

**Mid-term Examination Cover Sheet**  
First Semester: 1438 / 1439 - 2016 / 2017

Course Title:	<u>Computer Programming II</u>	Course Code:	<u>CS141</u>
Exam Duration:	<u>60 Minutes</u>	Number of Pages: (including cover page)	<u>1</u>

The table below is to be filled by the student

Student Name:	[Redacted]	Student ID:	[Redacted]
Class Day & Time	[Redacted]	CRN:	[Redacted]
Instructor Name:	[Redacted]	Exam Date:	[Redacted]

**Exam Guidelines**

- Mobile phones are not permitted.

**Marking Scheme**

Questions	Score
Q1	7/10
Q2	5/5
Q3	10/15
Q4	4/8
Q5	12/12
<b>Total Score</b>	<b>38/50</b>
<b>Midterm Total Score</b>	<b>19/25</b>



Questions 1: Choose the correct answer, by putting a circle around the correct letter. [10 points]

1. Say that there are three classes: Computer, AppleComputer, and IBMComputer. What are the likely relationships between these classes?

- A) Computer is the superclass, AppleComputer and IBMComputer are subclasses of Computer.
- B) IBMComputer is the superclass, AppleComputer and Computer are subclasses of IBMComputer.
- C) Computer, AppleComputer and IBMComputer are sibling classes.
- D) Computer is a superclass, AppleComputer is a subclasses of Computer, and IBMComputer is a subclas of AppleComputer.

2. given the value of  $n = 4$  how many times is the recursion method is called including the initial first call of multiplyEvens(4)

```
public static int multiplyEvens(int n)
{
    if (n == 1) {
        return 2;
    } else {
        return 2 * n * multiplyEvens(n - 1);
    }
}
```

- A) 4
- B) 1
- C) 0
- D) 3

3. Which of the following is not typically part of the software development process?

- A) Testing
- B) Design
- C) Analysis
- D) Maintenance

4. The performance of an algorithm is most closely related to what?

- A) The total number of element visits
- B) The total number of elements
- C) The type of elements
- D) The number of lines of code in the method



5. The term recursion refers to programming technique involving:

- A) For loops
- B) While loops
- C) A method that calls itself
- D) Nested if statements

6. The output of the implementation phase of the software life cycle is \_\_\_\_.

- A) The users have installed the program and are using it.
- B) A description of classes and methods.
- C) Completed program code.
- D) Performance measurements.

7. \_\_\_\_ is often described as the is-a relationship.

- A) Inheritance.
- B) Aggregation.
- C) Polymorphism.
- D) Dependency.

8. After one iteration of selection sort working on an array of 10 elements, what must hold true?

- A) The array cannot be sorted.
- B) The largest element is correctly placed.
- C) At least two elements are correctly placed.
- D) One element must be correctly placed.

9. A subclass can access all its superclass variables if they are declared:

- A) private or public.
- B) protected or public.
- C) public only.
- D) protected only.

10. An interface type is similar to a class, but there are several important differences:

- A) All methods in an interface type are abstract; they don't have an implementation.
- B) All methods in an interface type are automatically public.
- C) An interface type does not have instance fields.
- D) All of the above.



Questions 2: Mark the correct statement with T and false statement with F [5 points]

1. The complexity of Selection sort algorithm is a log n
2. In Insertion sort, you have to cut array in half then recursively sort each half
3. An infinite loop will occurs if recursive method does not have a base case
4. We can convert subclass reference to superclass reference.
5. A class can implement more than one interface

[F]

[F]

[T]

[T]

[T]

Questions 3: Short answers questions

1. What is the output of the following Java code:

[5 points]

```
class Base {
    public void show() {
        System.out.println("Base::show() called");
    }
}

class Derived extends Base {
    public void show() {
        System.out.println("Derived::show() called");
    }
}

public class Main {
    public static void main(String[] args) {
        Base b = new Derived();
        b.show();
    }
}
```

OUTPUT:

Derived::show() called

2. What are the two key requirements for recursion success?

- A method that calls itself

[5 points]

- Write a program correctly

3. List (in order) the different phases of the development process for the software life cycle

[5 points]

1) Analysis

2) Design

3) ~~Development~~ Implementation

4) Testing

5) Implementation



Questions 4:

1. Suppose an algorithm takes 12 seconds to handle a data set (n) of size 800. Fill in the following table, which shows the approximate growth (in seconds) of the execution times depending on the complexity of the algorithm.

