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CS 1301 CS1 with Robots Fall 2008 – Exam 3

This test has ten (10) problems on Nine (9) pages. Some problems have multiple parts.

Problem	Score	Possible Points
1. Vocabulary		15
2. Fill in the Blank (1)		8
3. Fill in the Blank (2)		12
4. N Lines		4
5. Which walls?		8
6. Which Image?		8
7. A rubber spine		9
8. printFile()		12
9. maxValues()		15
10. color2Gray		18
Total:		109

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1. Vocabulary Matching (15 points). Write the number of the correct definition from the right column before each word in the left column.

<p><u>7</u> Handle</p> <p><u>1</u> Text File</p> <p><u>13</u> Local Variables</p> <p><u>3</u> Format Operator</p> <p><u>5</u> Pickle</p> <p><u>15</u> Short Circuit Evaluation</p> <p><u>14</u> Lambda</p> <p><u>12</u> Global Variables</p> <p><u>11</u> Semantic errors</p> <p><u>2</u> File</p> <p><u>6</u> Runtime errors</p> <p><u>10</u> Exception</p> <p><u>8</u> Raise</p> <p><u>4</u> Format String</p> <p><u>9</u> Syntax Errors</p>	<ol style="list-style-type: none">1. Contains printable characters organized into lines separated by newline characters.2. A named entity, usually stored on a hard drive, floppy disk, or CD-ROM, that contains a stream of characters.3. % takes a format string and a tuple of expressions and yields a string that includes the expressions, formatted according to the format string.4. A string that contains printable characters and format sequences that indicate how to format values.5. To write a data value in a file along with its type information so that it can be reconstituted later.6. An error that occurs at runtime.7. To prevent an exception from terminating a program using the try and except statements.8. Statement used to signal an exception.9. An error produced by Python when the user presses F5 to run the code.10. Raised by the runtime system if something goes wrong while the program is running.11. Problems with a program that compiles and runs but doesn't do the right thing. Example: An expression may not be evaluated in the order you expect, yielding an unexpected result.12. Can be seen through a program module, even inside of functions.13. Names defined within a function, are only visible within that function.14. A block of code which can be executed as if it were a function but without a name.15. When a boolean expression is evaluated the evaluation starts at the left hand expression and proceeds to the right, stopping when it is no longer necessary to evaluate any further to determine the final outcome.
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2. Fill in the blanks 1 (8 points)

Python has several compound data types that we have learned about. A String can be used to store a sequence of characters, while a Tuple can store a sequence of any type of data (but is immutable). A List can also store any type of data, and allows you to change elements within it. Finally, a Dictionary can associate a value to a key.

3. Fill in the blanks 2 (12 points):

The getPixels() function returns a sequence containing all of the pixels in a picture.

The Selection sort algorithm operates by first finding the smallest element of the array and then moving it to the front (position [0]) of the array.

The Insertion or Bubble or Selection sort algorithm runs in $O(N^2)$ time.

The Merge / (Quick / Heap) sort algorithm runs in $O(N \log N)$ time complexity.

The Linear search algorithm takes $O(N)$ time to find a value, but has the advantage of working on unsorted data.

The Binary search algorithm requires data to be sorted.

4. Program Comprehension (4 points)

```
def n_lines(n):  
    if n >= 0:  
        print "Line!"  
        n_lines(n-1)
```

How many times will the string "Line!" be printed when n_lines is called with n=4?
Number 5

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5. Read Code (8 Points):

The following code is defined. Assume the `turnL45()` function turns the robot left (counter-clockwise from the top) exactly 45 degrees. Also assume that the `getObstacle("center")` function will return 500 or higher if the robot is facing any wall.

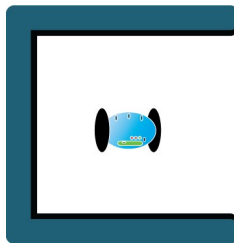
```
def turnL45():
    turnLeft(.5, 1)

def findPathOut():
    ir = getObstacle("center")
    out = False

    while out != True:
        if ir < 400:
            forward(1,5)
            out = True

        turnL45()
        ir = getObstacle("center")

findPathOut()
```



Please mark the wall(s) with the order that the robot faces them (and scans them with the Obstacle / IR sensors). The first wall it faces/scans should be marked with a 1, and so on, until the robot escapes.

