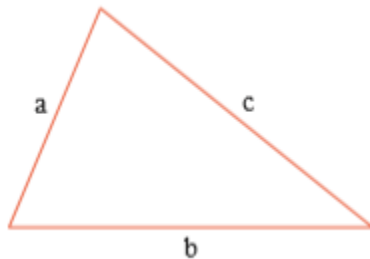
$$\text{Perimeter} = a + b + c$$

$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$$

$$\text{where } s = \frac{a+b+c}{2}$$

[5 Marks]

ii.   Write a C++ program that accepts N, N> 1, from the user and displays the first N numbers in the Fibonacci sequence. Use appropriate formatting to display the output cleanly.   **[5 Marks]**

iii.   You can compute sin x and cos x by using the following power series:

$$\sin X = X - \frac{X^3}{3!} + \frac{x^5}{5!} + \frac{x^7}{7!} + \cdots$$

$$\text{COS}\,X = X - \frac{X^2}{2!} + \frac{x^4}{4!} + \frac{x^6}{6!} + \cdots$$

iv. Write a program that evaluates sin x and cos x by using the power series. Use the double data type, and increase the number of terms in the series until the overflow occurs**. [10 Marks]**

QUESTION FOUR

i. Write a C++ program that reads an integer between 0 and 65535 from the keyboard and uses it to seed a random number generator. Then output 20 random numbers between 1 and 100 on screen. **[10 Marks]**

ii. Write the function **sum()** with four parameters that calculates the arguments provided and returns their sum. Parameters: Four variables of type long. Returns: The sum of type long. Use the default argument 0 to declare the last two parameter of the function **sum().**Test the function **sum()** by calling it by all three possible methods. Use random integers as arguments. **[10 Marks]**

QUESTION FIVE

i. Write a function pow(double base, int exp) to calculate integral powers of floating-point numbers.
Arguments:
The base of type double and the exponent of type int. Returns:
The power base exp of type double.
For example,calling pow(2.5, 3) returns the value
2.53 = 2.5 * 2.5 * 2.5 = 15.625 **[20 Marks]**

//END