CSC 1051 Algorithms and Data Structures I

Midterm Examination
October 8, 2015

Name: ___ KEY ___ A ___

<table>
<thead>
<tr>
<th>Question</th>
<th>Value</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

TOTAL 100

Please answer questions in the spaces provided. If you make a mistake or for some other reason need more space, please use the back of pages and clearly indicate where the answer can be found. Good luck!
1. [ /10] Refer to the program below. Next to each word in the list, choose the most fitting description:

- reserved word
- constant
- variable
- method

```java
import java.util.Scanner;

public class Age {
    //-----------------------------------------------------------------------------------
    //  Reads the user's age and prints comments accordingly.
    //-----------------------------------------------------------------------------------
    public static void main (String[] args)
    {
        final int MINOR = 21;

        Scanner scan = new Scanner (System.in);

        System.out.print ("Enter your age: ");
        int age = scan.nextInt();

        System.out.println ("You entered: " + age);

        if (age < MINOR)
            System.out.println ("Youth is a wonderful thing. Enjoy.");

        System.out.println ("Age is a state of mind.");
    }
}
```
2. [ /10]

a) What output is produced by the following program?

```java
public class OneMoreTime {
    public static void main (String[] args) {
        int x = 10;
        int a = 20;
        int b = 30;
        x = a;
        a = b;
        b = 40;
        System.out.println("Howdy, here are some numbers: ");
        System.out.println("x = " + x +" a = " + a + " b = " + b);
        System.out.println ("I promise
this is the
"last time"");
        System.out.println ("so
please count the \\
"s carefully!");
        System.out.println ("More numbers... " + 20 + 30);
        System.out.println ("and more... " + "20 + 30");
        System.out.println ("Is this different? ... " + (20 + 30));
    }
}
```

Output:

```
Howdy, here are some numbers:
x = 20 a = 30 b = 40
I promise
this is the
"last time"
you have to do this so
please count the "\"s carefully!
More numbers... 2030
and more... 20 + 30
Is this different? ... 50
```

b) Write a single `println` statement that would output

```
"Hello"

"Goodbye"
```

(2 tab stops here)

```java
System.out.println (""Hello"\n\t\n"Goodbye"\n");
```
3. [ /10] Short answer questions.

- For each of the following expressions, indicate the order in which the operations are performed by writing a number beneath each operator.

\[
a / b - d * e + f
\]

\[
1 3 2 4
\]

\[
a / (b + c) / e - f
\]

\[
2 1 3 4
\]

- Consider the following code fragment:

```java
if (a>0)
    if (b<0)
        x = x + 5;
    else
        if (a>5)
            x = x + 4;
        else
            x = x + 3;
    else
        x = x + 2;
```

If \( x \) is currently 0, \( a = 5 \) and \( b = 5 \), what will \( x \) become after the above statement is executed?

\[ x = \underline{3} \]

- The code below is supposed to print the numbers from 1 to 10, but it has an error.

```java
int count = 1;
while (count <= 10);
{
    System.out.println (count);
    count++;
}
```

a) Describe the error and how to correct it?

Incorrect semicolon after while

b) If the error is not corrected, what, if anything gets printed?

Nothing -- infinite loop

c) Is this a syntax, runtime, or logical error? Logic

a) How many bits/bytes are needed to store a color picture that is 200 pixels wide and 400 pixels high under each of the following schemes? Express your answer as approximate number of KB or MB, etc., as appropriate. Show your work and fill in the answers below:

Total # pixels: 80,000 (200x400 = 80,000)

<table>
<thead>
<tr>
<th>Scheme</th>
<th># bytes</th>
<th># bits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bitmap (1bit/pixel)</td>
<td>10 KB</td>
<td>80,000 bits or 80kbits</td>
</tr>
<tr>
<td>Greyscale (1byte/pixel)</td>
<td>80 KB</td>
<td>640,000 or 640Kbits</td>
</tr>
<tr>
<td>RGB (3 bytes/pixel)</td>
<td>240 KB</td>
<td>1,920,000 or ≈2Mbits</td>
</tr>
</tbody>
</table>

b) List all binary codes that can be made with 3 bits

000
010
011
001
111
100
101
110

C) With n bits we can have \(2^n\) different binary codes
5. [ /10]  

a) Given the following declarations:

```java
int iResult, num1 = 7, num2 = 3;
double fResult, val1 = 9.0;
boolean status, part1 = false;
```

What result is stored by each of the following assignment statements?

