ANSWER KEY
Final Exam
Computer Programming 230
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Thursday, 17 December 2009

1. True or False:

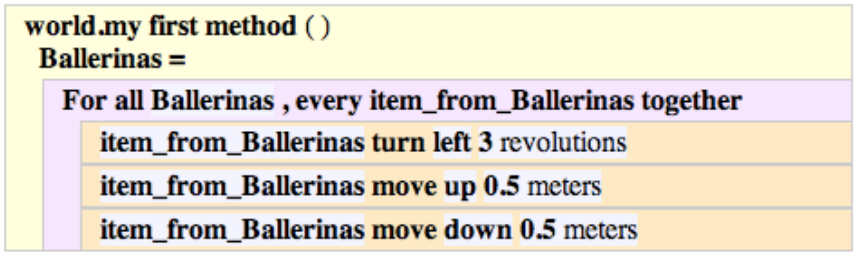
   (a) F In Alice, the body of the loop can contain another loop, but only of the while type.
   (b) F In Alice, an event may occur only as a result of user action.
   (c) F In Alice, an index in the array always starts with 1.
   (d) T Some methods in Alice and Java are called automatically.
   (e) T In Java, to generate a keyboard event, a component must have the keyboard focus.
   (f) T In Java, Boolean isEmpty ( ) returns true if this list contains no elements.
   (g) F In Java, a variable can be used before it is declared.
   (h) F In Java, class hierarchies can contain no more than three levels.
   (i) F In Java, the content of the input file can only be read as text.
   (j) T In Java, all exceptions are considered checked exceptions, except objects of type RuntimeException.

2. Write the Java code that declares

   (a) a variable `count` that holds the number 0:
   `int count = 0;`
   (b) a variable `score` which is `8.25`:
   `double score = 8.25;`
   (c) a string variable `me` that holds your name:
   `String me = "Katherine";`
   (d) an object `smiley` of the class `Circle`:
   `Circle smiley;`
   (e) a list `ShapesToDraw` of 5 `Shape` objects:
   `ArrayList<Shape> ShapesToDraw;` or `Shapes[] ShapesToDraw = new Shapes[5]`

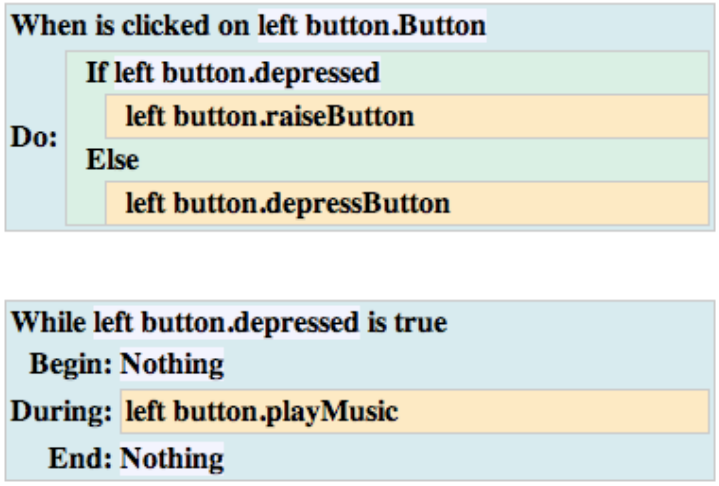
3. What happens when the code is run?

   (a)



The ballerinas, in unison, make 3 complete turns and then jump up and down once.

(b)



If the mouse clicks on the button, the button moves down and the music starts. If the button is pressed again, the button moves up and the music stops. This repeats every time the user clicks the button.

4. What is the output of the following code fragments:

(a)

```
int numtimes = 0;
while ( numtimes <= 1 )
{
    System.out.print("Hi!");
    numtimes++;
}
System.out.print("Bye!");
```

Output:

```
Hi!Hi!Bye!
```

(b)

```
boolean done = false;
int total = 0;
while ( !done )
{
    if ( total > 3 )
    {
        done = true;
    }
    total = total + (total+1);
}
System.out.println(total);
```

Output:

```
15
```

(c)

```
int i, j;
for ( i = 0 ; i < 3 ; i++)
```

Output:

```
{                                                    +++++
    for ( j = 0 ; j < 5 ; j++)                       +++++
    {                                                +++++
        System.out.print("+");
    }
    System.out.println();
}
```

(d) **Output:**

```
int i, j;
for ( i = 0 ; i < 3 ; i++)
{                                                    +-+-+
    for ( j = 0 ; j < 5 ; j++)                       -+-+-
    {                                                +-+-+
        if ( (i+j)%2 == 0 )
        {
            System.out.print("+");
        }
        else
        {
            System.out.print("-");
        }
    }
    System.out.println();
}
```

5. What is the output?

(a)
```
if ( ( 1 <= 10) && ( 20 > 10 ) )
    System.out.println("Yes");
else
    System.out.println("No");
```

Output: Yes

(b)
```
boolean tobe = true;
if ( tobe || !tobe )
    System.out.println("Yes");
else
    System.out.println("No");
```

Output: Yes

(c)
```
int x = 3, y = 3, z = 4;
if ( x+y*z > 15 )
    System.out.println("Yes");
else
    System.out.println("No");
```

Output: No

(d)
```
int number = 7;
boolean ispositive = ( number > 0 );
boolean iseven = ( number % 2 == 0 );
if ( ispositive || iseven )
    System.out.println("Yes");
else
    System.out.println("No");
```

