King Saud University

College of Computer and Information Sciences

Computer Science Department

Course Code:	CSC 111
Course Title:	Introduction to Programming
Semester:	Fall 2015
Exercises Cover Sheet:	**Final Exam - A**

Duration: 2h 30min

Student Name:	
Student ID:	
Student Section No.	

Tick the Relevant	Computer Science B.Sc. Program ABET Student Outcomes	Question No. Relevant Is Hyperlinked	Covering %
√	**a) Apply knowledge of computing and mathematics appropriate to the discipline;**	**1**	**30%**
	b) Analyze a problem, and identify and define the computing requirements appropriate to its solution;		
√	**c) Design, implement and evaluate a computer-based system, process, component, or program to meet desired needs;**	**2**	**65%**
	d) Function effectively on teams to accomplish a common goal;		
	e) Understanding of professional, ethical, legal, security, and social issues and responsibilities;		
	f) Communicate effectively with a range of audiences;		
	g) Analyze the local and global impact of computing on individuals, organizations and society;		
	h) Recognition of the need for, and an ability to engage in, continuing professional development;		
	i) Use current techniques, skills, and tools necessary for computing practices.		
	j) Apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices;		
	k) Apply design and development principles in the construction of software systems of varying complexity;		

Important Notes:

- Cheating is prohibited! Looking at your colleague's paper will get you an F in the course immediately!

- Turn OFF your Phone/s. If you take out your phone for ANY reason, you will get an F in the course immediately!

- Same applies for smart watches.

ملاحظات هامة

- الغش ممنوع! عند النظر إلى ورقة زميلك، سترسب في المادة مباشرة!
- أغلق جوالك / جوالاتك! عند إخراجك للجوال لأي سببٍ كان، سترسب في المادة مباشرة!
- نفس الشيء ينطبق على الأجهزة الذكية الأخرى

Question 1 (15 Marks)

Put your answer of the question 1 (**multiple choice questions**) in the following table.

Question	Answer
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	

1. What is the output of the following code fragment?

```
int[] numbers = {2, 5, 3, 1, 6};
int number = numbers[ numbers[1] ];
System.out.println( number );
```

A. 5
B. 6
C. 2
D. Run-time error (`ArrayIndexOutOfBoundsException`)

2. What is the output of calling method m1()?

```
public void m1() {
  char[] arr = {'O','L','L','E','H'};
  m2( arr);
  for(int i=0; i<arr.length; i++)
    System.out.print(arr[i] + " ");
}

public void m2(char[] arr) {
  int n = arr.length;
  char ch;
  for( int i=0; i<n; i++) {
    ch = arr[i];
    arr[i] = arr[n-i-1];
    arr[n-i-1] = ch;
  }
}
```

A. H E L L O
B. O L L E H
C. H E L E H
D. O L L L O
E. None of the above

3. What is the output of the following program?

```
class CLS {
  int num;
  public CLS() {
    num = 10;
    incBy( num );
  }
  public void incBy(int amt) {
    num = num + amt;
  }
}
```

```
class Client {
  public static void main(String[]
                                args) {
    int num = 5;
    CLS obj = new CLS();
    obj.incBy( num );
    System.out.println("Num is: "
                          + obj.num);
  }
}
```

A. Num is: 10
B. Num is: 15
C. Num is: 25
D. Num is: 35

4. Assume that we have the class "Customer":

```
public class Customer {
  public String name; /* line 2 */
  public int id;

  public void Customer(String n, int d) /* line 5 */
    { set(n,d); }

  public void set(String s, int i) { /*line 8 */
    name = "null";
    id = 10; }
}
```

What is the output of the following program, if any?

```
import java.util.Scanner;
public class FinalTest {
public static void main(String[] args) {
  Scanner kb = new Scanner(System.in);
  Customer cst = new Customer("Saad", 1111);//line 2
  System.out.println("name=" + cst.name + " ID=" + cst.id);
}
}
```

A. name=Saad ID=1111
B. name=null ID=10
C. The constructor we are trying to call on line 2 of `main` function does not exist.
D. name=Saad ID=10.

