CSE 5910 Software Foundations
Sample Test 2

1 (15 marks)

What is the difference between aggregation and composition?

2 (24 marks)

Consider the following pairs of classes. For each pair, indicate whether the classes related by aggregation or inheritance.

(a) `Red` and `Colour`

(b) `Book` and `Page`

(c) `Book` and `Biography`

(d) `Book` and `Colour`

3 (18 marks)

(a) Are *private* attributes inherited?

(b) Are *public* attributes inherited?

(c) Are *private* constructors inherited?

(d) Are *public* constructors inherited?

(e) Are *private* methods inherited?

(f) Are *public* methods inherited?

4 (10 marks)

Name two differences between `List` and `Set`.

5 (10 marks)

The API of the `CreditCard` class contains the method

```
public boolean isSimilar(CreditCard card)
```

The class `RewardCard` extends the class `CreditCard`. The API of the `RewardCard` class contains the method

```
public boolean isSimilar(RewardCard card)
```

Consider the following code fragment.

```
CreditCard first = new RewardCard(...);
CreditCard second = new RewardCard(...);
output.println(first.isSimilar(second));
```

(a) Which method is associated with the invocation `first.isSimilar(second)` during early binding? Provide the name of the class, the name of the method and the type of the parameter. **Explain** your answer.

(b) Which method is associated with the invocation `first.isSimilar(second)` during late binding? Provide the name of the class, the name of the method and the type of the parameter. **Explain** your answer.

6 (15 marks)

Consider the following main method.

```
6  public static void main(String[] args)
7  {
8     Scanner input = new Scanner(System.in);
9     PrintStream output = System.out;
10
11    output.print("Enter a word: ");
12    String word = input.nextLine();
13    output.print("Enter a positive integer: ");
14    int index = input.nextInt();
15    char letter = word.charAt(index - 1);
16    output.printf("The %d-th letter of the word %s is %s.%n",
17                  index, word, letter);
18 }
```

Consider the following run of the app.

```
Enter a word: test
Enter a positive integer: 5
Exception in thread "main" java.lang.StringIndexOutOfBoundsException:
   String index out of range: 4
        at java.lang.String.charAt(String.java:687)
        at Letter.main(Letter.java:15)
```

(a) Where in the code did the exception occur? Be as precise as possible.

(b) Using defensive programming, how can this exception be prevented?

(c) Using exception based programming, how can this exception be handled?

7 (8 marks)

The return type of the method `keySet` is `Set<K>`. `Set<K>` is an interface and one *cannot* create instances of an interface. Explain how it is possible for the method `keySet` to return an object of type `Set<K>`.