[4 points]

Note: The big(Oh) formula for QuickSort is given to you in table. You need to give the Big(Oh) formula for Selection sort and do the calculation for both given the data size  $n = 5000$  and  $n = 1000$

Note 1: You MUST show your calculations below the table.

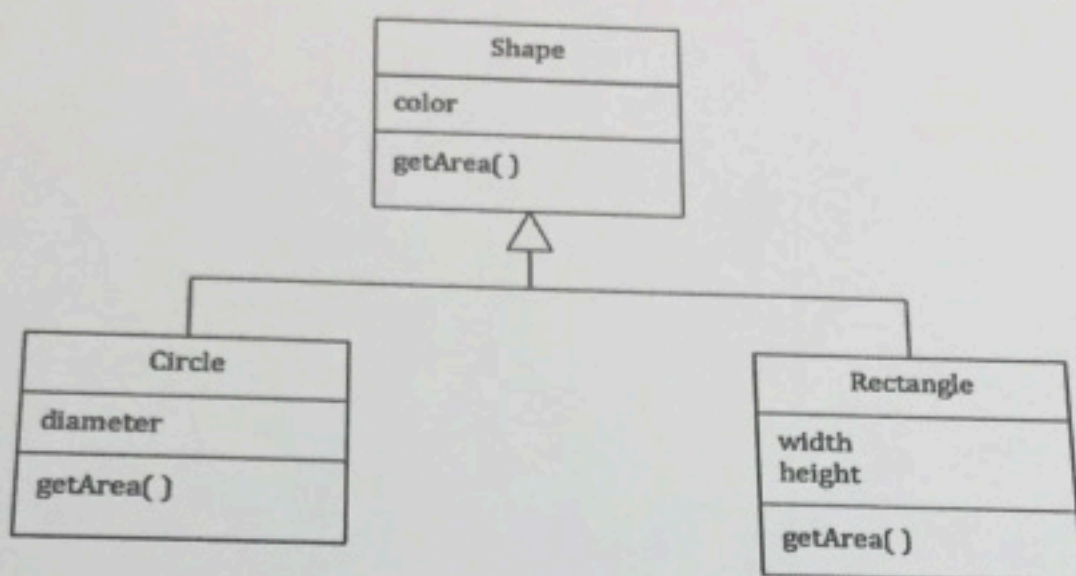
Note 2: Round your results to the nearest decimal point.

Sorting Type	Selection Sort	Quick Sort
Big O notation	$O(n^2)$	$O(n \log n)$
5000	50000	50000
1000	100	10000

9



Questions 5: Write a program representing the following UML diagram [12 points]



- Remember that Shape class has color instance variable, so you have to consider it when you build Circle and Rectangle constructors.

- Note that getArea method is available in the three classes, and you have to implement them differently. In the Shape class, let getArea method print "Can not define the area!". In the other subclasses let getArea method calculate the area based on the following rule and print the result.

Area of Circle =  $PI * radius^2$   
Where radius = diameter/2       $PI=3.14$

Area of Rectangle = width \* height

- No need to build the tester class with main method. Just the code for the superclass and its two subclasses

```

public Shape () {
    String Rectangle Rec = new Rectangle ();
    Circle cir = new Circle ();
    System.out.println(" " + Rec.getArea());
}
    
```

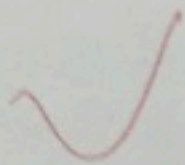
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Q5)

```
Public circle extend shape;  
{  
  Public void diameter();  
Public void getarea();  
  return getarea();  
}
```



```
Public Rectangle extends  
{  
  Public void width();  
  Public void height();  
  return getarea();  
}
```

