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(https://swayam.gov.in/nc_details/NPTEL)

NPTEL (<https://swayam.gov.in/explorer?ncCode=NPTEL>) » Programming, Data Structures And Algorithms Using Python (course)



Course outline

How does an NPTEL online course work? ()

Week 1 : Introduction ()

Week 1 Quiz ()

● Quiz: Week 1 Quiz (assessment? name=124)

Week 2: Basics of Python ()

Week 2 Quiz ()

Week 2 Programming Assignment ()

Week 1 Quiz

The due date for submitting this assignment has passed.

Due on 2022-02-09, 23:59 IST.

Score: 10/10=100%

Assignment submitted on 2022-01-24, 11:48 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.

1) What is the value of $f(3456)$ for the function below?

```
def f(x):
    d=0
    while x >= 1:
        (x,d) = (x/7,d+1)
    return(d)
```

Yes, the answer is correct.

Score: 2.5

Feedback:

The function computes the number of digits required to write x in base 7.

Accepted Answers:

(Type: Numeric) 5

2.5 points

2) What is $h(60) - h(45)$, given the definition of h below?

Week 3:
Lists,
inductive
function
definitions,
sorting ()

Week 3
Programming
Assignment
()

Week 4:
Sorting,
Tuples,
Dictionaries,
Passing
Functions,
List
Comprehension
()

Week 4 Quiz
()

Week 4
Programming
Assignment
()

Week 5:
Exception
handling,
input/output,
file handling,
string
processing ()

Week 5
Programming
Assignment
()

Week 6:
Backtracking,
scope, data
structures;
stacks,
queues and
heaps ()

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

Yes, the answer is correct.

Score: 2.5

Feedback:

$h(n)$ adds up the factors of n from 2 to $n-1$. $h(60) = 2+3+4+5+6+10+12+15+20+30 = 107$ and $h(45) = 3+5+9+15 = 32$, so the difference is 75.

Accepted Answers:

(Type: Numeric) 75

2.5 points

3) For what value of n would $g(375, n)$ return 4?

```
def g(m,n):
    res = 0
    while m >= n:
        (res,m) = (res+1,m/n)
    return(res)
```

Yes, the answer is correct.

Score: 2.5

Feedback:

This function computes the log (integer part) of m in base n .

- $4^4=256 \leq 375 < 4^5=1024$
- $5^4=625 > 375$
- $3^5=243 < 375$

Accepted Answers:

(Type: Numeric) 4

2.5 points

4) Consider the following function f :

2.5 points

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

Which of the following is correct?

Week 6 Quiz ()

Week 7: Classes, objects and user defined datatypes ()

Week 7 Quiz ()

Week 8: Dynamic programming, wrap-up ()

Week 8 Programming Assignment ()

Text Transcripts ()

Books ()

Download Videos ()

Online Programming Test - Sample ()

Online Programming Test 1, 19 Mar 2022, 10:00-12:00 ()

Online Programming Test 2, 19 Mar 2022, 20:00-22:00 ()

- ☐ The function always terminates with $\text{mys}(n) = \text{factorial of } n$
- ☐ The function always terminates with $\text{mys}(n) = 1+2+\dots+n$
- ☐ The function terminates for positive n with $\text{mys}(n) = \text{factorial of } n$
- ☒ The function terminates for positive n with $\text{mys}(n) = 1+2+\dots+n$

Yes, the answer is correct.

Score: 2.5

Feedback:

The function recursively computes $1+2+\dots+m$ provided $m \geq 1$. If $m \leq 0$, the recursive calls do not terminate.

Accepted Answers:

The function terminates for positive n with $\text{mys}(n) = 1+2+\dots+n$

X

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Course outline

How does an NPTEL online course work? ()

Week 1 : Introduction ()

Week 1 Quiz ()

Week 2: Basics of Python ()

Week 2 Quiz ()

Quiz: Week 2 Quiz (assessment? name=125)

Week 2 Programming Assignment ()

Week 2 Quiz

The due date for submitting this assignment has passed.