<table>
<thead>
<tr>
<th>Source code</th>
<th>Result stored</th>
</tr>
</thead>
<tbody>
<tr>
<td>fResult = (num1 + 2)/ 2;</td>
<td>4</td>
</tr>
<tr>
<td>iResult = num1 % num2;</td>
<td>1</td>
</tr>
<tr>
<td>fResult = val1 / 2;</td>
<td>4.5</td>
</tr>
<tr>
<td>fResult = (double) num1 / 2;</td>
<td>3.5</td>
</tr>
<tr>
<td>status = part1 &amp;&amp; (num1 &gt; num2);</td>
<td>false</td>
</tr>
<tr>
<td>status = part1</td>
<td></td>
</tr>
</tbody>
</table>
   a) Given a Random object named \texttt{gen}, what range of values are produced by the following expressions?
      \begin{itemize}
      \item \texttt{gen.nextInt(4)} \hspace{1cm} 0 to 3
      \item \texttt{gen.nextInt(20) + 100} \hspace{1cm} 100 to 119
      \item \texttt{gen.nextInt(4) - 15} \hspace{1cm} -15 to -12
      \end{itemize}

   b) Write some code that uses the object \texttt{gen}, above, to generate pseudorandom numbers in the following specified ranges (including the endpoints):
      \begin{itemize}
      \item 0 to 9 \hspace{1cm} \texttt{gen.nextInt(10)}
      \item -2 to 5 \hspace{1cm} \texttt{gen.nextInt(8) - 2}
      \end{itemize}

   c) Suppose the \texttt{String} variable \texttt{message} is already initialized. Write a Java code fragment that prints out \texttt{message}, one char per line.
      \begin{verbatim}
      int count = 0;
      while (count < message.length)
      {
        System.out.print(message.charAt(count));
        count ++;
      }
      \end{verbatim}

   d) Write some code that uses the Math class to compute and print out the value of \sin(\pi/2).
      \begin{verbatim}
      System.out.println(Math.sin( Math.PI /2 ) );
      \end{verbatim}
The following program is supposed to determine whether a positive integer `myNum` is prime (i.e., has no divisors other than 1 and itself). It does this by checking if any values `n` are divisors, using a boolean variable `gotIt` to keep track of whether a divisor has been found.

```java
import java.util.Scanner;
public class PrimeTester {
    public static void main (String[] args) {
        Scanner scan = new Scanner (System.in);
        System.out.println("Please enter a positive integer.");
        int myNum = scan.nextInt();

        int n = 2;
        boolean gotIt = false;

        System.out.print ("This number is ");
        if (gotIt)
            System.out.print ("NOT ");
        System.out.println ("prime.");
    }
}
```

a) Which of these versions of the code should go in the box above? (circle correct one)

```
while (n < myNum)
{
    if (myNum % n == 0)
        gotIt = true;
    else
        gotIt = false;
    n++;
}
```

Note: The differences are the "<" vs. "<=" and the `if/else` vs. just `if (no else)

b) Show the output produced by the program, given to the following inputs:

- 23  **This number is prime**
- 15  **This number is NOT prime**
- 2   **This number is prime**
8. [ 10] Below is the code for the Snowman applet and the image it produces.

