Foundations of Programming

A Java program is being developed to assist with the processing of examination marks. A test program begins as follows:

```java
public class Exam
    { private static Mark[] question = {new Mark(8),
                                        new Mark(),
                                        new Mark(6),
                                        ...}

The program makes use of a class Mark which begins:

```java
class Mark
    { public boolean attempted;
      public int score;
      ...
```

The Mark array question has one entry for each candidate so the length of the array indicates the total number of candidates.

An entry such as new Mark(8) sets up a Mark object whose data field attempted is set to true and whose data field score is set to 8, indicating that the candidate attempted the question and was awarded 8 marks. It may be assumed that every score is an integer in the range 0 to 10 inclusive.

An entry such as new Mark() sets up a Mark object whose data field attempted is set to false (and whose data field score is arbitrary) indicating that the candidate did not attempt the question.

(a) Supply suitable constructors for class Mark [4 marks]

(b) Write two methods int getCount() and double getMean() which, when handed the actual argument question, return the number of candidates who attempted the question and the mean mark achieved by those candidates respectively. If no candidates attempted the question, getMean() should return -1d. [9 marks]

(c) Write a method int[] getRank() which begins:

```java
private static int[] getRank(Mark[] q)
    { int[] rank = {0,0,0,0,0,0,0,0,0,0,0};
```

This method should return the int array rank with each element rank[i] set to the number of candidates who scored more than i marks. Note that if the maximum score is 9 then both rank[9] and rank[10] will be zero and rank[8] will be the number of candidates who scored 9. [7 marks]