

Second Semester 2014/2015 (142)
ICS 102 - Introduction to Computing I

Final Exam
Thursday, 21st May 2015
Time: 120 minutes

Name:

ID#:

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Please circle your section number below:

Section	01	03	04
Instructor	Said	Said	Said
Day and Time	UT 08:00-08:50	UT 09:00- 09:50	UT 11:00 - 11:50

Question #	Maximum Score	Score
1	18	
2	17	
3	15	
4	20	
5	30	
Total	100	

~Good Luck~

Question 1 [18 points: 6 * 3]:

What is the output of each of the following Java program fragment or Java Program?

	Program / Program Fragment	Output
1.	<pre> class Test { public static void main(String[] args) { String str [] = {"Riyadh", "Dhahran", "Dammam", "Jeddah"}; char array [] = atest(str); for(int k = 0; k < array.length; k++) System.out.println(array[k]); } public static char [] atest(String [] st){ char cArray [] = new char [st.length]; for(int k = 0; k < st.length; k++){ cArray[k] = st[k].charAt(k); } return cArray; } } </pre>	
2.	<pre> public class C2Driver { public static void main(String [] args) { C2 obj = new C2(); System.out.println(obj.getX()); } } class C2 { private int x; C2() { x = 10; } public int getX() { int x = 20; return this.x; } } </pre>	
3.	<pre> int [] y = {6, 8, 9}; int [] x = {4, 3, 2, 1, 0, 0, 0}; int k; for(k = 2; k <= 3; k++){ x[k + 3] = x[k]; x[k] = y[k - 2]; } x[k] = y[k - 2]; for(k = 5; k >= 0; k--) System.out.print(x[k]+ " "); </pre>	

	Program / Program Fragment	Output
4.	<pre> int [][] x = { {7, 1, 3}, {6, 8, 2}, {4, 5, 9} }; for(int k = 2; k >= 0; k--) { for(int m = 2; m >= 0; m--) { System.out.print(x[m][k] + " "); } System.out.println(); } </pre>	
5.	<pre> public class Test { public static void main(String[] args) { int k = 2; String str = "PYP002"; nPrint(str, k); System.out.println(str + ", " + k); } static void nPrint(String str, int n) { while (n > 0) { str = str.substring(0,n); System.out.println(str); n--; } } } </pre>	
6.	<pre> class MyClass{ public int x, y; MyClass(int x, int y){ this.x = x; this.y = y; } } public class Test{ public static void main(String[] args){ MyClass obj = new MyClass(2, 3); myMethod(obj); System.out.println("x = " + obj.x + ", y = " + obj.y); } public static void myMethod(MyClass obj){ obj.x = 4; obj.y = 5; obj = new MyClass(7, 8); } } </pre>	

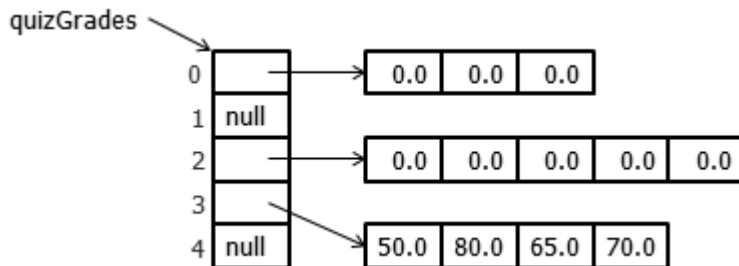
Question 2 [17 points: 10 + 7]:

(a) Identify the error(s), if any, in each of the following program or program fragments. If a program or a program fragment has no errors, write its output.

