Tutorial #9: Introduction to Classes - SOLUTIONS

Question 1:

Assume the following class that represents a playing card.

```
public class PlayingCard
{
   private int value; // ex. 1 (ace) to 13 (king)
   private String color; // ex: "heart" "diamond" "club" "spade"

   public void writeOutput()
   {
      System.out.println(value + " of " + color);
   }
   public void randomCard()
   {
      value = (int)(Math.random()*13)+1;// a random integer between [1..13]
      switch ((int)(Math.random()*4)+1) // a random integer between [1..4]
      {
        case 1: color = "heart"; break;
        case 2: color = "diamond"; break;
        case 3: color = "spade"; break;
        case 4: color = "club"; break;
      }
   }
   //public int isAFace() ← ERROR
   public boolean isFace() // Correction: Change the return type of this method
   {
      // is the value a jack (11), a queen (12) or a king (13)?
      // return (value == 11 || 12 || 13); ← ERROR
      return (value == 11 || value == 12 || value == 13); // correct Boolean Expression
   }
   public boolean isAnAce()
   {
      //return (PlayingCard.value == 1);  ← ERROR
      return (value == 1);  // value is a variable of the class
   }
}
```

And assume the following driver:

```
public class CardDriver{
	public static void main(String[] args)
	{
		PlayingCard mySecondCard = new PlayingCard();
		mySecondCard.randomCard();
		//boolean answer = isAnAce(); ← ERROR
		// need an object to invoke isAnAce
		boolean answer = mySecondCard.isAnAce();
		do
		{
			//mySecondCard = randomCard(); ← ERROR
			mySecondCard.randomCard();
			System.out.println(mySecondCard.isAFace());
			// System.out.println(mySecondCard.writeOutput());  ← ERROR
			mySecondCard.writeOutput();
			//"writeOutPut" is a "void" method.
		}while (mySecondCard.isAFace());
	}
}
```

A.

Name all the objects of the class `PlayingCard`.

Answer:
`mySecondCard`

B.

Name all the methods of the class `PlayingCard`.

Answer:
`writeOutput()`
`randomCard()`
`isAFace()`
`isAnAce()`

C.

The class and the driver program contain several syntax errors. Identify and correct them.

Answer:

See corrections marked in orange directly in the code at the start of this question

Question 2:

Given the following class definition

```
public class Question {
private int gradeQ1;
private int gradeQ2;
private int gradeQ3;
private int total;
public void computeTotal(){
…
}
public int returnTotal(){
…
}
public void printTotal(){
…
}
public boolean getQuestionRight(){
…
}
}
```

1. How many states does an object of type class have and what are their names?

   Answer: There are 4 states of the object of type class. They are
   a) `gradeQ1`
   b) `gradeQ2`
   c) `gradeQ3`
   d) `total`

2. Write down the complete header of one of the methods of class `Question`?

```
public void computeTotal()
public int returnTotal()
public void printTotal()
public boolean getQuestionRight()
```

3. What is the return type of the method `computeTotal()`?

   Answer: `void`

4. What is the return type of the method `getQuestionRight()`?

   Answer: `boolean`

5. Complete the method `computeTotal()` so that it calculates the total score (sum of `gradeQ1`, `gradeQ2` and `gradeQ3`) and assigns it to the attribute `total`.

   Answer:
```
public void computeTotal() {
     total = gradeQ1+ gradeQ2+gradeQ3;
}
```
6. Complete the method `returnTotal()` which returns the total score.

   Answer:
```
public int returnTotal() {
     return (total);
}
```

7. Complete the method `printTotal()` which displays the total score along with a descriptive message.

   Answer:
```
public void printTotal() {
     System.out.println("The total is: " + total);
}
```

Question 3:

Consider the following class:

```
public class AClass {
     private int a;
     public int b;

     public AClass() {
      a = 10;
      b = 10;
     }

     private void increment() {
      increment(1);
     }

     public void increment(int i) {
      a+= i;
      b+= i;
     }
}
```

and the following declaration in the driver class:

```
AClass obj1 = new AClass();
```

Indicate if the following instructions will cause a syntax error if they are placed in the driver class after the above declaration. If there is an error, briefly explain why.

```
a) System.out.print(obj1);
```

No syntax error,
However, since there is no "`toString()`" method defined in the "`AClass`",
"`System.out.print()`" will output the class name and the location on the object instead of the content of the object: Sample output is "`Aclass@757aef`".

```
b) AClass.increment(5+5);
```

Syntax error.
Since method "`increment`" is not a "`static`" method in Class "`AClass`", we should use an object of class "`AClass`" such as "`obj1`" to invoke it. In the driver class, change "`AClass.increment(5+5);`" to "`obj1.increment(5+5);`".

```
c) System.out.print(obj1.a);
```

Syntax error
Variable “a” is a private attribute in the class “AClass” as a result it is not visible in the driver class.

```
d) System.out.print(obj1.b);
```

No syntax error, since variable “b” has a “public” modifier in the class “AClass” as a result it is visible in the driver class.