a) Sketch the image produced by modifying the code indicated by the arrow, as follows:
   ```java
   final int TOP = 20;
   ```

b) Add some code to the program below to make the snowman look like he is holding a green ball, i.e.:
   - add a “hand” – 10 pixel long horizontal line, start at arm
   - add a green ball, 10 by 10 pixels, resting on the hand.
   - be sure the ball is green, but the hand is black
   - see illustration below

```java
import javax.swing.JApplet;
import java.awt.*;

public class Snowman extends JApplet {
    public void paint (Graphics page) {
        final int MID = 150;
        final int TOP = 50;

        page.setColor (Color.cyan);
        page.fillRect (0, 0, 300, 175); // sky
        page.setColor (Color.blue);
        page.fillRect (0, 175, 300, 50); // ground
        page.setColor (Color.yellow);
        page.fillOval (-40, -40, 80, 80); // sun
        page.setColor (Color.white);
        page.fillOval (MID-20, TOP, 40, 40); // head
        page.fillOval (MID-35, TOP+35, 70, 50); // upper torso
        page.fillOval (MID-50, TOP+80, 100, 60); // lower torso
        page.setColor (Color.black);
        page.fillOval (MID-10, TOP+10, 5, 5); // left eye
        page.fillOval (MID+5, TOP+10, 5, 5); // right eye
        page.drawArc (MID-10, TOP+20, 20, 10, 190, 160); // smile
        page.drawLine (MID-25, TOP+60, MID-25, TOP+60); // left arm
        page.drawLine (MID+25, TOP+60, MID+55, TOP+60); // right arm
        page.drawLine (MID-20, TOP+5, MID+20, TOP+5); // brim of hat
        page.fillRect (MID-15, TOP-20, 30, 25); // top of hat
        //*** code for left hand holding green ball goes here ***
        page.drawLine (MID-60, TOP+40, MID-50, TOP+40); // left hand
        page.setColor (Color.red);
        page.fillOval (MID-60, TOP+30, 10, 10); // red ball in hand
    }
}
```

hand and ball width is the same = 10 pixels
9. [____/ 10] Write a complete Java program that asks the user to input a value representing a number of seconds, and then prints the equivalent amount of time as a combination of hours, minutes, and seconds. (For example, 9999 seconds is equivalent to 2 hours, 46 minutes and 39 seconds.)

Be sure to write a complete Java program, including class definition, variable and constant declarations, as appropriate, comments, and proper indentation, to make it readable.

```java
import java.util.Scanner;

public class Seconds {

    public static void main(String[] args) {
        Scanner scan = new Scanner(System.in);
        int seconds = scan.nextInt();

        int hours = seconds / 3600;
        seconds = seconds - (hours * 3600);
        int min = seconds / 60;
        seconds = seconds - (min * 60);

        System.out.print(hours + " " + min + " " + seconds);
    }
}
```
10. [_____ / 10]
Construct an algorithm that inputs 10 positive numbers and prints the maximum of these numbers.

Example: If the numbers input are 44 7 31 22 53 16 21 48 72 60, the output should be:
max = 72

Directions:
Write your algorithm by rearranging and structuring elements chosen from the list below, using indentation to show structure. Do not use anything else and note that not all of these are needed, but you may use one of them more than once, if necessary:

- num = 0
- count = 0
- count = 1
- max = 0
- count = count + 1
- num = max
- max = num
- print "max = " max
- input num
- input max
- input count
- if (num > max)
- if (count < max)
- else
- while (count <= 10)
- while (count < 10)
- while (num < max)
- while (num != max)

```
count = 0
max = 0

while (count < 10)
    input num
    if (num > max)
        max = num
    count = count + 1

print "max = " max

ALTERNATIVELY we can count from 1 to 10:
count = 1
max = 0
while (count <= 10)
    input num
    if (num > max)
        max = num
    count = count + 1

print "max = " max
```
Drawing a Line

\[
\text{page.drawLine (10, 20, 150, 45);} \\
\text{page.drawLine (150, 45, 10, 20);} 
\]

Drawing a Rectangle

\[
\text{page.drawRect (50, 20, 100, 40);} 
\]

Drawing an Oval

\[
\text{page.drawOval (175, 20, 50, 80);} 
\]

Drawing an Arc

- An arc is defined by an oval, a start angle, and an arc angle.