	Program / Program Fragment	Error(s) or Output if there are no errors
1.	<pre> public class Test { public static void main(String[] args) { System.out.println(m(3)); } public static int m(int y) { private int x = 4; return x + y; } } </pre>	
2.	<pre> public class Test { public static void main(String[] args) { System.out.println(fun()); } int fun() { return 20; } } </pre>	
3.	<pre> int[] array = {1, 2, 3, 4}; for(int k = array.length ; k >= 0 ; k--) System.out.println(array[k]); </pre>	
4.	<pre> class B { private int x; private int y; B() { x = 100; y = 200; } } public class Test { public static void main(String[] args){ B obj = new B(); System.out.println(obj.x + " - " + obj.y); } } </pre>	

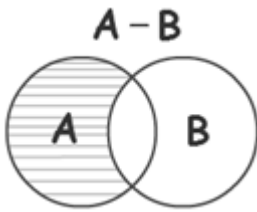
	Program / Program fragment	Error(s) or Output if there are no errors
5.	<pre> class MyClass{ private static int num = 4; private int x; private int y; MyClass(int x, int y){ this.x = x; this.y = y; } public static int sum(){ return x + y + y; } } public class MyClassDriver { public static void main(String[] args) { MyClass obj = new MyClass(2, 3); System.out.println(obj.sum()); } } </pre>	

(b) Write an appropriate Java statement or appropriate Java statements to create the following 2D-array.



Question 3 [15 points]:

Write a static Java method **setDifference** that takes as input two 1D integer arrays representing two sets A and B, it then returns a 1D-array that contains the set difference $A - B$, i.e., the returned array contains all elements of A that are not in B. Your method must not modify the passed arrays.



Example: If the set A is:

20	3	40	4	70	6	15	19
----	---	----	---	----	---	----	----

And the set B is:

1	2	3	4	5	6
---	---	---	---	---	---

Then the returned array is:

20	40	70	15	19
----	----	----	----	----

Note:

- Your method must be general.
- Your method must not contain any input and output statements.
- Assume that each of the passed arrays has distinct element.
- Do not write the main method.

Question 4 [20 points]:

Write a static Java method that takes a matrix and a target integer value **x** as input arguments. The function returns a 2D-array that contains the row and column indexes of all elements of the matrix that are equal to the value **x**.

Example: If the input matrix is:

5	2	9	4	2
7	6	2	0	8
1	0	8	2	4

and **x** is 2, then the locations where **x** is found in the matrix are (0,1), (0,4), (1,2) and (2, 3), therefore the returned array is:

0	0	1	2
1	4	2	3

Note:

- Your method must be general and not specific to the above example.
- Your method must not contain any input and output statements.
- Do NOT write the main method.

Question 5 [30 points]:

- (a) A **Ship** has an id and a number of containers. The id cannot be modified after it is initialized to a non-default value .

Write an appropriate **Ship** class that enables:

- **Ship** objects to be assigned unique consecutive ids starting at id 2514.
- The counting of total number of containers for all **Ship** objects.

The class must have:

- All its variables to be private
- A one-argument constructor that throws an appropriate exception
- A copy constructor
- Appropriate get-methods
- An appropriate set method that throws an appropriate exception.
- An appropriate **toString** method

- (b) A **ShipCompany** has private **numberOfShips** variable and a private array of **Ship** objects.

Write an appropriate **ShipCompany** class that has:

- A one-argument constructor that takes the maximum number of ships that the ship company can own. The constructor throws an appropriate exception if the argument is less than 10.
- **addShip** method. The method adds a new ship to the array of **Ship** objects. The method throws an appropriate exception. Your method must have no reference leaks.
- **getShipArray** method. The method returns the array of ship objects. Your method must have no reference leaks.

- (c) Write an appropriate **ShipCompanyDriver** class that performs the following in order:

- Creates a **ShipCompany** object that can have a maximum of 60 ships.
- Adds at least four **Ship** objects to the **ShipCompany** object.
- Decreases by 7 the number of containers of the last **Ship** object in the array of **Ship** objects. [Your code must be general; it must work for any array length]
- Displays the total number of containers for all ships. [The counting must neither be done in the driver class nor use loops anywhere in the program.]
- Displays the **Ship** array.
- Determines whether the ship with ID 2530 exists in the array or not by displaying an appropriate message.

Sample program run:

Total number of containers: 48983

Ship list:

[ID#: 2514, Number of containers: 13500]

[ID#: 2515, Number of containers: 11000]

[ID#: 2516, Number of containers: 15000]

[ID#: 2517, Number of containers: 9483]

The ship 2530 does not exist

