CS 101 Practice Midterm #2

1. Fill in your information:

Full Name: _____

UIN (Student Number): _____

NetID: _____

A. This test is fairly representative of the contents of the second midterm.

B. Material from lectures through `lec21` will be included.

C. We will also test random distributions (uniform v. normal.)

2. Fill in the following answers on the Scantron form:

95. D

96. C

1. (1 point) Consider the following program.

```
a=[1,"2","3",0]
x=""
for e in a:
    try:
        x+=int(e)
    except:
        x+="A"
```

After it is run, what is the final **value** of x?

(A) ★

```
'AAAA'
```

(B) `'A23A'`

(C) `'23'`

(D) None of the other answers are correct.

(E) `'1AA0'`

Solution.

---

2. (1 point) Consider the following program.

```
x=[]
for j in range(0,6):
    if (j%4)==0:
        x.append("-")
    if (j%3)==0:
        x.append("*")
```

After it is run, what is the final **value** of x?

(A) ★

```
["-","*","*","-"]
```

(B) None of the other answers are correct.

(C) `["*","-","*"]`

(D) `["-","*"]`

(E) `["*","-","*"]`

Solution.

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3. (1 point) For this problem, your job is to put the lines of code below in the proper order to create a function that accomplishes a task. We will completely ignore indentation.

```
1 def is_close( a,b,atol )

2 atol = 1e-3

3 return ( abs(a-b) <= atol )

4 return ( (a-b) <= atol )

5 except:

6 def is_close( a,b,atol=1e-3 ):

7 try:

8 return None
```

The function you should write is called `is_close`, and it should accept a two numbers, `a` and `b`. An optional third argument is the relative tolerance `atol` with default value `1e-3`. `is_close` `returns` `True` or `False` depending on whether the numbers are closer than `atol`:

$$|a-b| \leq \texttt{atol} \rightarrow \texttt{True} \qquad\qquad |a-b| > \texttt{atol} \rightarrow \texttt{False}$$

The code should return `None` if the calculation fails (for instance, if the parameters `a` or `b` are non-numeric).

What is the proper selection and ordering of the given lines of code?

(A) ★ 6, 7, 3, 5, 8

(B) 1, 2, 7, 3, 5, 8

(C) 6, 7, 4, 5, 8

(D) 6, 3

(E) 1, 2, 7, 4, 5, 8

Solution.

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4. (1 point) Consider the following program.

```
x=0
# x+=1 # x+=1
'''
'''
x+=1
'''
'''
x+=1
```

After it is run, what is the final **value** of x?

(A) `4`

(B) `3`

(C) `1`

(D) `5`

(E) ★

`2`

Solution.

---

5. (1 point) Consider the following 2-dimensional numpy array:

$$\begin{bmatrix} 1 & 5 & 9 \\ 2 & 6 & 10 \\ 3 & 7 & 11 \\ 4 & 8 & 12 \end{bmatrix}$$

Assuming it is stored in a variable named a, how can we index and retrieve the value 7?

(A) a[3][2]

(B) a[1][2]

(C) a[2][3]

(D) ★ a[2][1]

Solution.

---

6. (1 point) Consider the following program.

```
def f(x):
    for i in range(x):
        return x+1
    return 100
x=f(5)
```

After it is run, what is the final **value** of x?

(A) `6`

(B) ★ None of the other answers are correct.

(C) `100`

(D) `3`

(E) `5`

Solution.

---

7. (1 point) Consider the following program.

```
a,b="OBI","WAN"
def f(a):
    return tuple(a)
a,b=b,a
x=','.join(f(b))
```

After it is run, what is the final **value** of x?

(A) `"W,A,N"`

(B) `"W","A","N"`

(C) None of the other answers are correct

(D) ★

`"O,B,I"`

(E) `"O","B","I"`

Solution.

---

8. (1 point) Which of the following Python programs best simulates the roll of one six-sided die in the variable `x`? (*I.e.*, any number from 1–6 inclusive is equally likely to result from the die roll or program code.)

(A) `x = np.random.uniform( np.arange( 1,7 ) )`

(B) `x = np.random.randn( np.arange( 1,7 ) )`

(C) `x = np.random.shuffle( np.arange( 1,7 ) )`

(D) ★

```
x = np.random.choice( np.arange( 1,7 ) )
```

Solution.

---

9. (1 point) Consider the following program.

```
def f(x):
    if x<10:
       print(x)
   else:
       print(x+1)
x=f(5)
```

After it is run, what is the final **value** of x?

(A) `6`

(B) `4`

(C) `10`

(D) ★ None of the other answers are correct.

(E) `5`

Solution.

