EGERTON UNIVERSITY

UNIVERSITY EXAMINATIONS
(NJORO CAMPUS)

FIRST SEMESTER 2017/2018 ACADEMIC YEAR

SECOND YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE

COMP223: OBJECT ORIENTED PROGRAMMING

STREAM: BSc (STATS) **TIME:** 2 HOURS

EXAMINATION SESSION: DECEMBER **YEAR:** 2017

INSTRUCTIONS
1. Question 1 is compulsory
2. Answer any other two questions.
3. Extra answered questions will not be marked.

Question 1 (30 marks)

a) Using examples, explain how each of the following concept are implemented in a Java program:
   i. static method
   ii. dynamic binding
   iii. encapsulation
   iv. overriding

[12 marks @3 each]

b) In Java, method parameters are passed by value, explain what this means and give examples of the consequences.

[2 marks]

c) Explain how one would implement pass by reference in Java

[2 marks]

d) Given the following class definitions

```
public class A { }
public class B extends A { }
```

public class C extends A { }

i. Write a generic method, processElements, which would be used to print a list containing a collection of object belonging to any other class above.

[3 Marks]

ii. Modify your method to be limited objects that are instances of the class A.

[3 marks]

e) Write a single program that allow user to enter any integer. The program should then check whether a digit is repeated.

[8 marks]

Question 2 (20 Marks)

a) In this problem you are required to implement a class Fraction, which represents fractions of the form a/b where a and b are integers, (1/2, 4/6, 101/432. etc.). The class should:

i. Include a constructor that initializes from a numerator and denominator.

[2 Marks]

ii. Write an instance method for addition.

[2 Marks]

iii. Write a static method for multiplication.

[2 Marks]

iv. Write a static main() that allocates two Fractions, 1/2 and 3/4 and stores their sum in a third variable.

[2 Marks]

b) Write a program that takes two integers on the command line and prints their sum. For Example: Assuming the executable file is 'Foo', >java Foo 26 24 prints 50

[4 marks]

c) A simple program for calculating the total and the mean integer values and which is terminated by a value 0. You are require to

i. write a pseudo code for the program

[3 Marks]

ii. write a working source for program.

[5 Marks]

Question 3 (20 Marks)

a) Write a single program that prompts for five quiz grades for each five students. The program should then

i) compute the total score and average for each student

[5 Marks]

ii) compute the average score, high score, and low score for each quiz

[5 Marks]

b) Write a program that reads a message and print the reversal of the message

Enter the message: The Girl Is mine

Reversal is: enim sI lriG ehT

[6 marks]

c) Examine the following program

```
public class CompClass {
    public static void main(String[] args) {
            int arr[] = new int[args.length];
            float var1 = 0;
            for (int i = 0; i < args.length; i++)
                    arr[i] = (new Integer(args[i])).intValue();
            for (int i = 0; i < arr.length; i++)
                    var1 = (i % 2 == 0) ? 0 : arr[i];
            System.out.println(var1 / args.length);
    }
}
```

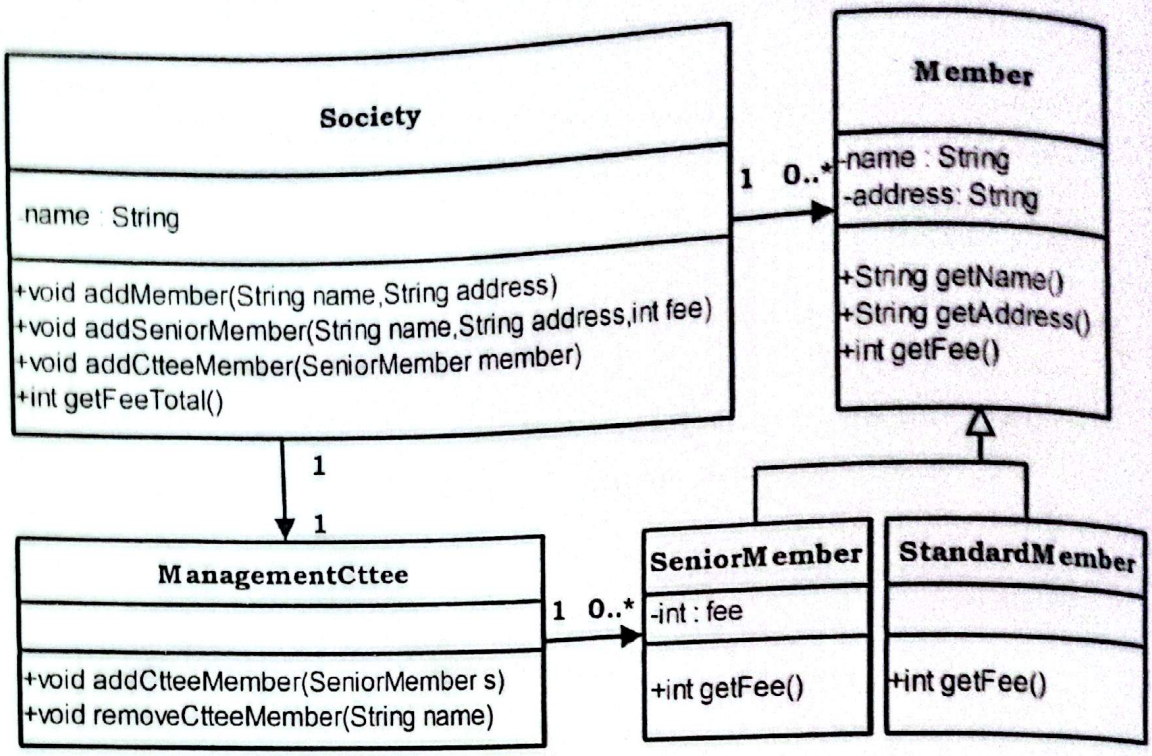
What would be the output of the above program given the following invocation:

> java CompClass 20 45 60 85 100 205 300 405

[4 marks]

Question 4 (20 Marks)

Consider this UML class diagram showing part of a program to manage the membership information for a professional society



a) Write a Java version of class ManagementCttee assuming it has this constructor:

public ManagementCttee()

[7 marks]

b) Class Member is an abstract class. Explain the role of an abstract class.

[3 marks]

c) Write a Java version of class Member assuming it has this constructor:

public Member(String name, String address) and that the method getFee() is abstract.

[6 marks]

d) Write a Java version of class StandardMember assuming it has this constructor:

public StandardMember(String name, String address) and the standard membership fee is fixed at KES 50.

[4 marks]

Question 5 (20 Marks)

a) What is polymorphism? Give a brief example.

[4 Marks]

b) Using the switch statement, write a program that converts a numerical grade into a letter grade using the following grading scale: A=80-100, B=70-79, C=60-69, D=50-59, F=0-49. The program should print an error message if the grade is larger than 100 or less than 0.

[8 marks]

c) Write a class called Product. A Product-object should represent a product stocked in a supermarket, e.g. a 100 gram can of Kiwi polish. It should contain the following information: a code for the product, the name of the product, the cost of the product, and the quantity of the product currently in stock. Assume the code and the name are represented by strings of characters. Include the following constructor and methods in the class definition.

i. An instance method addStock(int n) that will add n to the quantity of the product in stock.

ii. An instance method outOfStock() that will return the value true if there is none of this product in stock. Otherwise it will return false.

It should not be possible to access the attributes of a Product object except by using the methods listed above

[8 marks]

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