School of Business, Leadership & Enterprise

FdSc Communication Technologies:

Software Engineering

Level: 4

Module: Introduction to Programming (Java)

Assessment: 1 Knowledge and Programming

Module Tutor: Dr Nicholas Caldwell

Weighting in Module:40%

Hand out: 7th March 2014

Hand in: **on or before noon on Monday 19th May 2014**

Assessment Centre, WF 1st floor or SafeAssign.  
Please make sure you obtain and keep a receipt

**+What is required?**

A word processed document that contains the answers to the questions set, including screenshots of program outcomes and code listings. You may find it easier to bundle source code files and the Word document into a compressed archive. In all cases, the Word document and any overarching zip should have only your UCS studentid as its identifier.

**Learning outcomes to be assessed:**

1. to introduce the concept of a computer program, programming languages and program production methods;
2. to introduce generic high-level programming language concepts;
3. to introduce the concepts and structures of structured programming;
4. to introduce the concepts of object-oriented development and programming;

**Graduate Headstart**

C1 Reading, selecting, analyzing and synthesizing information from a range of sources

C2 Producing different types of documents

IT1: Preparing information

**Assessment & Grading Criteria:**

See attached.

**Assessment Brief.**

See attached.

**Assessment Criteria**

To achieve a Pass in this Assignment, the stated Pass criteria must be achieved

|  |  |
| --- | --- |
| **Learning Outcomes Assessed in this Assessment** | **PASS criteria** |
| 1. Demonstrate knowledge and understanding of computer program, programming languages and program production methods; | In order to be awarded a pass grade (P− or above) for this assignment you must meet the following criteria.   * You must score a minimum of 40% (40 marks) for the 28 questions * You must submit your work: * anonymously (i.e. you must identify yourself using only your student number); * word processed; * with the answers to all questions appropriately identified. |
| 2. Select appropriate structured, object-oriented high-level programming and formulate effective software solutions |
| 1. Employ structured and high-level programming constructs to implement effective software solutions |
| 3. Employ object-oriented programming constructs to implement effective software solutions |

Grading criteria follow…….

To achieve a higher grade it is the quality of work that will be considered, rather than the amount of work done, and will be assessed against the given criteria:

**Generic Grading criteria for Level 4**

|  |  |
| --- | --- |
| **Good Pass** | In order to be awarded a grade of “Good Pass” (G−, G= or G+)  your score for the 20 questions must greater than or equal to 50% (50 marks) and less than 60% (50 marks) |
| **Merit** | In order to be awarded a grade of “Merit” (M−, M= or M+)  your score for the 20 questions must greater than or equal to 60% (60 marks) and less than 70% (70 marks) |
| **Distinction** | In order to be awarded a grade of “Distinction” (D−, D= or D+)  your score for the 20 questions must greater than or equal to 70% (70 marks) |

**Assignment Brief**

Study the lecture slide sets, the example sheets, the book “Java: How to Program” by Deitel & Deitel (Ebook), and any other Java documentation that you personally find helpful in order to answer the questions posed.

Submit word processed answers to the questions, making sure that each answer is appropriately identified and properly corresponds to the question set. You should include source code listings (either included in the Word document or as distinct carefully named .java files), screenshots showing program outcomes and any diagrams such as flowcharts.

Modify the Word document by filling in each answer, appropriately identified as the answer, directly below its corresponding question. Rename the file to have your student userid in its filename.

Assignment Questions

1. (2 marks) Explain how Java compilation differs from standard high-level compilation

Standard high-level compilation, for example what happens in a C compiler, involves using a compiler program to translate a text file written in the high-level programming language and outputting binary machine codes that will have the a specific processor execute the equivalent of the high-level program.

Java compilation involves an extra step, where the Java code is compiled to a special binary code, called bytecode, that will be executed on a virtual machine, not a specific processor. The Java Virtual Machine then runs this byte code, translating the bytecode into machine codes for the local processor as it goes along.

1. (2 marks) What is the output produced by the following lines of program code?

char x, y;   
x = ′y′;   
System.out.println(x);   
y = ′z′;   
System.out.println(y);

x = y;   
System.out.println(x);

Output:

y

z

y

1. (2 marks) What is the output produced by the following and why?

System.out.println(″1 + 3 = ″ + (1 + 3));   
System.out.println(″1 + 3 = ″ + 1 + 3);

Output:

1 + 3 = 4

1 + 3 = 13

Java will convert integers to strings before adding them to other strings. Brackets are executed before any other operation. In the first output the brackets dictate that two integers 1 and 3 must be added together to get 4. Then 4 is added to the string “1 + 3 = ” to give the output above.

In the second output java proceeds with addition from left to right, as is the default mode when no brackets are present. In this case a string must be added to an int, giving “1 + 3 = 1”, then that string must be added to another int (3), giving the output above.