The bottom wall should be marked with a 1, and then the robot escapes. = 8 points

If students misread the test (assumed the robot is facing upward, despite the fact that the fluke is facing down), they should mark the top wall with a 1, the top left corner with a 2, the side wall with a 3, the bottom left corner with a 4, the bottom wall with a 5 and the bottom corner with a 6 then the robot will escape. = 7 points

Any other answer: 0 points.

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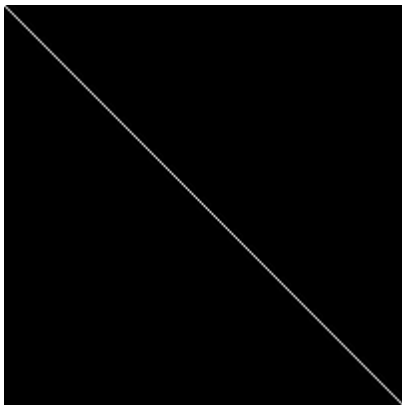
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6. Reading Code: (8 points)

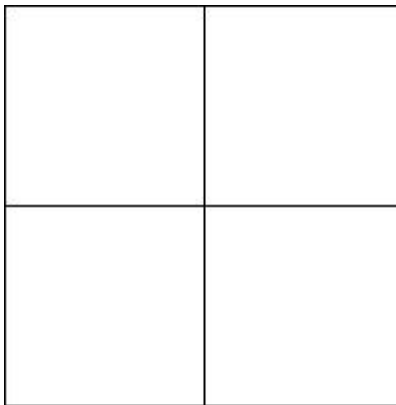
The following code is run in python:

```
picture = makePicture(201, 201)
for pixel in getPixels(picture):
    if (getX(pixel) % 100 == 0) | (getY(pixel) % 100 == 0):
        setRed(pixel, 0)
        setGreen(pixel, 0)
        setBlue(pixel, 0)
    else:
        setRed(pixel, 255)
        setGreen(pixel, 255)
        setBlue(pixel, 255)
show(picture)
```

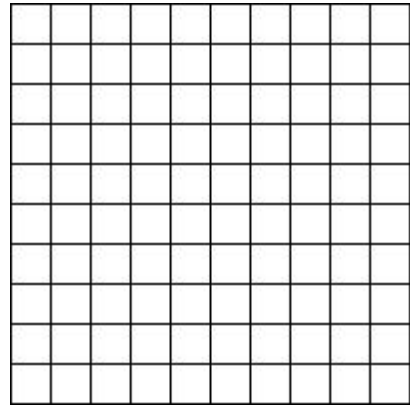
What image is shown? *Letter of image shown:* **B**



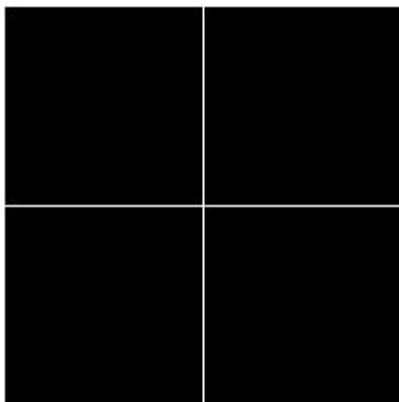
A



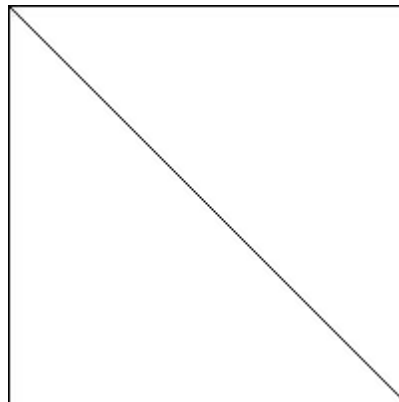
B



C



D



E

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7. **Code Understanding: (9 points)**

```
def function():  
    print "I often wonder which is mine"  
    return "Tolerance"  
    print "Or a rubber spine"
```