Due on 2022-02-09, 23:59 IST.

Score: 10/10=100%

Assignment submitted on 2022-01-31, 10:56 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 = [1,"abcd",2,"efgh",[3,4]] # Statement 1
y = x[0:6] # Statement 2
z = x # Statement 3
w = y # Statement 4
x[1] = x[1][0:3] + 'd' # Statement 5
y[2] = 4 # Statement 6
z[1][1:3] = 'yzw' # Statement 7
z[0] = 0 # Statement 8
w[4][0] = 1000 # Statement 9
a = (x[4][1] == 4) # Statement 10
```

Week 3:
Lists,
inductive
function
definitions,
sorting ()

Week 3
Programming
Assignment
()

Week 4:
Sorting,
Tuples,
Dictionaries,
Passing
Functions,
List
Comprehension
()

Week 4 Quiz
()

Week 4
Programming
Assignment
()

Week 5:
Exception
handling,
input/output,
file handling,
string
processing ()

Week 5
Programming
Assignment
()

Week 6:
Backtracking,
scope, data
structures;
stacks,
queues and
heaps ()

Yes, the answer is correct.

Score: 2.5

Feedback:

z[1] is a string, which is immutable, so assignment to the slice z[1][1:3] is not permitted.

Accepted Answers:

(Type: Numeric) 7

2.5 points

2) Consider the following lines of Python code.

2.5 points

```
x = [423, 'b', 37, 'f']
u = x[1:]
y = u
w = x
u = u[0:]
u[1] = 53
x[2] = 47
```

After these execute, which of the following is correct?

- ☒ x[2] == 47, y[1] == 37, w[2] == 47, u[1] == 53
- ☐ x[2] == 47, y[1] == 53, w[2] == 47, u[1] == 53
- ☐ x[2] == 47, y[1] == 37, w[2] == 37, u[1] == 53
- ☐ x[2] == 47, y[1] == 53, w[2] == 37, u[1] == 53

Yes, the answer is correct.

Score: 2.5

Feedback:

x and w are aliased. u and y are not, after the assignment u = u[0:]. So the update to x[2] affects w[2] while the update to u[1] leaves y[1] unchanged.

Accepted Answers:

x[2] == 47, y[1] == 37, w[2] == 47, u[1] == 53

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

```
first = "tarantula"
second = ""
for i in range(len(first)-1, -1, -1):
    second = first[i] + second
```

Yes, the answer is correct.

Score: 2.5

Feedback:

The loop copies the string from right to left.

Accepted Answers:

(Type: Regex Match) `ls*\"tarantula\"ls*`

Week 6 Quiz ()

Week 7: Classes, objects and user defined datatypes ()

Week 7 Quiz ()

Week 8: Dynamic programming, wrap-up ()

Week 8 Programming Assignment ()

Text Transcripts ()

Books ()

Download Videos ()

Online Programming Test - Sample ()

Online Programming Test 1, 19 Mar 2022, 10:00-12:00 ()

Online Programming Test 2, 19 Mar 2022, 20:00-22:00 ()

(Type: Regex Match) `\s*\'tarantula\'\s*`

2.5 points

4) What is the value of `list1` after the following lines are executed?

```
def mystery(l):
    l = l[0:5]
    return()

list1 = [44,71,12,8,23,17,16]
mystery(list1)
```

[44, 71, 12, 8, 23, 17, 16]

Yes, the answer is correct.
Score: 2.5

Feedback:

Since `l` is reassigned a value within the function, it refers to a new value and the update does not affect the value of `list1` outside the function. [44, 71, 12, 8, 23, 17, 16]

Accepted Answers:

(Type: Regex Match) `\s*\[\s*\d+\s*, \s*\d+\s*, \s*\d+\s*, \s*\d+\s*, \s*\d+\s*, \s*\d+\s*, \s*\d+\s*\]`

2.5 points

X

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Course outline

How does an NPTEL online course work? ()

Week 1 : Introduction ()

Week 1 Quiz ()

Week 2: Basics of Python ()

Week 2 Quiz ()

Week 2 Programming Assignment ()

Week 3: Lists, inductive function

Week 4 Quiz

The due date for submitting this assignment has passed.

Due on 2022-02-23, 23:59 IST.

Score: 10/10=100%

Assignment submitted on 2022-02-17, 04:11 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,v):  
    if len(l) == 0:  
        return (v)  
    else:  
        return (mystery(l[:-1],l[-1]+v))
```

What does `mystery([22,14,19,65,82,55],1)` return?

