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Week 1 Quiz

The due date for submitting this assignment has passed.

Due on 2022-08-10, 23:59 IST.

Score: 10/10=100%

Assignment submitted on 2022-07-25, 19:23 IST

All questions carry equal weightage. All Python code is assumed to be executed using Python3. You may submit as many times as you like within the deadline. Your final submission will be graded.

Note:

- If the question asks about a value of type `string`, remember to enclose your answer in single or double quotes.
- If the question asks about a value of type `list`, remember to enclose your answer in square brackets and use commas to separate list items.

1) What does `h(27993)` return for the following function definition?

```
def h(x):
    (d,n) = (1,0)
    while d <= x:
        (d,n) = (d*3,n+1)
    return(n)
```

10

Yes, the answer is correct.
Score: 2.5

Feedback:
The function computes the smallest power of 3 that is bigger than x. Effectively, it computes the number of digits in the base 3 representation of x.

Accepted Answers:
(Type: Numeric) 10

2.5 points

2) What is `g(60) - g(48)`, given the definition of g below?

```
def g(n):
    s=0
    for i in range(2,n):
        if n%i == 0:
           s = s+1
    return(s)
```

2

Yes, the answer is correct.
Score: 2.5

Feedback:
g(n) counts the number of factors of n, excluding 1 and n.

Accepted Answers:
(Type: Numeric) 2

2.5 points

3) Consider the following function `f`. ***2.5 points***

```
def f(n):
    s=0
    for i in range(1,n+1):
        if n//i == i and n%i == 0:
           s = 1
    return(s%2 == 1)
```

The function `f(n)` given above returns `True` for a positive number `n` if and only if:

- n is an odd number.
- n is a prime number.
- n is a perfect square.
- n is a composite number.

Yes, the answer is correct.
Score: 2.5

Feedback:
*f(n) sets s to 1 if there is a number i such that i*i == n.*

Accepted Answers:
n is a perfect square.

4) Consider the following function `foo`. ***2.5 points***

```
def foo(m):
    if m == 0:
      return(0)
    else:
      return(m+foo(m-1))
```

Which of the following is correct?

- The function always terminates with foo(n) = factorial of n
- The function always terminates with foo(n) = n(n+1)/2
- The function terminates for nonnegative n with foo(n) = factorial of n
- The function terminates for nonnegative n with foo(n) = n(n+1)/2

Yes, the answer is correct.
Score: 2.5

Feedback:
If `m` is negative, the function does not terminate. Otherwise, it computes `1+2+..+m = m(m+1)/2`.

Accepted Answers:
The function terminates for nonnegative n with foo(n) = n(n+1)/2

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Week 2 Quiz

The due date for submitting this assignment has passed.

Due on 2022-08-10, 23:59 IST.

Score: 10/10=100%

Assignment submitted on 2022-08-01, 22:17 IST

All questions carry equal weightage. All Python code is assumed to be executed using Python3. You may submit as many times as you like within the deadline. Your final submission will be graded.

Note:

- If the question asks about a value of type `string`, remember to enclose your answer in single or double quotes.
- If the question asks about a value of type `list`, remember to enclose your answer in square brackets and use commas to separate list items.

1) One of the following 10 statements generates an error. Which one? (Your answer should be a number between 1 and 10.)

```
x = [[3,5],"mimsy",2,"borogove",1]  # Statement 1
y = x[0:50]                         # Statement 2
z = y                               # Statement 3
w = x                               # Statement 4
x[1] = x[1][:5] + 'ery'             # Statement 5
y[1] = 4                            # Statement 6
w[1][:3] = 'fea'                    # Statement 7
z[4] = 42                           # Statement 8
x[0][0] = 5555                      # Statement 9
a = (x[3][1] == 1)                  # Statement 10
```

7

Yes, the answer is correct.
Score: 2.5

Feedback:
At statement 7, w[1] is the string "mimsy", which cannot be updated in place.

Accepted Answers:
(Type: Numeric) 7

2.5 points

2) Consider the following lines of Python code. ***2.5 points***

```
b = [43,99,65,105,4]
a = b[2:]
d = b[1:]
c = b
d[1] = 95
b[2] = 47
c[3] = 73
```

Which of the following holds at the end of this code?