Grading: 3 points per part for a correct answer. -2 points (only down to zero per part) for each incorrectly included or missing line

A. What appears in the console if we then run the following code from the console? `function()`

```
I often wonder which is mine  
Tolerance
```

B. What appears in the console if we then run the following code from the console?

```
myVar = function()  
I often wonder which is mine
```

C. Assuming part B has been run, what do we see if we run the following code from the console?

```
print myVar  
Tolerance
```

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8. Write Code! (12 points)

Write a function **printFile(fileName)** that will open the file name passed in the **fileName** parameter, read each line in the file, and print the contents of each line to the screen. You may assume that the file will exist and that you do not have to do error checking.

```
def printFile(fileName):  
    f = open(fileName,"r")  
    line = f.readline()  
    while(line != ""):  
        print line  
        line = f.readline()  
    f.close()
```

Points:

1 – Correct function definition. [`def printFile(filename):`]

2 – Correct open call (`open(filename,'r')`)

2- Assigns the file object to the variable that is used later [`f = open(.....)`]

3 – Correctly reads each line in the file. (2 points if they miss one line at the beginning or end)

2 - Correctly prints each line.

1 – Correctly closes file at end.

1- Correct indenting throughout.

[-1 point for minor syntax errors, intention problems, etc.]

9. Write Code (15 points)

Write a function named **maxValues(pic)** that takes in one parameter, a picture, and finds the highest blue, red, and green values in it. Print the maximum values to the console as specified by the example below. Nothing should be returned by the function. *Note: The maximum value for each color can occur in different pixels.*

Example usage and output:

```
>>> p = takePicture()
>>> maxValues(p)
Max Red: 152   Max Green: 203   Max Blue: 245
>>>
```

```
def maxValues(picture):
    maxG = 0
    maxR = 0
    maxB = 0
    for pix in getPixels(picture):
        g = getGreen(pix)
        if(g > maxG):
            maxG = g
        r = getRed(pix)
        if(r > maxR):
            maxR = r
        b = getBlue(pix)
        if(b > maxB):
            maxB = b
    print "Max Red:", maxR, "Max Green:", maxG, "Max Blue:", maxB
```

Points:

- 2- Correct function definition [`def maxValues(pic):`]
- 3 – Correctly iterates through all pixels
- 5 – Determines the largest value for Red / Green / Blue (2 points if they detect the

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largest for one of the three colors but mess up the other two)

5 – Prints the output correctly (2 points if they print the values, but out of order, or without labels)

[-1 point for minor syntax errors, intention problems, etc.]

10. Write Code! (18 points):

Write a function `color2gray(picture)` that accepts a picture as the parameter, converts it to grayscale, and also returns a reference to the newly grayed picture. To convert a picture to grayscale, set every pixel's R, G, and B color values equal to the green value. *Note that your function should be a modifier, in that it modifies the original picture, and does not work on a copy of it.*

```
def color2gray(picture):  
    for pixel in getPixels(picture):  
        g = getGreen(pixel)  
        setRed(pixel,g)  
        setBlue(pixel,g)  
    return(picture)
```

Points:

2 – correct definition [`def color2gray(picture):`]

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- 5 – Correctly iterates through all pixels.
- 3- Retrieves the green value for the pixel
- 3 – Sets red/blue values to the green value
- 3- Returns the picture at the end
- 2 – correct indentation throughout

Extra Credit (1 point each)

Name the primary fictional robot from the following books, TV shows or Movies:

Talmud _____ Golem _____	The Jetsons ___ Rosie _____
Metropolis _____ Maria _____	Futurama _____ Bender _____
The Day the Earth Stood Still ___ Gort _____	Short Circuit _____ Johnny-5 _____
2001- A Space Odyssey _____ Hal _____	Knight Rider _____ KITT or Kit _____
Aliens & Aliens ³ _____ Bishop _____	