

# GIS 540 Exam

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Course number: GIS 540

Test ID: exam

Instructor: Dr. Tateosian

Time Limit: 120 minutes

Materials allowed: Scrap paper (students may not take scrap paper away from the exam).

General instructions: **Write clearly.** Use complete sentences for short answer questions. Write name and unity login id (e.g. jkrowlin) on each page. Return all pages of the exam and scrap paper to the proctor. Do not discuss the exam with other students before the exams are returned.

Total points available     135

Total points deducted     \_\_\_\_\_

Total points earned     \_\_\_\_\_

1. **(5pts)** Given the Python code statements in the left column, specify if the statement in the middle column is true or false.

Python code	Statement	True or False?
species = 'trout'	<u>species</u> is a <i>string literal</i> .	FALSE
x = 5.0	<u>x</u> is an integer type variable.	FALSE
"256" > "2400"	The statement evaluates to True.	TRUE
str(5) == '5'	The statement evaluates to True.	TRUE
foo = "GIS" foo[:2]==foo[2]	The second line of code evaluates to True.	FALSE

2. **(18pts)** Label each item in the list as **M** for built-in module, **F** for built-in function, **C** for built-in constant, **E** for built-in exception, **K** for Python keyword, or **N** for none of the other choices. *There are three of each.*

<u>E</u> IndexError	<u>M</u> os	<u>F</u> max	<u>K</u> for	<u>N</u> arcpy
<u>M</u> sys	<u>E</u> SyntaxError	<u>N</u> by	<u>K</u> in	<u>E</u> TypeError
<u>C</u> False	<u>N</u> elif	<u>M</u> math	<u>C</u> None	
<u>F</u> type	<u>C</u> True	<u>K</u> and	<u>F</u> range	

3. **(5pts)** Write a Python FOR-loop equivalent to the following WHILE-loop

WHILE-loop	FOR-loop
<pre>x = 1 while x &lt; 500:     print(x)     x = x + 1</pre>	<pre>for x in range(1,500):     print (x)</pre>

4. **(18pts)** Beside each code fragment in the table below, give the output. If the code would cause an error, write *ERROR* and give a *brief explanation*.

Python code	Output or cause of error
<pre>count = 40 name = 'Toucan' print('There are' + count + name)</pre>	<p><b>ERROR.</b> The Python interpreter doesn't know whether to add or concatenate. strings and numbers can't be combined using +. Attempting to do this results in a <b>TypeError</b>.</p>
<pre>x = (8**2) - (5//10) + (5.0/10) print(x)</pre>	<p><b>64.5</b> The double slash is floor division, meaning it rounds down.</p>
<pre>y = 2 - 5 * 6 print(y)</pre>	<p><b>-28</b></p>
<pre>fieldName = 'rock age' fieldName.upper( ) print(fieldName)</pre>	<p><b>rock age</b> Strings are immutable, so calling the upper method does change the value of the string.</p>
<pre>myList = ['C','A','B'] myList.sort() print(myList)</pre>	<p><b>['A','B','C']</b></p>
<pre>myList = range(4, 12, 2) print(myList)</pre>	<p><b>[4,6,8,10]</b></p>
<pre>print(min(1, 2, 3)) min = 5 print(min(1, 2, 3))</pre>	<p>The first statement prints 1</p> <p>The 2<sup>nd</sup> statement gives an <b>ERROR</b>-&gt;The code changed the built-in 'min' function into an Integer type variable.</p>
<pre>theTime = "10:33:06" #HH:MM:SS timeParts = theTime.split(":") print(timeParts) print(timeParts[3])</pre>	<p>The first statement prints <b>['10','33','06']</b></p> <p>The 2<sup>ND</sup> statement gives an <b>ERROR</b>-&gt;Trying to index beyond the end of the list throws an <b>IndexError</b>.</p>
<pre>x = -5 if x &gt; 0 or 1:     print('IN') else:     print('OUT')</pre>	<p><b>IN</b></p>

