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1 # examples of using lists in python
2 x = [0, 2, 4, 6, 8]
3 y = [1, 3, 5, 7, 9]
4
5 # index starting at 0; getting slices from a list
6 print x[0], x[1], x[2], x[3], x[4], x[-1]
7 print y[0:5], y[2:3], y[0:5:2], y[5:0:-1]
8
9 # the length function and the concatenation operator
10 print len(x)
11 print x + y
12
13 # what does the following do?
14 head, tail = x[0], x[1:]
15 print head, tail
16
17 # a function to reverse a list
18 def rev(x):
19     if len(x) == 0:
20         return x
21     else:
22         head, tail = x[0], x[1:]
23         return rev(tail) + [head]
24
25 print "The reverse of", x, "is", rev(x), "."
26
27 # -----
28
29 # examples of using tuples in python; in general, we prefer
30 # the elements in a tuple are of different types, while
31 # the elements in a list are of the same type
32 a = ("a", 3, 0.2)
33 b = ()
34 c = (True,)
35
36 print a + b + c, (a, b, c)
37
38 u, v, w = a
39 print u, v, w
40
41 # the following are binary search trees. why?
42 left = (((), "clueless", ()), "complexify", (((), "jazzed", ()))
43 right = (((), "phat", ()), "poset", (((), "sheafify", ()))
44 tree = (left, "macchiato", right)
45
46 print tree
47
48 # a function to search a binary search tree
49 def search (t, x):
50     if len(x) == 0:
51         return False
52     else:
53         left, root, right = x
54         if t == root:
55             return True
56         elif t < root:
57             return search (t, left)
58         else:
59             return search (t, right)
60
61 print search ("phat", tree)
```

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62 print search ("orange", tree)
63 print search ("phat", ())
64
65 # -----
66
67 # examples of using sets in python;
68 basket = ["apple", "orange", "apple", "pear", "orange", "banana"]
69 fruit = set(basket)
70 taiwanfruit = {"banana", "pineapple", "mango"}
71
72 print fruit, taiwanfruit
73 print fruit | taiwanfruit
74 print fruit & taiwanfruit
75 print fruit - taiwanfruit
76
77 print "mango" in taiwanfruit
78 print "mango" in fruit
79 print taiwanfruit == {"pineapple", "mango", "banana"}
80
81 # -----
82
83 # examples of list and set comprehensions
84
85 # compare the differences
86 for e in x:
87     print e*e
88 print [ e*e for e in x ]
89
90 # compare the differences
91 for e in fruit:
92     print (e, e)
93 print { (e, e) for e in fruit }
94
95 # more comprehensions
96 print [ e for e in x if e > 5]
97 print { e for e in fruit if e in taiwanfruit }
98
99 # nested comprehensions
100 print [ (u, v) for u in x for v in y if u < v]
101 print { (u, v) for u in fruit for v in taiwanfruit }
102
103 # more nested comprehensions
104 this = { (u, v) for u in basket for v in x }
105 that = [ (u, v) for u in fruit for v in x ]
106
107 print this
108 print that
109 print this == set(that)
110
```