1. (3 marks) Write a complete Java program that reads in a line of keyboard input containing three values of type float, separated by one or more spaces, and outputs them as well as their average.
2. (3 marks) What output is produced by the following code for key having a value of 1, 4, 5, and 7 and what is the bug in the code?

int key = 1;   
switch (key \* 1) {   
 case 2:   
 System.out.println(“Binary”);   
 break;   
 case 8:   
 System.out.println(“Octal”);   
 break;   
 case 10:   
 System.out.println(“Denary”);   
 case 16:   
 System.out.println(“Hexadecimal”);   
 break;   
 default:

System.out.println(“Confused”);

}

1. (2 marks) Suppose elementA and elementB are two variables that have been given values. How would you test whether they are equal when they are of type double? How would you test whether they are equal when they are of type String? Explain any difference in your test.
2. (3 marks) Determine the value of each of the following Boolean expression, assuming that the value of the variable counter is 0 and the value of the variable sentinel is 20. (Give your answers as one of the values true or false).

a. (counter == 0) && (sentinel < 20)

b. counter == 0 && sentinel < 21

c. (sentinel > 20) || (counter < 5)

d. !(counter == 7)

e. ((sentinel/counter) > 5) || (sentinel < 30)

f. (sentinel < 20) | ((sentinel/counter) > 5)

1. (5 marks) Write code that sums the values 1 to 10 and outputs the answer. Create equivalent solutions using for loops, while loops and do while loops.
2. (4 marks) In the array declaration

Double[] reading = new Double[100];

what is

a. the array name?

b. the base type?

c. the length of the array?

d. the range of values an index accessing this array can have?

e.. Is it legal to write reading[100] = 79.45? (Explain your answer)

1. (2 marks) Predict the output from the following:

Double a[] = new Double[5];

int i;

for (i = 0; i < 5; i++)

a[i] = 2.0 \* i;

System.out.println(a[i – 1]);

What would be the output if the last line were changed to

System.out.println(a[i]); ?

1. (2 marks) Write an assertion check that checks to see that the value of the variable monitor is greater than or equal to the value of the variable threshold. Both variables are of type float.
2. (3 marks) Explain the differences between a class method and an instance method.
3. (4 marks) Explain the differences between public, private and protected access modifiers when applied to variables.
4. (3 marks) What is the signature of each of the following method headings?

public void lookupName(String name)

public double calculateCommission(double sales, double commissionRate)

public boolean exceededThreshold(double commission)

public int shares(float commission, String jobrole, int duration)

public float shares(float commission, String jobrole, int duration)

1. (4 mark) Explain the similarities and differences between classes and interfaces.
2. (3 marks)

public class Book

{ private String title;

private int code;

private String author;

public Book (String t, int c, String a)

{

**<Details not shown>**

}

public Book()

{

**<Details not shown>**

}

public void getDetails()

{

**<Details not shown>**

}

}

Which of the following are legal in a program that uses this class and if not, why not? Assume that each line of code follows in order.

Book Javain21Days = new Citizen(“Java in 21 Days”, 17, “Roger Cadenhead”);   
Book ThirtyNineSteps = new AnotherClass(“Thirty-Nine Steps”,78.9);

Book b = new Book();

b.getDetails();

Book TopBestSeller;

TopBestSeller.changeDetails();

1. (3 marks) Suppose Novel is a derived class of a class called Book and further suppose that the class Book has instance variables Title and Author and a method checkLoanStatus. Will an object of the class Novel have instance variable Title and Author? Explain your answer. Will the Novel class also have a method named checkLoanStatus and if so, how may it differ between the Novel and Book classes. Explain your answer.
2. (15 marks) In the Week 5 exercises, you developed code to encrypt text using the Caesar cipher. Now design using a flowchart or pseudocode an algorithm to decrypt a ciphertext which has been encoded by a Caesar cipher of unknown offset. Implement this as a complete program – you may assume that the ciphertext is available to the program as a String of multiple uppercase 5-character blocks separated by spaces.
3. (15 marks) Design (using flowcharts or pseudocode) and implement classes and methods which perform matrix multiplication on square matrices of size 2, 3 and 4. Matrix cells may be integer or double-valued
4. (20 marks) Design and implement (using flowcharts or pseudocode) a suitable (set of) class(es) and methods to implement a birthday and address book. Each entry in the book should contain a first name, a surname, a valid email address, and a birthday. A valid email address should have one or more letters or digits followed by an @ character followed by one or more letters or digits – there may be one or more periods between letters or digits. Create a constructor to create instances of the book entries, accessor methods to retrieve and display names, email addresses, and birthdays using family names and email addresses as search keys, mutator methods to change names, email addresses, and birthdays using family names and email addresses as search keys, a search method to test if there is an entry matching a given birthday, and a sorting routine that retrieves all the entries ordered by date (1st Jan first to 31st Dec).