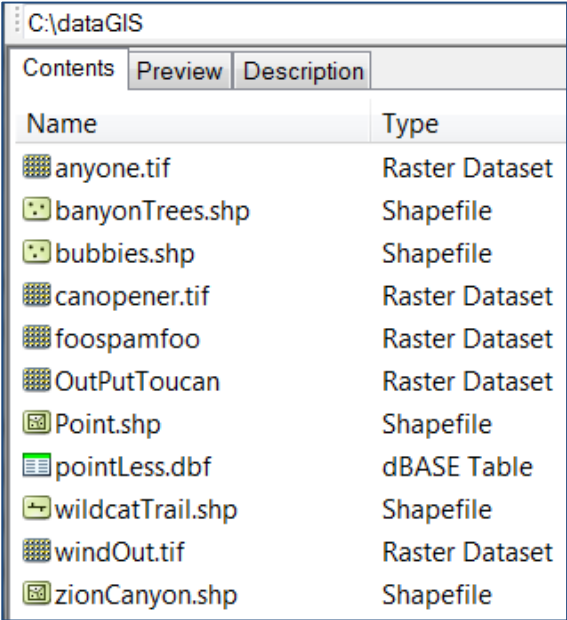
5. **(8pts)** Under each arcpy listing method in the table below, give the list contents. If the list is empty, write EMPTY and give a brief explanation. Assume the user passed in the following arguments:

"C:/dataGIS" \*foo

Assume the following code has been executed:

```
import arcpy, sys
```

```
arcpy.env.workspace = sys.argv[1]
```

L1 = arcpy.ListFeatureClasses("*anyon*")	 <p><b>Figure 1:</b> Contents of C:\dataGIS in ArcCatalog.</p>
"banyonTrees.shp", "zionCanyon.shp"	
L2 = arcpy.ListRasters("sys.argv[2]")	
EMPTY. This statement tries to list files that are <i>named</i> sys.argv[2]	
L3 = arcpy.ListRasters("Out*", "TIF")	
EMPTY The names of the TIF type rasters in this workspace do not start with 'Out'.	
L4 = arcpy.ListFeatureClasses("*", "Point")	
"banyonTrees.shp", "bubbies.shp"	

6. **(6pts)** Write a script which prints the names of all the fields in a given input Shapefile. The script has been started in the box below.

1	import arcpy, sys
2	inputFile = sys.argv[1]
3	fields = arcpy.ListFields(inputFile)
4	for f in fields:
5	print(f.name)

7. **(13pts)** Write a script which takes a year as input. Print 'CURRENT', if the input is this year (2015), 'RECENT' if the input is within the 5 years before this one (2009 through 2014), and 'TARDIS' otherwise. Also, list 3 or more sample inputs that would test the code thoroughly.

```
import sys
year = int(sys.argv[1])
if year == 2015:
    print('CURRENT')
elif 2009 <= year <= 2014:
    print('RECENT')
else:
    print('TARDIS')
```

**Sample inputs:** 2015, 2010, 2020, -2000, 2000.5, '200AD' (The first three inputs represent categories that are mandatory to test, since they test each of the three branches of code). The code would fail for the last 2 inputs but it still meets the requirements that were specified. This is something you might want to consider how to handle depending on your application.

8. **(4pts)** Answer the following questions about the traceback error shown in the box below:
- Which line number of 'findAvg.py' did the error occur on? **Line 8**
  - What is the name of the exception? **ZeroDivisionError**
  - The line of code that triggered the error is shown in bold. Use variable names in this line of code to explain why the exception was thrown. **rangeVal has a value of zero.**

Traceback (most recent call last):

File "C:\Python27\ArcGIS10.2\Lib\site-packages\scriptutils.py", line 326, in RunScript

exec codeObject in \_\_main\_\_.\_\_dict\_\_

File "C:\sampleScripts\findAvg.py", line 8, in <module>

**val = maxv - minv/rangeVal**

ZeroDivisionError: integer division or modulo by zero

9. **(14pts)** Identify the six mistakes in this pseudocode. Mistakes can pertain to logic, syntax, or efficiency. Line numbers for lines that have mistakes are given below (Some lines have 2 mistakes). CLEARLY show how to correct the mistakes *inside the code box*. Then, in parts 1)-7) below the box, explain the corrections.

