

NAME (PRINT LEGIBLY!) _____

(last, first)

Question 0 _____ out of 02

Question 1 _____ out of 20

Question 2 _____ out of 20

Question 3 _____ out of 18

Question 4 _____ out of 20

Question 5 _____ out of 20

This 90-minute exam has 6 questions worth a total of 100 points. We suggest that you spend a few minutes looking at all questions before beginning so that you can see what is expected. Budget your time wisely. Use the back of the pages, if you need more space.

Question 0 (2 points). Write your netid and your name, legibly, at the top of each page.

Question 1 (20 points). Write the body of method `fixCase`, which is specified below. *Remember that a string can be empty* (can contain 0 characters). Also, class `String` has the following methods:

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- `s.charAt(k)` = the character at position (or index) `k` of string `s`
- `s.substring(h, k)` = a string consisting of characters `s[h]`, `s[h+1]`, ..., `s[k-1]`
- `s.substring(h)` = a string consisting of characters `s[h]`, `s[h+1]`, ..., `s[s.length()-1]`
- `s.toLowerCase()` = `s` but with all its letters in lower case
- `s.toUpperCase()` = `s` but with all its letters in upper case
- `s.indexOf(c)` = index of the first occurrence of character `c` in `s` (-1 if none)

`/** If the first character of s is 'a', then return s but with all its letters in lower case.`

`If the first character of s is 'A', then return s but with all its letters in upper case.`

`If the first character of s is a blank, then return s but with the first occurrence of new line character '\n' in it removed (if present).`

`Otherwise, return s. */`

public String `fixCase(String s) {`

`}`

Question 2 (20 points). Below are two class definitions, for classes MP and S.

(a) Draw a manilla folder (or instance, or object) of class MP.

(b) Draw a manilla folder of class S. Note that both fields in S are given by initializing declarations. You have to draw the values in these fields correctly. If this requires drawing new folders, do so.

```
public class MP {  
    private int d= 5;  
    public static int x= 0;  
    public void m(String p) {  
        d= p.length();  
    }  
}
```

```
    public void setD(int v) {  
        d= v;  
        x= x + 1;  
    }  
}
```

```
public class S extends MP{  
    private MP one= null;  
    private MP two= new MP();  
    public static final double pi= 3.14;  
}
```

Question 3 (18 points). This question deals with classes Animal and Lion, shown below, and two variables x and y declared as:

Animal x; Lion y;

- (a) Write down the names of methods that class Lion inherits.

- (b) Write down the names of methods in class Lion that override other methods.

- (c) Write a syntactically legal assignment that assigns x to y.

- (d) Suppose x contains the name of a folder of class Lion. Is the expression x.toString() legal? If yes, what method does it call?

- (e) Suppose x contains the name of a folder of class Lion. Is the expression x.noise() legal? If yes, what method does it call?

- (f) Suppose y contains a Lion with name “Narasimhan” and age 1008. Write down the value of expression y.toString() .

```
// An instance is an animal with a name and age
public class Animal {
    // Name of this animal (e.g. "Fido")
    private String name="";
    // Age of this animal
    private int age= 0;
    // = this animal's age
    public int getAge() { return age; }
    // = this animal's name
    public String getName() { return name; }
    // Set this animal's name to n
    public void setName(String n)
        { name= n; }
    // Set this animal's age to b
    public void setAge(int b)
        {age= b; }
    // = description of this animal
    public String toString() {
        return name + ", " + age;
    }
}
```

```
// An instance is a lion, which makes a noise
public class Lion extends Animal{
    // = the noise this lion makes
    public String noise() {
        if (getAge() < 1)
            return "mew!";
        return "roar!";
    }
    // = description of this animal
    public String toString() {
        return super.toString() + ", " + noise();
    }
}
```

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Question 4 (20 points). This question deals with classes `Animal` and `Lion` (they are the same as in exercise 3). Write a subclass `Horse` of `Animal`. It needs one field, which contains the number of horns that the horse has (e.g. unicorns are a kind of mythical horse that have one horn). Please write getter and setter methods for the field. Write methods `noise()` and `toString()` —they should do something reasonable, based on those methods in other classes.

```
// An instance is an animal with a name and age
public class Animal {
    // Name of this animal (e.g. "Fido")
    private String name= "";
    // Age of this animal
    private int age= 0;
    // = this animal's age
    public int getAge() { return age; }
    // = this animal's name
    public String getName() {return name; }
    // Set this animal's name to n
    public void setName(String n)
        { name= n; }
    // Set this animal's age to b
    public void setAge(int b)
        {age= b; }
    // = description of this animal
    public String toString() {
        return name + ", " + age;
    }
}
```

```
// An instance is a lion, which makes a noise
public class Lion extends Animal{
    // = the noise this lion makes
    public String noise() {
        if (getAge() < 1)
            return "mew!";
        return "roar!";
    }
    // = description of this animal
    public String toString() {
        return super.toString() + ", " + noise();
    }
}
```

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Question 5 (20 points).

(a) Define the term “parameter”.

(b) Define the term “argument”.

(c) Give the syntax of the assignment statement and explain how to execute an assignment statement.

(d) What is a local variable, and what is its scope?

(e) Suppose a function body is being executed because of a function call. What kind of statement causes the function body to terminate?

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1	_____	out of 20
2	_____	out of 20
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4	_____	out of 20
5	_____	out of 20
Total	_____	out of 100