Yes, the answer is correct.

**definitions,
sorting ()**

Week 3 Programming Assignment ()

Week 4: Sorting, Tuples, Dictionaries, Passing Functions, List Comprehension ()

Week 4 Quiz

● Quiz: Week 4 Quiz (assessment? name=130)

Week 4 Programming Assignment ()

Week 5:
Exception
handling,
input/output,
file handling,
string
processing ()

Week 5 Programming Assignment ()

Week 6:
Backtracking,
scope, data
structures;
stacks,
queues and
heaps ()

Score: 2.5

Feedback:

Correct answer is 258. The function inductively computes $\text{sum}(l)+v$

Accepted Answers:
(Type: Numeric) 258

2.5 points

2) What is the value of triples after the following assignment?

```
triples = [ (x,y,z) for x in range(2,4) for y in range(2,5) for z in range(5,7) if 2*x*y > 3*z ]
```

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

Yes, the answer is correct.

Score: 2.5

Feedback:

```
triples = []
for x in range(2,4):      # x = 2,3
    for y in range(2,5):  # y = 2,3,4
        for z in range(5,7): # z = 5,6
            if 2*x*y > 3*z:
                triples.append((x,y,z))
```

Output: $[(2, 4, 5), (3, 3, 5), (3, 4, 5), (3, 4, 6)]$

Accepted Answers:

(Type: *Regex Match*) `|s*|/s*|(s*2s*,s*4s*,s*5s*)|s*,s*|/(s*3s*,s*3s*,s*5s*)|s*,s*|(s*3s*,s*4s*,s*5s*)|s*,s*|/(s*3s*,s*4s*,s*6s*)|s*|/s*`

2.5 points

3) Consider the following dictionary.

2.5 points

```
runs = {"Test":{"Rahul":[90,14,35],"Kohli":[3,103,73,42],"Pujara":[53,15,133,8]}, "ODI":{"Sharma":[37,99],"Kohli":[63,47]}}
```

Which of the following statements does **not** generate an error?

- ☐ runs["ODI"]["Rahul"].append([74])
- ☐ runs["ODI"]["Rahul"].extend([74])
- ☐ runs["ODI"]["Rahul"][0]=74
- ☒ runs["ODI"]["Rahul"]=74

Yes, the answer is correct.

Score: 2.5

Feedback:

`runs["ODI"]["Rahul"]` creates a new key, so one can only assign it a fresh value, not access parts of the value or append to or extend the value.

Accepted Answers:

```
runs["ODI"]["Rahul"]=74
```

4) Assume that actor has been initialized as an empty dictionary:

2.5 points

Week 6 Quiz
()**Week 7:
Classes,
objects and
user defined
datatypes** ()**Week 7 Quiz**
()**Week 8:
Dynamic
programming,
wrap-up** ()**Week 8
Programming
Assignment**
()**Text
Transcripts** ()**Books** ()**Download
Videos** ()**Online
Programming
Test -
Sample** ()**Online
Programming
Test 1, 19
Mar 2022,
10:00-12:00**
()**Online
Programming
Test 2, 19
Mar 2022,
20:00-22:00**
()

```
actor = {}
```

Which of the following generates an error?

- ☐ actor["Star Wars"] = ["Rey", "Ridley"]
- ☐ actor["Star Wars, Rey"] = "Ridley"
- ☒ actor[["Star Wars", "Rey"]] = "Ridley"
- ☐ actor[("Star Wars", "Rey")] = "Ridley"

Yes, the answer is correct.

