**Please fill in your Student Number and Name.**

**Student Number    :** _____

# University of Cape Town ~ Department of Computer Science

## Computer Science 1016S ~ 2008

# Supplementary Test 1

| Question | Max | Mark | Internal | External |
|----------|-----|------|----------|----------|
| 1 | 30 | | | |
| | | | | |
| | | | | |
| TOTAL | 30 | | | |
| | | | | |

**Marks        : 30**

**Time          : 40 minutes**

**Instructions:**

a)  Answer all questions.

b)  Write your answers in the space provided.

c)  Show all calculations where applicable.

**Program: The questions in this test are all based on the program listed below. Study it carefully.**

```java
public class Test1Supp {
      public static void main(String[] args) throws
PictureException, FileNotFoundException {

         Scanner scan = null;
         PrintWriter pw = null;

         try {
            scan = new Scanner(new FileInputStream("file2.txt"));
            pw = new PrintWriter(new
FileOutputStream("file1.txt"));
            int level = scan.nextInt();
            pw.println(Stack(level,""));
         }
           catch (PictureException e) {
             pw.println(e.getMessage());
           }
           catch (FileNotFoundException e) {
             pw.println(e.getMessage());
           }
         finally {pw.println("Completed."); pw.close(); }
      }

     public static String Line(int n) {
       if (n>0)
          return '*'+Line(n-1);
       return"";
     }


     public static String Picture(int n,String offset) throws
PictureException {  /*code hidden */ }

     public static String Stack(int n,String offset)  throws
PictureException     {
        if (n<0)
           throw new PictureException("Can't draw a picture of
negative size!");
        else if (n==0)
           return "";
        else
           return Picture(n*2-1,offset)  + Stack(n-1,offset+" ");
     }
  }
```

a) Explain clearly why it is a good idea include the line `pw.close();` in the program above.

_____

_____

_____

_____

[3]

b) The program above can throw a *java.util.InputMismatchException*. Which method can throw this exception and under what conditions would it be thrown?

_____

_____

_____

[2]

c) Is the *java.util.InputMismatchException.* a checked exception? Justify your answer.

_____

_____

_____

[2]

d) Explain clearly what a `StackOverflowError` is and why this type of error can occur in recursive functions.

_____

_____

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_____

[3]

e) Write a suitable definiton for the class `PictureException`.

```
public class PictureException extends Exception
{
```

_____

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_____[6]

```
}
```

f) Give an example of the use of a **stream** from the program above.

_____

_____

[1]

g) For different values of the parameter n, the method `Picture` produces output as follows.

Picture(1,"") returns the string:

```
*
```

Picture(2,"") returns the string:

```
**

**
```

Picture(3,"") returns the string:

```
***

 *

***
```

Picture(4,"") returns the string:

```
****

 **

 **

****
```

Picture(5,"") returns the string:

```
*****

 ***

  *

 ***

*****
```

Picture(6,"") returns the string:

```
******

 ****

  **

  **

 ****

******
```

Picture(7,"") returns the string:

```
*******

 *****

  ***

   *

  ***

 *****

*******
```

If, before the program is run, the files contain the following text:

file1.txt:

-5

file2.txt:

4

Write down the **exact** contents of each of these files after the program is run.

_____

file1.txt:

_____
_____
_____
_____
_____
_____
_____
_____
_____

file2.txt:

_____
_____
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_____
_____
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_____
_____
_____

[4]

h) If, before the program is run, the files contain the following text:

file1.txt:                              file2.txt:

5                                       -3

Write down the **exact** contents of each of these files after the program is run.

file1.txt:                              file2.txt:

_____           _____

_____           _____

_____           _____

_____           _____

_____           _____

_____           _____

_____           _____

_____           _____

_____           _____

_____           _____

[3]

(i) Write a **recursive** definition of the Picture method. Note that no marks will be given for **iterative solutions**!

```
public static String Picture(int n,String offset)
                                   throws PictureException {
```

_____

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_____

_____

_____

```
}
```

[6]