---

10. (1 point) Consider the following program.

```
a=[1,"2","3",0]
x=""
for e in a:
    try:
        x+=e
    except:
        x+="A"
```

After it is run, what is the final **value** of x?

(A) None of the other answers are correct.

(B) ★

```
'A23A'
```

(C) `'23'`

(D) `'AAAA'`

(E) `'1AA0'`

Solution.

---

11. (1 point) Consider the following exception.

```
TypeError: can only concatenate tuple (not "int") to tuple
```

Which of the following programs will throw this exception?

(A) `"LAN"+[tuple("DO")]`

(B) ★

```
tuple("LAN")+len("DO")
```

(C) `tuple("LAN")[len("DO")]`

(D) None of the other answers are correct

(E) `tuple("LAN")+tuple("DO")`

Solution.

---

12. (1 point) Consider the following program. (N.B.: This is a tricky one!)

```
def chase( chevy ):
    chevy.append( "arrow" )
    chevy.reverse()
    chevy = chevy.sort()
    return chevy

earl = "cheviot hills".split(" ")
chase( earl )
```

After it is run, what is the final **value** of `earl`?

(A) `[ 'hills', 'cheviot', 'arrow' ]`

(B) ★ `[ 'arrow', 'cheviot', 'hills' ]`

(C) `[ 'hills', 'cheviot' ]`

(D) `None`

(E) `[ 'cheviot', 'hills', 'arrow' ]`

Solution.

---

13. (1 point) Consider the following program:

```
a=1
def f():
    return 1
    a=3
x=a+f()
```

What is the **value** of x after this program is executed?

(A) `3`

(B) None of the other answers are correct.

(C) `1`

(D) ★

`2`

(E) `4`

Solution.

---

14. (1 point) Consider the following program.

```
e=[1,2,3,4,5]
d={0:0,1:0}
for a,b in enumerate(e):
    d[b%2]+=a
x=d[1]
```

After it is run, what is the final **value** of x?

(A) `3`

(B) `15`

(C) `9`

(D) `4`

(E) ★

`6`

Solution.

---

15. (1 point) Consider the following program.

```
import numpy as np
x=np.zeros((3,3))
for i in range(3):
    x[i][i]=1
    for j in range(3):
        if i>=j:
            continue
        x[i][j]=2
```

After it is run, what is the final **value** of x?

(A) ★ $\begin{bmatrix} 1 & 2 & 2 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$

(B) $\begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 2 & 2 & 1 \end{bmatrix}$

(C) $\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$

(D) $\begin{bmatrix} 2 & 2 & 2 \\ 0 & 2 & 2 \\ 0 & 0 & 2 \end{bmatrix}$

(E) $\begin{bmatrix} 2 & 0 & 0 \\ 2 & 2 & 0 \\ 2 & 2 & 2 \end{bmatrix}$

Solution.

---

16. (1 point) Consider the following program:

```
d={}
for i,c in enumerate("ABCDEFGHIJKLMNOPQRSTUVWXYZ"):
    d[c]=i
x=0
for c in "HANSOLO":
    x+=d[c]
```

What is the **value** of x after this program is executed?

(A) `84`

(B) `62`

(C) None of the other answers are correct.

(D) ★

`77`

(E) `93`

Solution.

---

17. (1 point) What should replace the three question marks to produce a program that runs without throwing an exception? Note: `sin`, `cos`, and `pi` are all part of the `math` module.

```
???
math.sin(pi)+math.cos(pi)
```

(A)
```
import math as pi, as sin, as cos
```

(B)
```
from math import *
import sin,cos
```

(C)
```
from math import sin,cos
import math
```

(D) ★

```
import math
from math import pi
```

Solution.

---

18. (1 point) Consider the following program.

```
x="5 4 1".split()
x=x.sort()
try:
    print(len(x))
except:
    print(type(x))
```

After it is run, what is printed by this program?

(A) `list`

(B) ★

`NoneType`

(C) `3`

(D) `TypeError`

Solution.

---

19. (1 point) Consider the following program.

```
import numpy as np
x=np.array([1,2]+[3,4])+5
```

After it is run, what is the final **value** of x?

(A) $\begin{bmatrix} 9 & 11 \end{bmatrix}$

(B) None of the other answers are correct

(C) $\begin{bmatrix} 9 \\ 11 \end{bmatrix}$

(D) $\begin{bmatrix} 6 & 7 \\ 8 & 9 \end{bmatrix}$

(E) ★ $\begin{bmatrix} 6 & 7 & 8 & 9 \end{bmatrix}$

Solution.

---

20. (1 point) Consider the following exception.

```
ValueError: invalid literal for int() with base 10: "R"
```

Which of the following programs will throw this exception?