Score: 2.5

Feedback:

Dictionary keys must be immutable values.

Accepted Answers:

`actor[["Star Wars", "Rey"]] = "Ridley"`

X


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Course outline

How does an NPTEL online course work? ()

Week 1 : Introduction ()

Week 1 Quiz ()

Week 2: Basics of Python ()

Week 2 Quiz ()

Week 2 Programming Assignment ()

Week 3: Lists, inductive function

Week 6 Quiz

The due date for submitting this assignment has passed.

Due on 2022-03-09, 23:59 IST.

Score: 7.5/10=75%

Assignment submitted on 2022-03-01, 22:50 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 denote sets in Python. Under what condition can we guarantee that $u - (v - u) == u$?

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:

$v - u$ has no elements from u , so $u - (v - u)$ removes nothing from u and is hence always equal to u .

Accepted Answers:

This is true for any u and v .

definitions, sorting ()

Week 3 Programming Assignment ()

Week 4: Sorting, Tuples, Dictionaries, Passing Functions, List Comprehension ()

Week 4 Quiz ()

Week 4 Programming Assignment ()

Week 5: Exception handling, input/output, file handling, string processing ()

Week 5 Programming Assignment ()

Week 6: Backtracking, scope, data structures; stacks, queues and heaps ()

Week 6 Quiz ()

● Quiz: Week 6 Quiz

2) Suppose u and v both denote sets in Python. and $u|v \neq u \cap v$. What can we conclude about u and v ?

2.5 points

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

No, the answer is incorrect.

Score: 0

Feedback:

If the two sets were disjoint, we would have $u|v == u \cap v$. Since the two expressions are not equal, it must be that the sets overlap.

Accepted Answers:

The sets u and v should overlap.

3) Which of the following *does not* correspond to a min-heap on the list of values [19,97,83,45,72,55,31,28,31,29].

2.5 points

- ☐ [19, 28, 72, 31, 29, 83, 97, 55, 45, 31]
- ☐ [19, 31, 28, 45, 31, 97, 29, 72, 55, 83]
- ☐ [19, 28, 29, 31, 31, 45, 55, 72, 83, 97]
- ☒ [19, 28, 29, 31, 45, 83, 97, 55, 72, 31]

Yes, the answer is correct.

Score: 2.5

Feedback:

In [19, 28, 29, 31, 45, 83, 97, 55, 72, 31], value 45 has left child 31.

Accepted Answers:

[19, 28, 29, 31, 45, 83, 97, 55, 72, 31]

4) Consider the min-heap [19, 28, 31, 31, 29, 83, 55, 97, 45, 72]. Suppose we apply the operation `delete_min()` to this min-heap. The resulting min-heap is:

2.5 points

- ☐ [28, 29, 31, 31, 97, 83, 55, 72, 45]
- ☒ [28, 29, 31, 31, 72, 83, 55, 97, 45]
- ☐ [28, 29, 31, 31, 83, 72, 55, 97, 45]
- ☐ [28, 29, 31, 31, 55, 83, 72, 97, 45]

Yes, the answer is correct.

Score: 2.5

Feedback:

Execute `delete_min` and check.

Accepted Answers:

[28, 29, 31, 31, 72, 83, 55, 97, 45]

(assessment?
name=133)

**Week 7:
Classes,
objects and
user defined
datatypes ()**

**Week 7 Quiz
()**

**Week 8:
Dynamic
programming,
wrap-up ()**

**Week 8
Programming
Assignment
()**

**Text
Transcripts ()**

Books ()

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Programming
Test -
Sample ()**

**Online
Programming
Test 1, 19
Mar 2022,
10:00-12:00
()**

**Online
Programming
Test 2, 19
Mar 2022,
20:00-22:00
()**

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Course outline

How does an NPTEL online course work? ()

Week 1 : Introduction ()

Week 1 Quiz ()

Week 2: Basics of Python ()

Week 2 Quiz ()

Week 2 Programming Assignment ()

Week 3: Lists, inductive function

Week 7 Quiz

The due date for submitting this assignment has passed.

