



**MAASAI MARA UNIVERSITY**  
**REGULAR UNIVERSITY EXAMINATIONS**  
**2022/2023 ACADEMIC YEAR**  
**THIRD YEAR FIRST SEMESTER**  
**SCHOOL OF PURE, APPLIED AND HEALTH**  
**SCIENCES**  
**BACHELOR OF SCIENCE**  
**(COMPUTER SCIENCE)**

**COURSE CODE: COM 3105**  
**COURSE TITLE: OBJECT ORIENTED**  
**PROGRAMMING II**

**5<sup>th</sup> April, 2022**

**8:30 – 10:30**

---

**INSTRUCTIONS TO CANDIDATES**

(i) Answer Question **ONE** and any other **TWO** questions

*This paper consists of 5 printed pages. Please turn over.*

## SECTION A (30 Marks): Answer all questions from this section

---

### QUESTION 1

(a) Explain the meaning of the following terms **(6 Marks)**

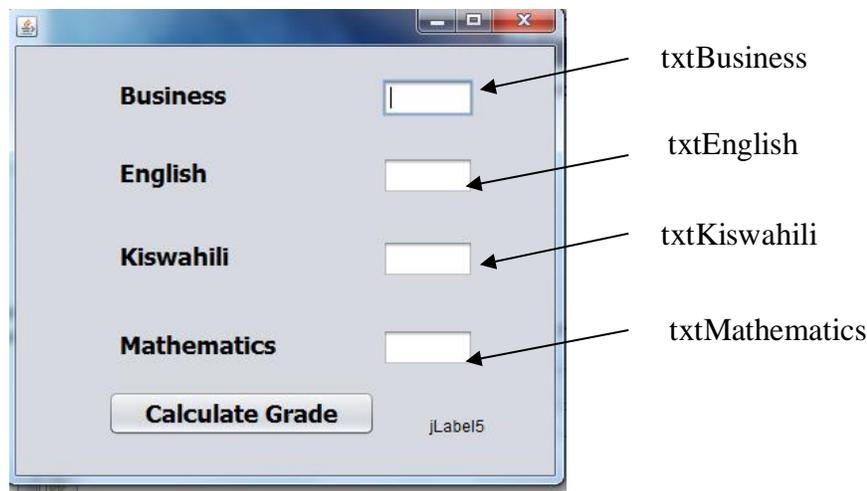
- (i) Inheritance
- (ii) Encapsulation
- (iii) Polymorphism

(b) Give three limitations of inheritance **(6 Marks)**

(c) What is the output of the following block of code **(4 Marks)**

```
for(int i=1;i < 5;i++)
{
    if(i % 2== 0)
        System.out.println("Hello World: "+i);
}
```

(d) Write the code for the calculate grade button to display on jLabel5 the average grade of the subjects entered on the textbox with the variables indicated. The program should also indicate pass if the average is above 40 and fail if the average is below 40 **(4 Marks)**



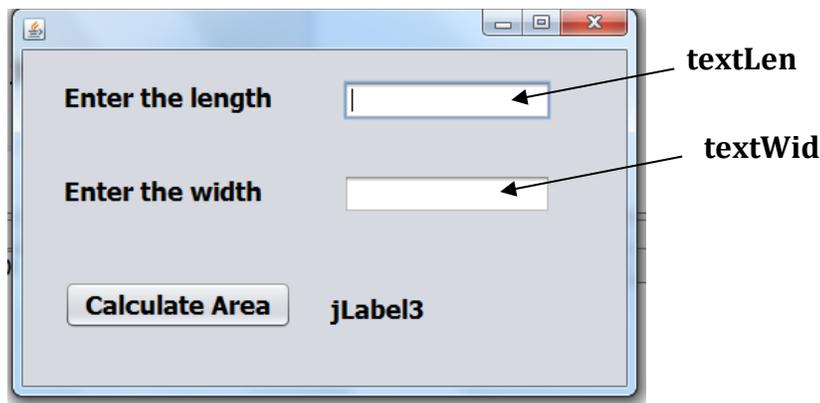
(e) Create a private method named countChars that will accept a string and a char as parameters and will count the number of times the char appears in a String. Use a for loop to go through the String and return the count of characters to the calling method. **(5 Marks)**