- `a[0] == 47, b[3] == 73, c[3] == 73, d[1] == 47`
- `a[0] == 65, b[3] == 105, c[3] == 73, d[1] == 95`
- `a[0] == 65, b[3] == 73, c[3] == 73, d[1] == 95` (selected)
- `a[0] == 95, b[3] == 73, c[3] == 73, d[1] == 95`

Yes, the answer is correct.
Score: 2.5

Feedback:
`a[0] == 65, b[3] == 73, c[3] == 73, d[1] == 95`
`b` and `c` refer to the same list, while `a` and `d` are two independent slices. The update to `d[1]` does not affect any other list. The update to `b[2]` does not affect `a` or `d`. The update to `c[3]` is also reflected in `b[3]`.

Accepted Answers:
`a[0] == 65, b[3] == 73, c[3] == 73, d[1] == 95`

3) What is the value of `endmsg` after executing the following lines?

```
startmsg = "anaconda"
endmsg = ""
for i in range(1,1+len(startmsg)):
  endmsg = endmsg + startmsg[-i]
```

"adnocana"

Yes, the answer is correct.
Score: 2.5

Feedback:
`"adnocana"`
The loop copies each letter in `startmsg` from right to left to the end of `endmsg`, so the resulting string is the reverse of the original string.

Accepted Answers:
(Type: Regex Match) \s\'adnocana\'\s**
(Type: Regex Match) \s\"adnocana\"\s**

2.5 points

4) What is the value of `mylist` after the following lines are executed?

```
def mystery(l):
  l = l[2:]
  return(l)

mylist = [7,11,13,17,19,21]
mystery(mylist)
```

[7, 11, 13, 17, 19, 21]

Yes, the answer is correct.
Score: 2.5

Feedback:
`[7,11,13,17,19,21]`
The update `l = l[2:]` inside the function creates a new list, so the list passed as the argument is not changed.

Accepted Answers:
(Type: Regex Match) \s\[\s*7,\s*11,\s*13,\s*17,\s*19,\s*21\s*]\s**

2.5 points

X

Week 4 Quiz

The due date for submitting this assignment has passed.

Due on 2022-08-24, 23:59 IST.

Score: 10/10=100%

Assignment submitted on 2022-08-15, 12:30 IST

All questions carry equal weightage. All Python code is assumed to be executed using Python3. You may submit as many times as you like within the deadline. Your final submission will be graded.

Note:

- If the question asks about a value of type `string`, remember to enclose your answer in single or double quotes.
- If the question asks about a value of type `list`, remember to enclose your answer in square brackets and use commas to separate list items.

1) Consider the following Python function.

```
def mystery(l):
    if l == []:
        return(l)
    else:
        return(mystery(l[1:])+l[:1])
```

What does `mystery([22,14,19,65,82,55])` return?

[55, 82, 65, 19, 14, 22]

Yes, the answer is correct.
Score: 2.5

Feedback:
Elements are moved from the beginning of the list to the end, so the list gets reversed.

Accepted Answers:
(Type: Regex Match) [ ][[ ]*55[ ]*,[ ]*82[ ]*,[ ]*65[ ]*,[ ]*19[ ]*,[ ]*14[ ]*,[ ]*22[ ]*][ ]**

2.5 points

2) What is the value of `pairs` after the following assignment?

```
pairs = [ (x,y) for x in range(4,1,-1) for y in range(5,1,-1) if (x+y)%3 == 0 ]
```

[(4, 5), (4, 2), (3, 3), (2, 4)]

Yes, the answer is correct.
Score: 2.5

Feedback:
All pairs (i,j) with i ∈ {4,3,2}, j ∈ {5,4.3,2} such that i + j is a multiple of 3,

Accepted Answers:
(Type: Regex Match) [ ][[ ]*\([ ]*4[ ]*,[ ]*5[ ]*\)[ ]*,[ ]*\([ ]*4[ ]*,[ ]*2[ ]*\)[ ]*,[ ]*\([ ]*3[ ]*,[ ]*3[ ]*\)[ ]*,[ ]*\([ ]*2[ ]*,[ ]*4[ ]*\)[ ]*][ ]**

2.5 points

3) Consider the following dictionary. ***2.5 points***

```
wickets = {"Tests":{"Bumrah":[3,5,2,3],"Shami":[4,4,1,0],"Ashwin":[2,1,7,4]},"ODI":{"Bumrah":[2,0],"Shami":[1,2]}}
```

Which of the following statements does not generate an error?