(A) `"RAN"[10]"COR"`

(B) None of the other answers are correct

(C) ★

```
int("RANCOR"[0])
```

(D) `10+"RANCOR"`

(E) `"RANCOR"[int("10")]`

Solution.

---

21. (1 point) Consider the following program.

```
a=list("JEDI")
for c in "EDJI":
    print(a[c])
```

What kind of exception will this program throw?

(A) `KeyError: 'E'`

(B) `TypeError: cannot concatenate 'str' and 'int' objects`

(C) None of the other answers are correct

(D) ★

`TypeError: list indices must be integers, not str`

(E) `SyntaxError: invalid syntax`

Solution.

---

22. (1 point) Consider the following incomplete function.

```
def pal(s):
    a=list(s)
    n=len(s)
    ???
```

The function is intended to return True if and only if the input string s is a palindrome. A palindrome is a string that reads the same forward and backward, like "ABBA" or "RACECAR". What should replace the three question marks to complete the function?

(A) `return a[0:n:-1]==a[n:0:1]`

(B) ★

```
for i in range(n):
    if a[i]!=a[n-i-1]:
        return False
return True
```

(C) `return a[:n/2]==a[(n+1)/2:]`

(D) `return a==a.reverse()`

(E) `None of the other answers are correct.`

Solution.

---

23. (1 point) Consider the following incomplete Python program:

```
def tribo( n ):
    if n <= 1:
        return 1
    else:
        ???
```

The function `tribo` should return the nth number of the so-called "Tribonacci" sequence (counting from zero), in which each number is equal to the sum of the preceding three; *i.e.*,

0, 0, 1, 1, 2, 4, 7, 13, 24, 44, 81, ...

What should replace the `???` block to complete the program correctly?

(A) ★ `return tribo( n-1 ) + tribo( n-2 ) + tribo( n-3 )`

(B) `return (n - 1) + (n - 2) + (n - 3)`

(C) `return tribo[ n-1 ] + tribo[ n-2 ] + tribo[ n-3 ]`

(D) `return tribo( n-1, n-2, n-3 )`

(E) `return tribo( n ) + tribo( n-1 ) + tribo( n-2 )`

Solution.

---

24. (1 point) Consider the following program.

```
import numpy as np
x=np.zeros((3,3))
for i in range(3):
    for j in range(3):
        x[i][j]=i*j+i
```

After it is run, what is the final **value** of x?

(A) $\begin{bmatrix} 0 & 1 & 2 \\ 0 & 2 & 4 \\ 0 & 3 & 6 \end{bmatrix}$

(B) None of the other answers are correct

(C) ★ $\begin{bmatrix} 0 & 0 & 0 \\ 1 & 2 & 3 \\ 2 & 4 & 6 \end{bmatrix}$

(D) $\begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$

(E) $\begin{bmatrix} 0 & 1 & 4 \\ 1 & 2 & 5 \\ 2 & 3 & 6 \end{bmatrix}$

Solution.

---

25. (1 point) Consider the following Python program.

```
e=list(range(6,-1,-1))
d={0:1,1:2,2:3,3:4}
for i in e:
    d[i%3]+=e[i]
x=d[1]
```

After it is run, what is the final **value** of x?

(A) ★

```
9
```

(B) `16`

(C) `5`

(D) `3`

(E) `12`

Solution.

---

26. (1 point) Evaluate the following expression:

```
len(",4,5,6,7".split(','))
```

(A) `6`

(B) `"4567"`

(C) `22`

(D) ★

```
5
```

(E) `4`

Solution.

---

27. (1 point) Consider the following program:

```
d={}
for i,c in enumerate("ABCDEFGHIJKLMNOPQRSTUVWXYZ"):
    d[c]=i
x=0
for c in "CHEWBACCA":
    x+=d[c]
```

What is the **value** of x after this program is executed?

(A) `35`

(B) `44`

(C) `40`

(D) None of the other answers are correct.

(E) ★

`77`

Solution.

---

28. (1 point) Consider the following program.

```
import numpy as np
x=np.zeros((3,3))
for i in range(3):
    for j in range(3):
        x[i][j]=i*j+j
```

After it is run, what is the final **value** of x?

(A) $\begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$

(B) ★ $\begin{bmatrix} 0 & 1 & 2 \\ 0 & 2 & 4 \\ 0 & 3 & 6 \end{bmatrix}$

(C) $\begin{bmatrix} 0 & 0 & 0 \\ 1 & 2 & 3 \\ 2 & 4 & 6 \end{bmatrix}$

(D) $\begin{bmatrix} 0 & 1 & 4 \\ 1 & 2 & 5 \\ 2 & 3 & 6 \end{bmatrix}$

(E) None of the other answers are correct

Solution.
