Sample exam 2

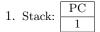
The INFDEV team

1 Question 1

Given the following block of code, fill in the stack, heap, and PC with all the steps taken by the program at runtime.

- Points: 4 (50% of total).
- Grading: one point per correctly filled-in execution step.
- Associated learning objective: abstraction.

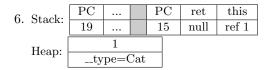
```
interface Animal {
       void makeSound();
   3
     class Dog : Animal {
       public Dog() {
       public void makeSound() {
         System.out.println("Woof!");
   8
  9
  10
  11
      class Cat : Animal {
       public Cat() {
  12
  13
  14
       public void makeSound() {
\sim 15
         System.out.println("Miao!");
  16
       }
  17
     Animal myAnimal = new Cat();
  18
     myAnimal.makeSound();
```



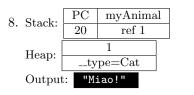
2. Stack:	PC 18				
Uoon.	1				
Heap:	type=Cat				

3. Stack:	PC			PC	ret	this
o. Stack.	18			13	null	ref 1
Heap:		1				
	ty	pe=0	Cat			

4.	Stack:	PC		PC		ret	
		18			13		ref 1
Heap:	1						_
	neap.	ty	pe=0	Cat			







2 Question 2

Given the following block of code, fill in the declarations, class definitions, and PC with all steps taken by the compiler while type checking.

- Points: 4 (50% of total).
- \bullet Grading: one point per correctly filled-in type checking step.
- Associated learning objective: type checking.

```
class Employee {
      private String name;
 3
     public Employee() {
 5
     public string GetName() {
 6
        return this.name;
     }
 8
   class Manager : Employee {
10
     public Manager() {
11
     public string GetFunction() {
12
13
        return "I | am | the | boss!";
```

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```
14   }
15   }
16   ...
17   Employee employee = new Manager();
```

2. Declarations: PC 8

3. Declarations: PC 15

4. Declarations: $\begin{array}{|c|c|c|}\hline PC \\ \hline 17 \\ \hline \end{array}$

5. Declarations: PC employee 18 Employee

 $\begin{array}{c} Employee & Manager \\ Employee=Employee \rightarrow Employee \\ GetName=Employee \rightarrow string \\ name=string \\ \end{array} \begin{array}{c} GetFunction=Manager \rightarrow string \\ GetName=Employee \rightarrow string \\ Manager=Manager \rightarrow Manager \\ name=string \\ \end{array}$