- `wickets["ODI"]["Ashwin"][0:] = [4,4]`
- `wickets["ODI"]["Ashwin"].extend([4,4])`
- `wickets["ODI"]["Ashwin"] = [4,4]` ✓
- `wickets["ODI"]["Ashwin"] = wickets["ODI"]["Ashwin"] + [4,4]`

Yes, the answer is correct.
Score: 2.5

Feedback:
Direct assignment to a new key adds a value. All other updates result in `KeyError`.

Accepted Answers:
`wickets["ODI"]["Ashwin"] = [4,4]`

4) Assume that hundreds has been initialized as an empty dictionary: ***2.5 points***

```
hundreds = {}
```

Which of the following generates an error?

- `hundreds["Tendulkar, international"] = 100`
- `hundreds["Tendulkar"] = {"international":100}`
- `hundreds[("Tendulkar","international")] = 100`
- `hundreds[["Tendulkar","international"]] = 100` ✓

Yes, the answer is correct.
Score: 2.5

Feedback:
Dictionary keys must be immutable values.

Accepted Answers:

```
hundreds["Tendulkar","international"] = 100
```

X

Week 6 Quiz

The due date for submitting this assignment has passed.

Due on 2022-09-07, 23:59 IST.

Score: 10/10=100%

Assignment submitted on 2022-09-02, 19:00 IST

All questions carry equal weightage. All Python code is assumed to be executed using Python3. You may submit as many times as you like within the deadline. Your final submission will be graded.

Note:

- If the question asks about a value of type `string`, remember to enclose your answer in single or double quotes.
- If the question asks about a value of type `list`, remember to enclose your answer in square brackets and use commas to separate list items.

1) Suppose u and v both have values of type set and are disjoint. Which of the following expressions evaluates to `True`? ***2.5 points***

- u == v | (u^v)
- u == (v^u)
- u == v^(u | v)
- u == u^(v | u)

Yes, the answer is correct.
Score: 2.5

Feedback:
Check set theoretically.

Accepted Answers:
u == v^(u | v)

2) Suppose u and v both denote sets in Python. What is the most general condition that guarantees that `u|v == u^v`? ***2.5 points***

- The sets u and v should be disjoint.
- The set u should be a subset of the set v.
- The set v should be a subset of the set u.
- This is true for any u and v.

Yes, the answer is correct.
Score: 2.5

Feedback:
u^v has all elements that are in exactly one of u or v. This is the same as `u|v - u&v`. Since `u^v = u|v`, we have u&v is empty, so u and v are disjoint.

Accepted Answers:
The sets u and v should be disjoint.

3) Consider the min-heap [15, 27, 33, 39, 66, 39, 47, 58, 51]. built by repeatedly inserting values into an empty heap. Which of the following *could not* have been the last element inserted into this heap? ***2.5 points***

- 27
- 15
- 58
- 51

Yes, the answer is correct.
Score: 2.5

Feedback:
The last position added was the one containing 51. The last element added must lie on the path from 51 to the root: {15, 27, 39, 51}.

Accepted Answers:
58

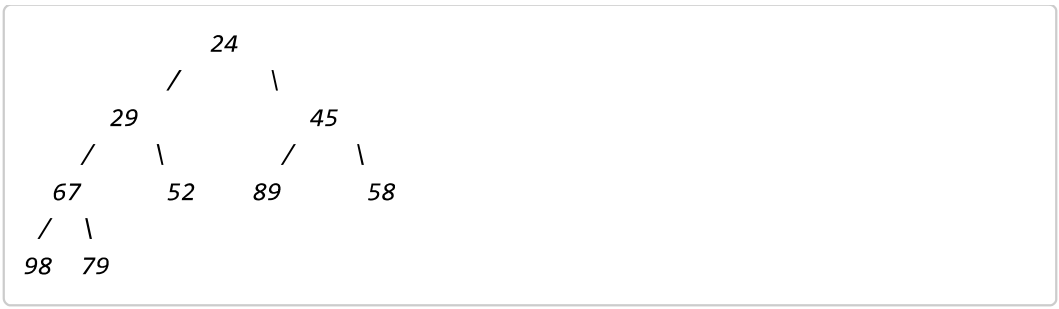
4) Suppose we execute delete-min twice on the min-heap [13,29,24,67,52,89,45,98,79,58]. What is the resulting heap?