5. What is the output of the following code?

```
double[] myList = {1, 5, 5, 5, 5, 1};
double max = myList[0];
int indexOfMax = 0;
for (int i = 1; i < myList.length; i++) {
  if (myList[i] > max) {
    max = myList[i];
    indexOfMax = i;
  }
}
System.out.println(indexOfMax);
```

A. 0
B. 1
C. 2
D. 3
E. 4

6. Analyze the following code:

```
public class Test {
  public static void main(String[] args) {
    int[] x = new int[5];
    int i;
    for (i = 0; i < x.length; i++)
      x[i] = i;
    System.out.print(x[i]+" ");
  }
}
```

A. The program displays 0 1 2 3 4.
B. The program displays 4.
C. The program has a runtime error because the last statement in the main method causes ArrayIndexOutOfBoundsException.
D. The program has a compile error because i is not defined in the for statement.

7. What is wrong in the following code?

```
class TempClass {
  int i;
  public void TempClass(int j) {
    int i = j;
  }
}

public class C {
  public static void main(String[] args) {
    TempClass temp = new TempClass(2);
  }
}
```

A. The program has a compilation error because TempClass does not have a default constructor.
B. The program has a compilation error because TempClass does not have a constructor with an int argument.
C. The program compiles fine, but it does not run because class C is not public.
D. The program compiles and runs fine.

8. Assume that you have the following class:

```
public class StaticTest {
      private static int a;
      private double b;
      private String s;
      ...
      // The methods from parts 8 to 9.
      ...
}
```

Now, for each of the following methods in this class, choose the correct answer:

```
public static double multNum(double d)
{
      return (b * d);
}
```

A) The method is correct, because the non-static method is using a static variable.
B) The method is correct, because the non-static method is using an instance variable.
C) The method is correct, because the static method is using a local variable.
D) The method is incorrect, because the static method is using an instance variable.
E) A & B.

9. (This method is related to the class `StaticTest` in part 8 above)

```
public int subNum(int x)
{
      return (a - x);
}
```

A) The method is correct, because the non-static method is using a static variable.
B) The method is correct, because the non-static method is using an instance variable.
C) The method is correct, because the static method is using a local variable.
D) The method is incorrect, because the static method is using an instance variable.
E) A & B.

10. Assume that we have the following class:

```
public class Signatures {
      // ... Instance Variables, ...
      // ... Setters, Getters, ...

      public void display(int x, int y)
      {
      System.out.println(x+y);
      }

      public int display(int y, int x)
```

```
        {
        System.out.println(x+y);
        return x+y;
        }
    }
```

Will there be any problems (errors) with this class?

A. No, the methods signatures are different because the return type is different.

B. No, the methods signatures are different because the order of parameters is different.

C. Yes, the methods signatures are the same.

D. A & B

11. Which of the following statements is false:

A. An instance of an int is the same size on all machines that a java program is run on.

B. The operator = = should not be used to compare strings.

C. You must define a constructor in a class.

D. A Java program may be run on any machine.

12. Assume that you have the following class:

```
public class Student {
      public String name;
      public int id;

      public Student(){
            name = "no name";
            id = 0;
      }
}
```

What is the output of the following program, if any?

```
public class Final {
      public static void main(String[] args) {
            Student[] student = new Student[4];
            System.out.println("Name = "+student[3].name
+",id = "+student[3].id);
      }
}
```

A. `Name = null,id = 0`

B. `Name = no name,id = 0`

C. There is a compilation error.

D. There is a run-time error (Null Pointer Exception).

E. There is a run-time error (Array Index Out of Bound).

13. What is the output of the following program, if any?

```
public class Evaluate {
      public static void main(String args[]) {
        int arr[] = new int[] { 3, 2, 6, 5, 4, 1};
        int n = 5;
        n = arr[arr[n] / 2];
        System.out.println(arr[n] / 2);
        }
}
```

