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.

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.

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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:

```python
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.

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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.

```python
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.

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