1	GET a list of shapefiles from workspace
2	FOR each shapefile in the workspace
3	DETERMINE the geometry of the current shapefile
4	IF the geometry is polygon <del>then</del> THEN
5	CALCULATE the area of the polygonal lake in square feet.
6	COMPUTE buffer of the polygonal lake.
7	PRINT area of lake
8	ELSE IF the geometry is line THEN
9	CALCULATE the length of the linear river in feet.
10	COMPUTE buffer of the linear river.
11	---->PRINT length of river
12	ENDIF
13	ENDFOR

- 1) Line 2 (something is missing!) Should be a FOR loop (FOR each shapefile). The first line gets a list of shapefiles to work on.
- 2) Line 4 then should be uppercase, THEN
- 3) Line 8 IF should be ELSE IF. This would be more efficient than repeat IF's, since these conditions are mutually exclusive.
- 4) Line 8 missing THEN
- 5) Line 11 needs to be indented, otherwise it would be printed for any kind of shapefile.
- 6) Line 12 (something is missing!) missing ENDIF
- 7) Line 12 (something is missing!) missing ENDFOR

10. **(8pts)** The script 'polygonNeighbors\_nonBatch.py' in the first box below creates a table with statistics pertaining to polygon contiguity for polygons in the 'C:/data/COVER63p.shp' file. Rewrite this as 'polygonNeighbors\_Batch.py' in the second box (where the script is started for you). The batch version should call the Polygon Neighbor (Analysis) on all the polygon Shapefiles in the 'C:/data' directory whose names start with "COVER".

```
1 # polygonNeighbors_nonBatch.py
2 import arcpy, os
3 arcpy.env.workspace = 'C:/data'
4 inputFile = 'COVER63p.shp'
5 outputFile = os.path.splitext(inputFile)[0] + 'PN.dbf'
6 arcpy.PolygonNeighbors_analysis(inputFile, outputFile)
7 print('{0} created.'.format(outputFile))
```

```
1 # polygonNeighbors_Batch.py
2 import arcpy, os
3 arcpy.env.workspace = 'C:/data'
4 fcs = arcpy.ListFeatureClasses('COVER*', 'Polygon')
5 for fc in fcs:
6     outputFile = os.path.splitext(fc)[0] + 'PN.dbf'
7     arcpy.PolygonNeighbors_analysis(fc, outputFile)
8     print('{0} created.'.format(outputFile))
```

11. (6pts) The screen shot in Figure 2 shows a debugging session. Use the information in the Watch Window, the current position of the cursor, and the code you can see to answer the following questions.

- a. What is the name of the file that was input into the script?

jack.jpg

- b. Which line number is the cursor currently pointing to?

Line 27

- c. Starting at the current cursor position, when the user presses the 'Step Over' button 10 times, which sound(s) will play?

Based on the code shown here, 'haha.wav', 'doh.wav', and 'yeehaa.wav' are the sounds that will play.

- d. Give an example (if possible) of an input that won't result in any sound being played.

Any valid data would result in 'yeehaa.wav' being played. If the user enters a non-existent data path (e.g., C:/Temp/bogus.txt) or something else that the Describe method can't handle (e.g., 5 or 'foo') the Describe method will throw an error, so no sounds will be played, because the script will stop running before it reaches the sounds.

Similarly, if the user doesn't enter an argument, the script will fail on line 21.

