Sample exam 1

The INFDEV team

1 Question 1

Given the following block of code, fill in the stack, heap, and PC with all 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 A {
       int M(int x);
   3
      class C : A {
   5
       public C() {
       public int M(int x) {
   8
         return (x + 2);
   9
       }
  10
  11
      class D : A {
       public D() {
  12
  13
  14
       public int M(int x) {
         return (x + 2);
  15
№ 16
  17
  18
  19 A myA = new C();
 20 | Console.WriteLine(myA.M(5));
```

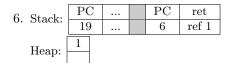
1	Stack:	PC
1.	Stack.	1

2	Stack:	PC
۷.	Duack.	18

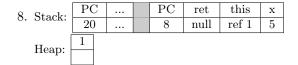
3	Stack:	PC
Э.	Stack.	19

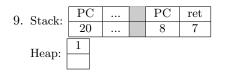
4	Stack:	PC
4.	Duack.	19
	Heap:	1
	meap.	

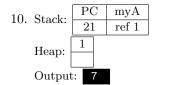
5	Stack:	PC		PC	ret	this
ο.	Duack.	19		6	null	ref 1
	Heap:	1				











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.

```
interface A {
   int M(int x);
}

class C : A {
   public C() {
   public int M(int x) {
      return (x + 2);
   }
}
```

```
class D : A {
     public D() {
12
13
     public int M(int x) {
14
       return (x + 2);
15
16
     }
17
   }
18
   A myA = new C();
19
   Console.WriteLine(myA.M(5));
```

- 1. Declarations: $\begin{array}{|c|c|c|c|}\hline PC \\ \hline 1 \\ \hline \end{array}$
- 2. Declarations: $\begin{array}{|c|c|c|}\hline PC \\\hline 4 \\\hline \\ Classes: & A \\\hline \hline M=(M\times int) \to int \\\hline \end{array}$

- 5. Declarations: PC 19

 A C D

 Classes: $M=(M\times int) \rightarrow int$ $C=C \rightarrow C$ $D=D \rightarrow D$ $M=(C\times int) \rightarrow int$ $M=(D\times int) \rightarrow int$

7. Declarations:

myA	PC	ret	arg_1	this
Α	20	null	int	A

Classes:

A	C	D
$M=(M\times int) \rightarrow int$	$C=C \rightarrow C$ $M=(C \times int) \rightarrow int$	$D=D \to D$ $M=(D\times int) \to int$

8. Declarations:

	Declarati	iona	myA		PC	ret	arg_1	this		
•	Deciaran	ions.	A		20	int	int	A		
		A					С			D
Classes:	$M=(M\times int) \rightarrow int$					$C=C \rightarrow C$			$D=D \rightarrow D$	
		$M=(M\times Mt)\to Mt$]	$M=(C\times int) \to int$			$M=(D\times int) \to int$

a	Declarations:	PC	myA
η.	Declarations.	21	A

Classes:

A	C	D
$M=(M\times int) \rightarrow int$	$C=C \rightarrow C$	$D=D \rightarrow D$
$M-(M \times M C) \rightarrow M C$	$M=(C\times int) \to int$	$M=(D\times int) \to int$