Foundations of Programming

(a) Outline the use of `enum` in Java programs and explain any similarities to and any differences from a Java class. [6 marks]

The following fragment of code shows an early attempt to write and test a Java program to simulate the paper-scissors-stone game. In the method `main()` each of the identifiers `a` and `b` is assigned one of the items, paper, scissors or stone and the `printf()` method then says whether the first beats, draws with or loses against the second. [The rule is that paper beats stone, scissors beat paper and stone beats scissors.]

```java
public class Game {
    public static void main(String[] args) {
        Item a = allocateItem();
        Item b = allocateItem();
        int res = a.versus(b);
        System.out.printf("%s %s %s\n", a, res>0 ? "beats" : res==0 ? "draws with" : "loses against", b);
    }

    private static Item allocateItem() {
        // ...
    }
}

enum Item {
    PAPER...
}
```

The three possibilities `PAPER`, `SCISSORS` and `STONE` are declared in `enum Item` along with a constructor, the method `versus()` and any necessary additional data fields.

(b) Using the method `Math.random()` or otherwise, provide a body for the method `allocateItem()` such that the method returns an `Item PAPER`, `SCISSORS` or `STONE` equiprobably. [6 marks]

(c) Complete the `enum Item` so that the statements in the method `main()` operate as intended. [8 marks]