Due on 2022-03-16, 23:59 IST.

Score: 10/10=100%

Assignment submitted on 2022-03-09, 22:41 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 **previous** permutation in lexicographic (dictionary) order? Write your answer without any blank spaces between letters.

fjadchbegi

'fjadcgiheb'

Yes, the answer is correct.

Score: 2.5

Feedback:

Invert the algorithm given in the video. Look for the longest suffix in increasing order, here begi. The letter before is h. Replace by the next smallest letter in the suffix, g and arrange the remaining letters in descending order, to get giheb. So the final answer is fjadcgiheb.

Accepted Answers:

(Type: Regex Match) []*fjadcgiheb[]*

definitions, sorting ()

Week 3 Programming Assignment ()

Week 4: Sorting, Tuples, Dictionaries, Passing Functions, List Comprehension ()

Week 4 Quiz ()

Week 4 Programming Assignment ()

Week 5: Exception handling, input/output, file handling, string processing ()

Week 5 Programming Assignment ()

Week 6: Backtracking, scope, data structures; stacks, queues and heaps ()

Week 6 Quiz ()

Week 7: Classes,

(Type: Regex Match) []*\fjadcgiheb\[]*

(Type: Regex Match) []*"fjadcgiheb\[]*

2.5 points

2) Assume we have defined a class Node that implements user defined lists of numbers. Each object node of type Node has two attributes node.value and node.next with the usual interpretation. We want to add a function sum() to the class Node which will compute the sum of values in the list. An incomplete implementation of sum() given below. What should be put in place of XXX and YYY?

```
def sum(self):
    if self.value == None:
        return(0)
    elif self.next == None:
        return(XXX)
    else:
        return(YYY)
```

- ☐ Replace XXX by 1 and YYY by 1 + self.next.sum()
- ☐ Replace XXX by 1 and YYY by self.value + self.next.sum()
- ☐ Replace XXX by self.value and YYY by 1 + self.next.sum()
- ☒ Replace XXX by self.value and YYY by self.value + self.next.sum()

Yes, the answer is correct.

Score: 2.5

Accepted Answers:

Replace XXX by self.value and YYY by self.value + self.next.sum()

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?

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

- ☐ The sum of the elements in the tree
- ☒ The maximum sum across all root to leaf paths in the tree
- ☐ The length of the longest root to leaf path in the tree
- ☐ The number of root to leaf paths in the tree.

Yes, the answer is correct.

Score: 2.5

Feedback:

This computes the maximum sum along the paths from the root to the leaves.

Accepted Answers:

The maximum sum across all root to leaf paths in the tree

**objects and
user defined
datatypes ()****Week 7 Quiz
()****● Quiz: Week 7
Quiz
(assessment?
name=134)****Week 8:
Dynamic
programming,
wrap-up ()****Week 8
Programming
Assignment
()****Text
Transcripts ()****Books ()****Download
Videos ()****Online
Programming
Test -
Sample ()****Online
Programming
Test 1, 19
Mar 2022,
10:00-12:00
()****Online
Programming
Test 2, 19
Mar 2022,
20:00-22:00
()**

4) The preorder traversal of a binary search tree with integer values produces the **2.5 points** following sequence: 35, 23, 26, 46, 40, 39, 41, 52. What is the value of the right child of the root of the tree?

- ☐ 39
☐ 40
☐ 41
☒ 46

Yes, the answer is correct.

Score: 2.5

Feedback:

The inorder traversal of a search tree is always the sorted sequence. In this case: 23, 26, 35, 39, 40, 41, 46, 52. From the preorder traversal, we know that 35 is the root of the tree, so the segment 23, 26 corresponds to the left subtree and the segment 39, 40, 41, 46, 52 corresponds to the right subtree. The preorder traversal of the right subtree starts with 46, so this is the right child of the root node.

Accepted Answers:

46