REFERENCE MATERIAL
**Random class**

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>double nextDouble()</code></td>
<td>Returns the next pseudorandom, uniformly distributed double value between 0.0 and 1.0</td>
</tr>
<tr>
<td><code>int nextInt()</code></td>
<td>Returns the next pseudorandom, uniformly distributed int value from this random number generator's sequence.</td>
</tr>
<tr>
<td><code>int nextInt(int n)</code></td>
<td>Returns a pseudorandom, uniformly distributed int value between 0 (inclusive) and the specified value (exclusive), drawn from this random number generator's sequence.</td>
</tr>
</tbody>
</table>

**Some methods of the Math class**

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>static double abs(double a)</code></td>
<td>Returns the absolute value of a double value.</td>
</tr>
<tr>
<td><code>static double cos(double a)</code></td>
<td>Returns the trigonometric cosine of an angle.</td>
</tr>
<tr>
<td><code>static double pow(double a, double b)</code></td>
<td>Returns the value of the first argument raised to the power of the second argument.</td>
</tr>
<tr>
<td><code>static double random()</code></td>
<td>Returns a double value greater than or equal to 0.0 and less than 1.0.</td>
</tr>
<tr>
<td><code>static long round(double a)</code></td>
<td>Returns the closest long to the argument.</td>
</tr>
<tr>
<td><code>static double sin(double a)</code></td>
<td>Returns the trigonometric sine of an angle.</td>
</tr>
<tr>
<td><code>static double sqrt(double a)</code></td>
<td>Returns the correctly rounded positive square root of a double value.</td>
</tr>
</tbody>
</table>

**String class**

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>boolean isEmpty()</code></td>
<td>Returns true if, and only if, <code>length()</code> is 0.</td>
</tr>
<tr>
<td><code>char charAt(int index)</code></td>
<td>Returns the char value at the specified index.</td>
</tr>
<tr>
<td><code>int length()</code></td>
<td>Returns the length of this string.</td>
</tr>
<tr>
<td><code>String toUpperCase()</code></td>
<td>Converts all of the characters in this String to upper case using the rules of the default locale.</td>
</tr>
</tbody>
</table>
Please answer questions in the spaces provided. If you make a mistake or for some other reason need more space, please use the back of pages and clearly indicate where the answer can be found. Good luck!
1. [ /10] Refer to the program below. Next to each word in the list, choose the most fitting description:
   • reserved word
   • constant
   • variable
   • method

```java
import java.util.Scanner;

public class Age {
    // Reads the user's age and prints comments accordingly.
    public static void main(String[] args) {
        final int MINOR = 21;

        Scanner scan = new Scanner(System.in);
        System.out.print("Enter your age: ");
        int age = scan.nextInt();

        System.out.println("You entered: "+age);

        if (age < MINOR)
            System.out.println("Youth is a wonderful thing. Enjoy.");

        System.out.println("Age is a state of mind.");
    }
}
```

nextInt  Method__  if  Reserved Word__
scan  Variable___  println  Method____
import  Reserved Word__  public  Reserved Word__
MINOR  Constant____  class  Reserved Word__
age  Variable____  int  Reserved Word__
2. [ /10]  

a) What output is produced by the following program?

```java
public class OneMoreTime {
    public static void main (String[] args) {
        int x = 1;
        int a = 2;
        int b = 3;
        x = b;
        b = a;
        a = x;
        System.out.println("Howdy, here are some numbers: ");
        System.out.println("x = " + x + " a = " + a + " b = " + b);
        System.out.println("I promise this is the \n\"last time\"");
        System.out.println ("you have to do this ");
        System.out.println ("so\nplease count the \"\\\\"s carefully!");

        System.out.println(" Try this: " + (2 + 3));
        System.out.println(" and this: " + (2 + 3));
        System.out.println(" and this also: " + 2 + 3);
    }
}
```

