1 Functions

Questions

1.1 Determine what the Python interpreter will output given the following lines of code.

```python
>>> from operator import add, mul
>>> mul(add(5, 6), 8)
88
>>> print('x')
x
>>> y = print('x')
x
>>> print(y)
None
>>> print(add(4, 2), print('a'))
a
6 None
```

1.2 Determine what the Python interpreter will output given the following lines of code.

```python
>>> def foo(x):
    print(x)
    return x + 1

>>> def bar(y, x):
    print(x - y)

>>> foo(3)

3
4
>>> bar(3)
```
Functions, Control and Environments

```
>>> bar(6, 1)
-5
```

```
>>> bar(foo(10), 11)
10
0
```

2 Control Questions

2.1 Which numbers will be printed after executing the following code?

```python
n = 0
if n:
    print(1)
elif n < 2
    print(2)
else:
    print(3)
print(4)
```

```
2
4
```

2.2 WWPD (What would Python Display) after evaluating each of the following expressions?

```python
>>> 0 and 1 / 0
```

```
0
```

```python
>>> 6 or 1 or "a" or 1 / 0
```

```
6
```

```python
>>> 6 and 1 and "a" and 1 / 0
```

```
Error
```

```python
>>> print(print(4) and 2)
```

```
4
```

```python
>>> not True and print("a")
```

```
None
```
2.3 Define a function, \texttt{count_digits}, which takes in an integer, \texttt{n}, and counts the number of digits in that number.

```python
def count_digits(n):
    ...
    >>> count_digits(4)
    1
    >>> count_digits(12345678)
    8
    >>> count_digits(0)
    0
    ...
    count = 0
    while n > 0:
        count += 1
        n = n//10
    return count
```

2.4 Define a function, \texttt{count_matches}, which takes in two integers \texttt{n} and \texttt{m}, and counts the number of digits that match.

```python
def count_matches(n, m):
    ...
    >>> count_matches(10, 30)
    1
    >>> count_matches(12345, 23456)
    0
    >>> count_matches(121212, 123123)
    2
    >>> count_matches(111, 11) # only one's place matches
    2
    >>> count_matches(101, 10) # no place matches
    0
    ...
    matches = 0
    while n > 0 and m > 0:
        if n % 10 == m % 10:
            matches += 1
            n, m = n // 10, m // 10
    return matches
```
3 Environment Diagrams

Questions

3.1 Draw the environment diagram for evaluating the following code

```python
def f(x):
    return y + x

y = 10
f(8)
```

Solution: https://goo.gl/rZnzaM

3.2 Draw the environment diagram for evaluating the following code

```python
def dessef(a, b):
    c = a + b
    b = b + 1

b = 6
dessef(b, 4)
```

Solution: https://goo.gl/4m3NRD
3.3 Draw the environment diagram for evaluating the following code

```python
def foo(x, y):
    foo = bar
    return foo(bar(x, x), y)

def bar(z, x):
    return z + y

y = 5
foo(1, 2)
```

Solution: https://goo.gl/7Kcx6n

3.4 Draw the environment diagram for evaluating the following code

```python
def spain(japan, iran):
    def world(cup, egypt):
        return japan-poland
    return iran(world(iran, poland))

def saudi(arabia):
    return japan + 3

japan, poland = 3, 7
spain(poland+1, saudi)
```

Solution: https://goo.gl/iddW49
3.5 Draw the environment diagram for evaluating the following code

```python
cap = 9
hulk = 3

def marvel(cap, thor, avengers):
    marvel = avengers
    iron = hulk + cap
    if thor > cap:
        def marvel(cap, thor, avengers):
            return iron
    else:
        iron = hulk
    return marvel(thor, cap, marvel)

def iron(man):
    hulk = cap - 1
    return hulk

marvel(cap, iron(3), marvel)

Solution: https://goo.gl/sofcq2
```