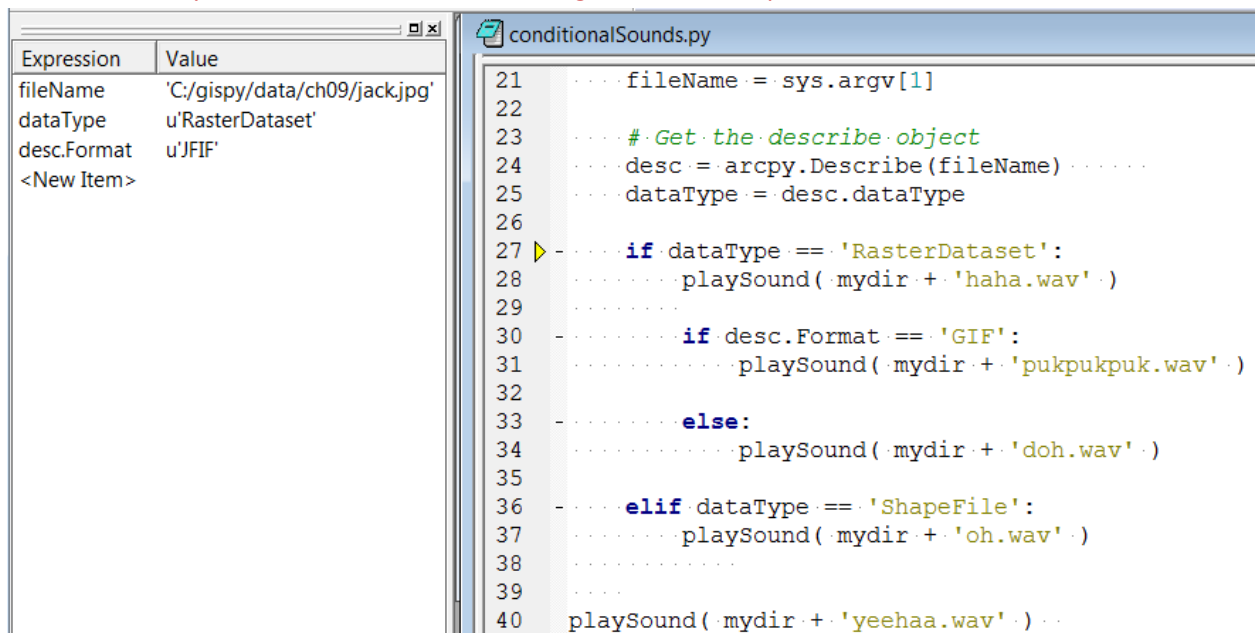


Figure 2: PythonWin debugging session.



12. **(10pts)** Rewrite the workflow described below in terms of pseudocode. Use appropriate **structural components** (sequences, decision-making, and repetition), **key words** and **indentation**. Use each of the pseudocode key words, GET, SET, CALCULATE, FOR, IF, THEN, CALL, ENDIF, and ENDFOR, one or more times in your solution.

*Get a workspace from the user and get a list of the files in that workspace. Then check the modification time of each file and delete any files that have not been modified for 5 years.*

GET workspace from user

SET theDate to today's date.

CALCULATE threshold = theDate – 5 years

GET a list of files in the workspace

FOR each file in the file list

    GET modifiedDate, the date of when the current file was last modified

    IF modifiedDate is prior to the threshold THEN

        CALL the deletion tool to delete the current file

    ENDIF

ENDFOR

13. **(20pts)** The following script is meant to use a WHILE-loop to create 1 mile, 2 mile, 3 mile, 4 mile, and 5 mile buffer output files using the Buffer (Analysis) tool, but at the moment, it has 10 mistakes. Line numbers with mistakes are given (some lines have 2 mistakes). CLEARLY show how to correct the mistakes *inside the code box*. Then, in parts 1)-10) below the box, explain what would happen if the mistake were not fixed.

```
1 import arcpy, sys
2 inputFile = sys.argv[0] sys.argv[1]
3 count = 1
4 while count <= 6: count < 6:
5     distance = count + "miles" str(count) + " miles"
6     output = inputFile[:-4] + 'buff.shp' inputFile[:-4] + str(count) + 'buff.shp'
7     arcpy.Buffer(inputFile, output, distance) arcpy.Buffer_analysis(inputFile, output, distance)
8     print("Output created.")
9     count = count + 2 count + 1
```

- 1) **Line 1** The sys module is used without being imported, so it would throw a NameError when you get to line 2 and try to use sys.
- 2) **Line 2** sys.argv[0] would return the path of the script, not the first user argument.
- 3) **Line 3** The iterating variable needs to be initialized. The script would throw a name error upon reaching line 4.
- 4) **Line 4** The problem description specifies that the script should find 1,2,3,4, and 4 mile buffers. This script would also find a 6 mile buffer. (count<=5 would also work)
- 5) **Line 5** The count is an integer, which needs to be cast to string to be concatenated with the string literal that represents the linear unit. Change it to the following:  
str(count)
- 6) **Line 5** The number and linear unit need to be separated by a space; otherwise, the buffer distance will be invalid (e.g., 2miles)
- 7) **Line 6** The value of the output is variable not being modified. This would result in only one output file. Need to use the iterating variable in its name.
- 8) **Line 7** The toolbox alias is missing. The problem description specifies that the script should be calling the Buffer tool in the Analysis toolbox, so you need to add the alias, \_analysis to the tool call.
- 9) **Line 9** This line should be indented the same level as line 8, otherwise lines 4-8 will keep looping infinitely.
- 10) **Line 9** Count should be incremented by 1, not 2. count = count + 1