Output:

```
Howdy, here are some numbers:  
x = 3 a = 3 b = 2  
I promise this is the "last time" you have to do this so please count the "\\"s carefully!  
Try this: 2 + 3  
and this: 5  
and this also: ... 23
```

b) Write a single println statement that would output

```java
System.out.println ("\t\t"Hello\"
\t\t"Goodbye\")
```


- For each of the following expressions, indicate the order in which the operations are performed by writing a number beneath each operator.

\[
a - b + d / e / f \\
3 - 4 - 1 - 2
\]

\[
b + e + a + f + c
\]

- Consider the following code fragment:

```java
if (a>0)
    if (b<0)
        x = x + 5;
    else
        if (a>5)
            x = x + 4;
        else
            x = x + 3;
      else
        x = x + 2;
```

If x is currently 0, a = 1 and b = -1, what will x become after the above statement is executed?

\[ x = \_\_\_\_\_\_\_\_\_\_\_\_\]

- For each of the following Java code fragments, mark the error and show how to correct it. What do you need to do to fix it so that it works as appears to be intended?

a) ```java
if (value = 0)
    System.out.print ("Right!");
```  

b) ```java
if (value > 0);
    System.out.print ("Right!");
```  

c) ```java
if (value > 0)
    System.out.print ("Right!");
    System.out.println(" value is positive");
```
4. [ /10] Short answer questions.

a) How many bits/bytes are needed to store a color picture that is 300 pixels wide and 200 pixels high under each of the following schemes? Express your answer as approximate number of KB or MB, etc., as appropriate. Show your work and fill in the answers below:

Total # pixels 60,000

<table>
<thead>
<tr>
<th>Scheme</th>
<th># Bytes</th>
<th># Bits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bitmap (1 bit/pixel)</td>
<td>10 KB</td>
<td>80,000 bits</td>
</tr>
<tr>
<td>Greyscale (1 byte/pixel)</td>
<td>80 KB</td>
<td>640,000 bits or 640K bits</td>
</tr>
<tr>
<td>RGB (3 bytes/pixel)</td>
<td>240 KB</td>
<td>1,920,000 bits or ≈ 2M bits</td>
</tr>
</tbody>
</table>

b) List all binary codes that can be made with 4 bits

0000
0001
0010
0011
0100
0101
0110
0111
1000
1001
1010
1011
1100
1101
1110
1111

c) With 5 bits we can have $2^5 = 32$ different binary codes
5. [10] Given the following declarations:

```java
int iResult, num1 = 9, num2 = 2;
double fResult, val1 = 9.0;
boolean status, part1 = true;
```

What result is stored by each of the following assignment statements?

<table>
<thead>
<tr>
<th>Source code</th>
<th>Result stored</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>fResult = (num1 + 2)/ 2;</code></td>
<td><code>5.0</code></td>
</tr>
<tr>
<td><code>iResult = num2 % num1;</code></td>
<td><code>2</code></td>
</tr>
<tr>
<td><code>fResult = val1 / 2;</code></td>
<td><code>4.5</code></td>
</tr>
<tr>
<td>`status = part1</td>
<td></td>
</tr>
<tr>
<td><code>status = part1 &amp;&amp; (num1 &gt; num2);</code></td>
<td><code>true</code></td>
</tr>
<tr>
<td><code>fResult = (double) num1 / 2;</code></td>
<td><code>4.5</code></td>
</tr>
</tbody>
</table>

a) Given a Random object named `gen`, what range of values are produced by the following expressions?

- `gen.nextInt(5) + 1` 1 to 5
- `gen.nextInt(10) + 50` 50 to 59
- `gen.nextInt(5) - 2` -2 to 2

b) Write some code that uses the object `gen`, above, to generate pseudorandom numbers in the following specified ranges (including the endpoints):

- 1 to 8 `gen.nextInt(8) + 1`
- -10 to 0 `gen.nextInt(11) - 10`

c) Suppose the String variable `message` is already initialized. Write a Java code fragment that prints out `message`, backwards.