A. 2

B. 3

C. 4

D. 6

E. There is a run-time error.

14. Which of these is an incorrect array declaration?

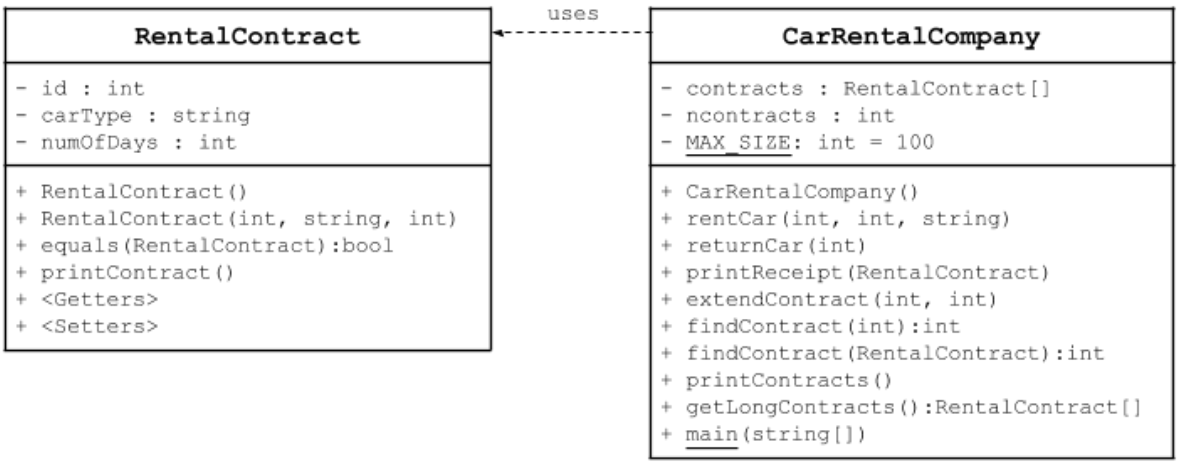
```
A. int arr[] = new int[5];
B. int [] arr = new int[5];
C. int arr[]; arr = new int[5];
D. int arr[] = int [5] new;
```

15. What output will be produced by this code segment?

```
for (int i = 5; i >= 1; i--){
      for (int j = i; j >= 1; j--)
            System.out.print(2 * j - 1);
      System.out.println();
}
```

A.	B.	C.	D.	E.
97531	97531	97531	1	13579
9753	7531	7531-1	13	1357
975	531	531-1-3	135	135
97	31	31-1-3-5	1357	13
9	1	1-1-3-5-7	13579	1

Question 2 (25 marks): Write a program for a system that manages **rental contracts** in a car rental company. Your system should allow the user to rent a car, return a car, extend a rental, manage and print contracts. Here is the UML:



The Class: **RentalContract** (8 marks)

Develop the class RentalContract that has the attributes: id of type integer, carType of type String, and numOfDays of type integer that represent the ID of the contract, the type of the rental car, and the duration of the rental contract in days, respectively.

The methods of this class are **(all methods are not static)**:

- **RentalContract**: A constructor that receives three parameters id, carType, numOfDays and initializes new contract with the initial values from these parameters. (*Bonus: you will get 2 marks bonus if you use setter methods to initialize instance variables here*).
- **RentalContract**: A constructor that receives no parameters. It initializes id to -1, carType to `null`, and numOfDays to -1. ***THIS CONSTRUCTOR MUST USE (CALL) THE CONSTRUCTOR ABOVE.***
- **equals**: a method that takes a parameter of type RentalContract, compares the current object (it was called upon) with the parameter object and returns true if they are equal otherwise false. Two contracts are equal if they have the same id.
- **printContract**: a method that prints the contract information (its id, car type and number of days). It receives no parameters and returns nothing.
- **Setter methods** (one for each): That sets the values for: id, carType, numOfDays.
- **Getter Methods** (one for each): That returns the values of: id, carType, numOfDays.