[29,52,45,67,79,89,58,98]

Yes, the answer is correct.
Score: 2.5

Feedback:
The original heap is:

After one delete-min, we have:



After the second delete-min, we have:

Accepted Answers:
(Type: Regex Match) [ ][29[ ]*,[ ]*52[ ]*,[ ]*45[ ]*,[ ]*67[ ]*,[ ]*79[ ]*,[ ]*89[ ]*,[ ]*58[ ]*,[ ]*98[ ]*][ ]**

2.5 points

X

Week 7 Quiz

The due date for submitting this assignment has passed.

Due on 2022-09-14, 23:59 IST.

Score: 10/10=100%

Assignment submitted on 2022-09-06, 13:39 IST

All questions carry equal weightage. All Python code is assumed to be executed using Python3. You may submit as many times as you like within the deadline. Your final submission will be graded.

Note:

- If the question asks about a value of type `string`, remember to enclose your answer in single or double quotes.
- If the question asks about a value of type `list`, remember to enclose your answer in square brackets and use commas to separate list items.

1) Given the following permutation of `a,b,c,d,e,f,g,h,i,j`, what is the next permutation in lexicographic (dictionary) order? Write your answer without any blank spaces between letters.

```
fjadbihgec
```

'fjadcbeghi'

Yes, the answer is correct.
Score: 2.5

Feedback:
The prefix to change is `bihgec`. This becomes `cbeghi`

Accepted Answers:
*(Type: Regex Match) [ ]*fjadcbeghi[ ]**
(Type: Regex Match) [ ]\"fjadcbeghi\"[ ]**
(Type: Regex Match) [ ]\'fjadcbeghi\'[ ]**

2.5 points

2) We want to add a function `length()` to the class `Node` that implements user defined lists which will compute the length of a list. An incomplete implementation of `length()` given below. You have to provide expressions to put in place of XXX, YYY. and ZZZ. ***2.5 points***

```
def length(self):
  if self.value == None:
     return(XXX)
  elif self.next == None:
     return(YYY)
  else:
     return(ZZZ)
```

- XXX: 0, YYY: 0, ZZZ: self.next.length()
- XXX: 0, YYY: 0, ZZZ: 1 + self.next.length()
- XXX: 0, YYY: 1, ZZZ: self.next.length()
- XXX: 0, YYY: 1, ZZZ: 1 + self.next.length()

Yes, the answer is correct.
Score: 2.5

Feedback:
Inductive definition: if empty, return 0, if singleton return 1, else add 1 to the length of the list starting at self.next.

Accepted Answers:
XXX: 0, YYY: 1, ZZZ: 1 + self.next.length()

3) Suppose we add this function `foo()` to the class `Tree` that implements search trees. For a name `mytree` with a value of type `Tree`, what would `mytree.foo()` compute? ***2.5 points***

```
    def foo(self):
        if self.isempty():
            return(0)
        elif self.isleaf():
            return(1)
        else:
            return(1 + max(self.left.foo(),self.right.foo()))
```

- The number of nodes in `mytree`
- The largest value in `mytree`.
- The length of the longest path from root to leaf in `mytree`.
- The number of paths in `mytree`.

Yes, the answer is correct.
Score: 2.5

Feedback:
This computes the height of the tree, which is the length of the longest root to leaf path.

Accepted Answers:
The length of the longest path from root to leaf in `mytree`.

4) Inorder traversal of a binary tree has been defined in the lectures. A preorder traversal lists the vertices of a binary tree (not necessarily a search tree) as follows:

- Print the root.
- Print the left subtree in preorder.
- Print the right subtree in preorder.

Suppose we have a binary tree with 10 nodes labelled `a, b, c, d, e, f, g, h, i, j`, with preorder traversal `gbhecidajf` and inorder traversal `ehbicgjafd`. What is the right child of the root node?

'd'

Hint

Yes, the answer is correct.
Score: 2.5

Feedback:
From the preorder traversal, g is the root. The inorder traversal tells us that `jafd` lie to the right of the root. The preorder traversal of this segment says d is the root of this subtree, so d is the right child of the root.

Accepted Answers:
*(Type: Regex Match) [ ]*d[ ]**
(Type: Regex Match) [ ]"d"[ ]**
(Type: Regex Match) [ ]'d'[ ]**

2.5 points