```java
int count = message.length() - 1;
while (count >= 0)
{
    System.out.print(message.charAt(count));
    count--;
}
```

d) Write some code that uses the Math class to compute and print out the value of cos(π/2).

```
System.out.println(Math.cos(Math.PI / 2));
```
The following program is supposed to determine whether a positive integer `myNum` is prime (i.e., has no divisors other than 1 and itself). It does this by checking if any values `n` are divisors, using a boolean variable `gotIt` to keep track of whether a divisor has been found.

```java
import java.util.Scanner;
public class PrimeTester {
    public static void main (String[] args) {
        Scanner scan = new Scanner (System.in);
        System.out.println("Please enter a positive integer.");
        int myNum = scan.nextInt();

        int n = 2;
        boolean gotIt = false;

        System.out.print ("This number is ");
        if (gotIt)
            System.out.print ("NOT ");
        System.out.println ("prime.");
    }
}
```

a) Which of these versions of the code should go in the box above? (circle correct one)

```java
while (n <= myNum)
{
    if (myNum % n == 0)
        gotIt = true;
    else  gotIt = false;
    n++;
}
```

```java
while (n < myNum)
{
    if (myNum % n == 0)
        gotIt = true;
    else  gotIt = false;
    n++;
}
```

Note: The differences are the "<" vs. "<=" and the if/else vs. just if (no else)

b) Show the output produced by the program, given to the following inputs:

- **33** This number is NOT prime
- **13** This number is prime
- **1** This number is prime
8. [ /10] Below is the code for the Snowman applet and the image it produces.

a) Sketch the image produced by modifying the code indicated by the arrow, as follows:

```java
final int MID = 50;
```

b) Add some code to the program below to make the snowman look like he is holding a red ball, i.e.:
- add a “hand” – 10 pixel long horizontal line, start at arm
- add a red ball, 10 by 10 pixels, resting on the hand.
- be sure the ball is red, but the hand is black
- see illustration below

```java
import javax.swing.JApplet;
import java.awt.*;

public class Snowman extends JApplet
{
    public void paint (Graphics page)
    {
        final int MID = 150;
        final int TOP = 50;

        page.setColor (Color.cyan);
        page.fillRect (0, 0, 300, 175); // sky
        page.setColor (Color.blue);
        page.fillRect (0, 175, 300, 50); // ground
        page.setColor (Color.yellow);
        page.fillOval (-40, -40, 80, 80); // sun
        page.setColor (Color.white);
        page.fillOval (MID-20, TOP, 40, 40); // head
        page.fillOval (MID-35, TOP+35, 70, 50); // upper torso
        page.fillOval (MID-50, TOP+80, 100, 60); // lower torso
        page.setColor (Color.black);
        page.fillOval (MID-10, TOP+10, 5, 5); // left eye
        page.fillOval (MID+5, TOP+10, 5, 5); // right eye
        page.drawArc (MID-10, TOP+20, 20, 10, 190, 160); // smile
        page.drawLine (MID-25, TOP+60, MID+25, TOP+60); // left arm
        page.drawLine (MID-20, TOP+5, MID+20, TOP+5); // right arm
        page.drawLine (MID-20, TOP+5, MID+20, TOP+5); // brim of hat
        page.fillRect (MID-15, TOP-20, 30, 25); // top of hat
        //*** code for left hand holding red ball goes here ***
        page.drawLine (MID-60, TOP+40, MID-50, TOP+40); // left hand
        page.setColor (Color.red);
        page.fillOval (MID-60, TOP+30, 10, 10); // red ball in hand
    }
}
```
9. [________/ 10] Write a complete Java program that asks the user to input an integer representing a number of days and then calculates and prints the equivalent as a number of weeks and days. For example, if the user inputs 18 for the number of days, the output should state that it is equivalent to 2 weeks and 4 days.

Be sure to write a complete Java program, including class definition, variable and constant declarations, as appropriate, comments, and proper indentation, to make it readable.