The Main Class: **CarRentalCompany** (17 marks)

The main class is class `CarRentalCompany` which is the class that you are going to use to test your program. This class contains one array of objects `contracts` that holds all the contracts information. It also contains the variable `nContracts` that stores **the current number** of contracts stored in the array of objects.

This class contains `main` method as well as other methods. Note that the maximum number of contracts in the class is 100 (*hint: use a constant MAX_SIZE)*.

The methods of this class are **(all methods are not static, except for `main`)**:

- **CarRentalCompany**: A constructor that takes no parameters. It creates the array and initializes number of contracts to zero.
- **rentCar**: this method receives 3 parameter `contractId` of type integer, `numOfDays` of type integer, and `carType` of type String. Using this info, it creates and adds a new contract if the contract is not already there and the array is not full. If the contract was created before, then it prints error message "`ERROR: there is another contract with the same id. Use extend contract instead`". *Use* `findContract` *to check if the contract exists*. If the array is full then it prints the error message "`ERROR, array is full`".
- **returnCar**: the method receives one parameter `contractId` of type integer that represents the id of the contract of the returned car. If the contract is found then it is deleted and a receipt is printed using `printReceipt` method. *Note: use* `findContract` *to check if the contract exists*.
- **printReceipt**: a *private method* that takes a parameter rentalContract of type RentalContract and prints the cost of a contract. The cost is 100 SAR per day if the contract duration is less than 1 month. Otherwise, the cost is 2000 SAR per month and 100 SAR per day.
- **extendContract**: given the parameters `contractId` and `numOfDays` both of type integer, this methods looks up the contract and extend it using value of `numOfDays` if it was found. *Note: use* `findContract` *to check if the contract exists*.
- **findContract**: a method that receives a parameter `contractId` of type integer and returns the index of the contract with this id. If the contract ID is not found, the method returns -1.
- **findContract**: an overloaded method of the previous one that receives a parameter `contract` that is an object of type RentalContract and returns the index of this contract object if it is found. If the contract is not found, the method returns -1. *Use method* `equals` *from class RentalContract to compare two contract objects*.
- **printContracts**: this method prints all the contacts in the array. *Use method* `printContract` *from class RentalContract to print a contract object.*
- **getLongContracts:** this method returns an array (array of objects) of all contracts that are longer than 3 months (90 days).

- **main:** the main method. It will do the following:
    1. It creates a CarRentalCompany object.
    2. Then, it rents a “Corolla” for 15 days with ID 1000.
    3. Then, it rents an “Accent” for 100 day with ID 1001.
    4. Then, it prints all long contracts (more than 90 days). *Use the method getLongContracts to get all long contracts*.
    5. Then it returns the rented car “Accent” (ID 1001).
    6. Finally, it displays all the contracts.

Bonus **Question 3 (3 Marks):**

A palindrome is a word, phrase, number, or other sequence of characters which reads the same backward or forward.
For example: “eye”, “wow”, “noon”, “level”, “radar”, ”hannah” are all palindrome words.

In 7 lines or less, write a method that:

- receives a word as an array of characters,
- then, it checks if the word is a palindrome word (returns true) or not (returns false).

Assume that the array is always full (no partial arrays). Also, assume that letters are all lowercase letters.

Note: the body should have a maximum of 7 statements, any more statements will not be graded.

```
public boolean isPalindrome(char[] word)
{




}
```

Result

Question No.	Relevant Student Outcome	SO is Covered by %	Full Mark	Student Mark	Assessor's Feedback
1	a	30%			
2	c	65%			
3	N/A	N/A			
Totals		100%			

I certify that the work contained within this assignment is all my own work and referenced where required. **Student Signature:** **Date:**		**Feedback Received:** **Student Signature:** **Date:**