Output: Yes

(e)
```
int year = 2004;
if (( year%4 == 0 && year%100 != 0 ) || ( year%400 == 0 ))
    System.out.println("Yes");
else
    System.out.println("No");
```

Output: Yes

6. Assume the following class definition:

```
public class SampleClass {
    public int number;
    public String message;
    public SampleClass()
    { number = 0; message = "I love Java"; }
    public void print()
    {   System.out.println(message); }
    public void wonder()
    {   int i;
        for ( i = 0 ; i < number ; i++ )
            System.out.print(message);
    }
}
```

and the following code has been executed:

```
SampleClass first = new SampleClass();
SampleClass second, third;
first.number = 2;
first.message = "Hi";
second = new SampleClass();
second.number = 2*first.number;
third = first;
```

What is the output from the following statements?

(a) `first.print();`

Output:

Hi

(b) `first.wonder();`

Output:

HiHi

(c) `second.print();`

Output:

I love Java

(d) `second.wonder();`

Output:

I love JavaI love JavaI love JavaI love java

(e) `third.print();`

Output:

Hi

7. (a) Write a `for`-loop that prints out the even numbers from 10 to 0:
`10 8 6 4 2 0`

```
for (int i = 10; i >= 0; i = i-2)
   System.out.print(i + " ");
```

(b) Write a `while`-loop that reads characters from the `Scanner` object `line` while there are still characters on the line and prints out any digits from the `line`.

```
while ( line.hasNext() )
{
   char ch = line.nextChar();
   if ( (ch >= '0') && (ch <= '9')
      System.out.print(ch);
}
```

`CHECK THAT nextChar() IS THE CORRECT NAME`

8. You have just been accepted a job with the Metropolitan Transit Authority (MTA). Your first assignment is to keep track of train departures. Your predecessor, before quitting, began writing a `Train` class. Each of the methods of the class is proceeded by a comment that explains what the method should do. Fill in each method with the appropriate code:

```
public class Train
{
    public String start; //The starting location of the train
    public String end;  //The ending location of the train
    public int distance; //Distance travelled
    public int numCars; //Number of cars on the train
    public int people;  //Number of people on the train
```

```
 public Train() {
   start = end = "Grand Central Station;
   distance = numCars = people = 0;
 }
 /* Prints all the information about the train: */
 public void print()
 {

    system.out.println("Start: " + start);
    system.out.println("End: " + end);
    system.out.println("Distance: " + distance);
    system.out.println("Number of cars: " + numCars);
    system.out.println("Number of people: " + people);


 }
 /* Calculates and returns the number of passengers per car */
public double carDensity()
{

   return(people/numCars);

}
/* Calculates and returns the time of trip given the speed of train*/
public double tripTime( double speed )
{

  return(distance/speed);

}
}
```

9. Create a new class called `Rectangle` that extends the abstract class `BoundedShape` below. Your `Rectangle` class should have a constructor that takes two points as input (and uses the `determineUpperLeft()`) to store the upper left hand corner as well as the height and width. You should also write a method `draw()` that draws a rectangle to the screen with upper left point, `upperLeft`, and the given height and width.

```
import java.awt.*;
public abstract class BoundedShape extends Shape
{
   protected Point upperLeft;
   protected int width, height;
   protected boolean filled;
```

```
   //-----------------------------------------------------------------------
   //  Creates and returns a point representing the upper left corner of a
   //  bounding rectangle based on two points.
   //-----------------------------------------------------------------------
   protected Point determineUpperLeft(Point p1, Point p2)
   {
      int x = (int) Math.min(p1.getX(), p2.getX());
      int y = (int) Math.min(p1.getY(), p2.getY());
      return new Point(x, y);
   }
}

//*************************************************************************
//  Rectangle.java       Programming with Alice and Java
//
//  Represents a rectangle that can be drawn in a particular graphics context.
//*************************************************************************

import java.awt.*;

public class Rectangle extends BoundedShape
{
   //-----------------------------------------------------------------------
   //  Sets the characteristics of the rectangle based on two points.
   //-----------------------------------------------------------------------
   public Rectangle(Point p1, Point p2, Color shade, boolean isFilled)
   {
      upperLeft = determineUpperLeft(p1, p2);
      width = (int) Math.abs(p1.getX()-p2.getX());
      height = (int) Math.abs(p1.getY()-p2.getY());
      filled = isFilled;
      color = shade;
   }

   //-----------------------------------------------------------------------
   //  Draws the rectangle in the specified graphics context.
   //-----------------------------------------------------------------------
   public void draw(Graphics gc)
   {
      gc.setColor(color);

      int x = (int) upperLeft.getX();
      int y = (int) upperLeft.getY();

      if (filled)
         gc.fillRect(x, y, width, height);
```

```
      else
         gc.drawRect(x, y, width, height);
   }
}
```

10. Write a **complete** Java program that asks the user for their full name, and then prints out their initials.
    For example, if the user enters: `Herbert H Lehman`
    Your program should print out: `The initials are HHL`.

```
public class Initials {
   public static void main(String[] args) {
       Scanner line = new Scanner(System.in);

       System.out.println("Please enter your full name:");

       System.out.print("The initials are ");
       while ( line.hasNext() ) {
          char ch = line.next().charAt(0);
          System.out.print(ch);
       }
       System.out.println();
   }
}
```