```java
import java.util.Scanner;

public class Days {
    public static void main(String[] args) {
        Scanner scan = new Scanner(System.in);
        int days = scan.nextInt();
        int weeks = days / 7;
        days = days % 7;
        System.out.println(weeks + " " + days);
    }
}
```
10. [______/ 10]

Construct an algorithm that inputs a number num and then prints "Hello" that many times. After the "Hello"s are printed, print a goodbye message.

Example: If num (i.e., the input) is 5, the algorithm should print something like this:

Hello
Hello
Hello
Hello
Hello
Goodbye

Directions:
Write your algorithm by rearranging and structuring elements chosen from the list below, using indentation to show structure. Do not use anything else and note that not all of these are needed, but you may use one of them more than once, if necessary.

input num
input count
count = 1
count = 0
count = count + 1
num = num + 1
if (count < num)

else
while (count <= num)
while (count != 5)
while (count <= 5)
print "Hello"
print num
print "Goodbye"

input num
count = 1
while (count <= num)

print "Hello"
count = count + 1
print "Goodbye"
Drawing a Line

```
page.drawLine (10, 20, 150, 45);
page.drawLine (150, 45, 10, 20);
```
## Random class

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>double nextDouble()</code></td>
<td>Returns the next pseudorandom, uniformly distributed <code>double</code> value between 0.0 and 1.0</td>
</tr>
<tr>
<td><code>int nextInt()</code></td>
<td>Returns the next pseudorandom, uniformly distributed <code>int</code> value from this random number generator's sequence.</td>
</tr>
<tr>
<td><code>int nextInt(int n)</code></td>
<td>Returns a pseudorandom, uniformly distributed <code>int</code> value between 0 (inclusive) and the specified value (exclusive), drawn from this random number generator's sequence.</td>
</tr>
</tbody>
</table>

## Some methods of the Math class

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>static double abs(double a)</code></td>
<td>Returns the absolute value of a <code>double</code> value.</td>
</tr>
<tr>
<td><code>static double cos(double a)</code></td>
<td>Returns the trigonometric cosine of an angle.</td>
</tr>
<tr>
<td><code>static double pow(double a, double b)</code></td>
<td>Returns the value of the first argument raised to the power of the second argument.</td>
</tr>
<tr>
<td><code>static double random()</code></td>
<td>Returns a <code>double</code> value greater than or equal to 0.0 and less than 1.0.</td>
</tr>
<tr>
<td><code>static long round(double a)</code></td>
<td>Returns the closest <code>long</code> to the argument.</td>
</tr>
<tr>
<td><code>static double sin(double a)</code></td>
<td>Returns the trigonometric sine of an angle.</td>
</tr>
<tr>
<td><code>static double sqrt(double a)</code></td>
<td>Returns the correctly rounded positive square root of a <code>double</code> value.</td>
</tr>
</tbody>
</table>

## String class

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>boolean isEmpty()</code></td>
<td>Returns true if, and only if, <code>length()</code> is 0.</td>
</tr>
<tr>
<td><code>char charAt(int index)</code></td>
<td>Returns the <code>char</code> value at the specified index.</td>
</tr>
<tr>
<td><code>int length()</code></td>
<td>Returns the length of this string.</td>
</tr>
<tr>
<td><code>String toUpperCase()</code></td>
<td>Converts all of the characters in this String to upper case using the rules of the default locale.</td>
</tr>
</tbody>
</table>