- (f) Write a java program using a collection to create a variable that will store a list of countries (Strings). Your collection should not store duplicates, and order is not important. **(5 Marks)**

**SECTION B (40 Marks): Answer any two questions from this section.**

**QUESTION 2**

- (a) Give four limitations of Object Oriented Programming **(4 Marks)**  
(b) Write the code for the calculate area button to display the area on jLabel3 using the variables indicated in the following figure **(4 Marks)**



- (c) Create a RoadParts interface that has a constant named terrain that will store the String value "track\_racing". The interface will define two methods that accept a String argument name newValue and two that will return the current value of an instance field. The methods are to be named: getTyreWidth, setTyreWidth, getPostHeight, setPostHeight. **(6 Marks)**
- (d) Write a program to does the following **(6 Marks)**
1. get from the user the radius of a cone in cm
  2. get from the user the height of a cone in cm
  3. compute the cone's volume
  4. display the volume of the cone in cm<sup>3</sup>
- The volume of a cone is  $\frac{1}{3}\pi r^2 h$  where r is the radius and h is the height.

**QUESTION 3**

- (a) The body mass index (BMI) is a commonly used measure of body fat for adult men and women based on height and weight. The equation for BMI is:

$$BMI = \frac{weight}{height^2}$$

where weight is in kilograms and height is in meters

The following table shows how BMI equates to body fat categories.

BMI	Category
< 18.5	underweight
18.5 – 24.9 <sup>9</sup>	normal
25 – 29.9 <sup>9</sup>	overweight
>= 30	obese

Using the following conversions:

1 inch = 0.0254 meters

1 pound = 0.4535 kilograms

Write a program that does the following:

1. Prompt for and get from the user their height in inches
2. Prompt for and get from the user their weight in pounds
3. Compute the user's BMI (using the appropriate unit conversions)
4. Display the user's BMI (with 2 decimal places) and their corresponding body fat category

For example, if the user entered their height as 70 inches (5'10") and their weight as 180 pounds, your function should report:

Your BMI is 25.82 which classifies you as overweight.

Your code may assume the user will enter appropriate numbers for height and weight.

**(6 Marks)**

- (b) Here at the world renowned Snake Box Factory, we pride ourselves on our ability to deliver the highest quality, custom sized, cardboard boxes to our customers. Our boxes are filled with the highest quality, custom-ordered snakes. We service thousands of accounts worldwide and have a solid 98% satisfaction rating with customers. However, the entire ordering process is

currently written on cardboard, which is transported between departments via carrier snake. We thought this would be a good way to show confidence in the quality and usefulness of our product. But as our business continues to grow, we're realizing this was a bad idea. We believe it's time for a more conventional and digitized approach to our operations. Would you be able to help us develop the software we need to make this happen? **(8 Marks)**

- (i) Identify 3 objects from this scenario
  - (ii) List 3 properties and 3 behaviors belonging to each object.
- (c) java program to calculate the roots of a quadratic equation  $ax^2 + bx + c = 0$  **(6 Marks)**

Hint:  $d = \sqrt{b^2 - 4ac}$ , and the roots are:  $x_1 = \frac{-b + d}{2a}$  and  $x_2 = \frac{-b - d}{2a}$

#### **QUESTION 4**

- (a) Give reasons why you might use an Abstract class rather than an Interface **(4 Marks)**
- (b) Create an interface named MountainParts that has a constant named TERRAIN that will store the String value "off\_road". The interface will define two methods that accept a String argument name newValue and two that will return the current value of an instance field. The methods are to be named: getSuspension, setSuspension, getType , setType. **(6 Marks)**
- (c) Write a java program to calculate the area of a circle that implements the following Object Oriented Concepts **(10 Marks)**
- (i) Static Method
  - (ii) Using Interface
  - (iii) Using Inheritance
  - (iv) Using Constructor
  - (v) Using Method