

Exam for Basic Linux and Coding for Astronomy and Astrophysics

2017 10 27, 09:00-12:00, G3.02

You are allowed to use a pencil and eraser or a pen to fill out this exam, not anything else.

1. Using the following definitions:

`a = 2.71828`

`b = '45'`

`c = 11`

What are value **and** type for each of the following expressions? Make sure that you answer both these questions for all four Python expressions below:

- (a) `c / 4.`

- (b) `float(c / 10)`

- (c) `'buz' + b * 2`

- (d) `float(b) + 2`

2. Which of the following line(s) use(s) correct Python syntax?

☐ `t += 7.4`

☐ `t -= 6.5`

☐ `t /= 17`

☐ `t *= 5`

3. Which of the following lines define(s) a list?

☐ `l = ('a', 'b', 'c')`

☐ `l = {False, False, True}`

☐ `l = list(set('abacadabra'))`

☐ `l = ['I', None, '7']`

4. Which of the following define(s) a dictionary?

☐ `d = {p: 1, q: None}`

☐ `d = {'a', 'b', 'c', 'd'}`

☐ `d = [6: 't', 's': 9]`

☐ `d = dict([(7, 10), (5, 65)])`

5. Which of the following define(s) a set?

☐ `s = set({1: 2, 5: 6, 9: 8})`

☐ `s = {'a', 'b', 'c', 'd'}`

☐ `s = [6, 7, 5]`

☐ `s = set(8)`

6. The following little program is supposed to sort a list of number, it contains an error.

*# Hint: to swap the values of a and b in Python do the following:
a, b = b, a*

Program for this question:

```
def bubble_sort(l):  
    """Sort elements of l"""  
    while True:  
        swapped = False  
        for i in range(len(l)-1):  
            if l[i] < l[i+1]:  
                l[i], l[i+1] = l[i+1], l[i]  
                swapped = True  
        if not swapped:  
            break  
    return l  
  
print bubble_sort([0, 10, 2, 5, 9, 7, 8])
```

(a) Please explain what error this code contains.

(b) Please rewrite the code so that the bug is fixed.

7. The following little program is supposed to generate a list of prime numbers up to n (assume integer n).

Hint: range(2, 10) creates the following list: [2, 3, 4, 5, 6, 7, 8, 9]

```
def prime_sieve(n):  
    """Generate all primes up to and including n."""  
    primes = []  
    for i in range(2, n+1):  
        for p in primes:  
            if i % p == 0:  
                continue  
        else:  
            primes.append(i)  
    return primes  
  
print prime_sieve(100)
```

- (a) Please explain what error this code contains.

- (b) Please rewrite the code so that the bug is fixed.

8. The following little program is very inefficient.

```
def make_unique(l):  
    unique = []  
    for e in l:  
        if not e in unique:  
            unique.append(e)  
    return unique
```

(a) Please explain why this program is very inefficient.

(b) Please rewrite the code to be efficient.

9. Evaluate the following boolean expressions and write down what they evaluate to.

(a) `(True or False) or False`

(a) _____

(b) `not (not True or False)`

(b) _____

(c) `(False and True) or not (False or True)`

(c) _____

(d) `False or (not False or False)`

(d) _____

10. Explain the following keywords:

(a) **continue**

(b) **pass**

(c) **import**

(d) **break**

11. Write a function `filter_even(l)` that checks a list `l` of integers and returns a new list that contains only even numbers. Use a `while`-loop for your function.

12. What is the point of the following lines at the end of a program?

```
if __name__ is '__main__':  
    main()
```