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Q1

```
def unknown_function(boolean_variable):
    if not not(1-boolean_variable) == 1:
        return False
    else:
        return True
```

Which of the following statements can replace the body of `unknown_function` and produce the same result?

- return False
- return boolean_variable
- return True
- return not boolean_variable
- None of the above

Question 2) Write the output of the following code in the box on the right-hand side. [4 marks]

Q2a

```
(a) def subset(letters):
    return letters[1:2:4]

sample_letters = 'ABCDEFGHI'
print(subset(sample_letters))
```

Q2b

```
(b) def get_season(weather):
    if weather == 'Hot':
        season = 'Summer'
    else:
        season = 'Winter'
    return season

weather = 'Hot'
season = 'Winter'
get_season(weather)
print(weather, 'in', season)
```

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**Question 3 [7 marks]****Q3a**

(a) The following *poorly written* Python function is intended to identify if an integer between 20 and 27 is even or odd and divisible by five or six. It should then print those properties to the screen.

Circle each mistake in the code and fill in the table on the right-hand side, indicating the line number and writing the complete corrected line of code. **Change only 4 lines of code** [4 marks]

```

1 def num_properties(num):
2     """
3         (number) -> number
4     """
5     if num == 20:
6         print("Even.")
7         print("Divisible by 5.")
8     if num == 21:
9         print("Odd.")
10    if not num != 22:
11        print(Even.)
12    if num == 23:
13        print("Odd.")
14    if num == 24:
15        print("Even.")
16        print("Divisible by 6.")
17    elif num == 25:
18        print("Odd.")
19        print("Divisible by 5.")
20    if num == 26:
21        print("Even.")
22    else:
23        print("Odd.")
```

Line #	Correct Code



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Q3b

- (b) Write a new function that, given an integer, prints only if the integer is **not** divisible by 6,7,8, and 9. Write a docstring for the function. [3 marks]

For example:

```
>>> num_properties(102)
```

No output!



```
>>> num_properties(17)  
Not divisible by 6,7,8, and 9.
```

```
def num_properties(num):
```

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**Question 4 [4 marks]**

On the next page, write a python function called `what_can_i_buy` with one parameter: `money` (the money you have in your wallet). Write a docstring for the function.

In this function, assume the input is between \$1 and \$1500 (inclusive), and print what item(s) you can buy from the following before your money runs out. Start by printing the most expensive item you can afford first. You can only buy one of each:

a 4K TV	\$1000
a flight to Cuba	\$500
a pair of headphones	\$100
a movie ticket	\$25
a burger	\$5

Examples:

```
>>>what_can_i_buy(126)
You can buy a pair of headphones
You can buy a movie ticket
```

```
>>>what_can_i_buy(27)
You can buy a movie ticket.
```



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```
def what_can_i_buy(money):
```

Q4

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**Question 5 [13 marks]**

Profs Ali and Henry are using a panel of switches as a novel way to communicate with their students. They find that with a single switch, they have two options: **OFF** and **ON** corresponding to NO and YES.

They noticed that if they concurrently use two switches, they have more options as per the following table:

Switch 1	Switch 2	State	Choice #
OFF	OFF	(OFF, OFF)	0
OFF	ON	(OFF, ON)	1
ON	OFF	(ON, OFF)	2
ON	ON	(ON, ON)	3

They are now able to have 4 combinations of switch positions that will allow them to answer multiple choice questions from students.

Prof Ali started writing some code that would map switch positions to the appropriate choice number but got a little sleepy last night and forgot to finish the function. Prof Henry has requested that you finish it on their behalf.

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Q5a

(a) Fill in the blanks to complete the function below. [2 marks]

```
def switch_states_to_num(sw1, sw2):
    ''' (bool, bool) -> int
```

Takes input of state of Switch 1, sw1, and state of Switch 2, sw2, and maps it to the appropriate choice number.

False corresponds to OFF, and True corresponds to ON.

```
>>>switch_states_to_num(False, False)
0
>>>switch_states_to_num(False, True)
1
>>>switch_states_to_num(True, False)
2
>>>switch_states_to_num(True, True)
3
...

```

```
if not sw1 and not sw2:
    return 0
elif not sw1 and sw2:
```

```
elif :
```

```
elif :
```

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Q5b

(b) Examine and understand the following piece of unknown code: [2 marks]

```
def unknown_cow(moo1, moo2):  
    ''' (bool, bool)->int  
    '''  
    return moo1 * (2**1) + moo2 * (2**0)
```

Indicate in the table below the return value for all possible combinations of `moo1` and `moo2` for the function `unknown_cow`.

moo1 value	moo2 value	Return value

(c) What is the relationship between the functions in question 5a) and 5b)? [1 mark]

Q5c

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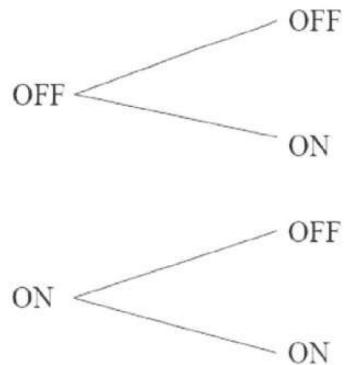
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**Q5d**

(d) Profs Ali and Henry decided she would like to expand to have 3 switches available.
Extend the tree below to reflect the updated number of possible states. [4 marks]

Switch 1	Switch 2	Switch 3	Choice #
----------	----------	----------	----------



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Q5e

(e) Fill in the body of the function below for the 3-switch case. [4 marks]

```
def new_switch_states_to_num(sw1, sw2, sw3):  
    '''(bool, bool, bool)->int
```

Takes input of state of Switch 1, sw1, state of Switch 2, sw2, and state of Switch 3, sw3 and maps it to the appropriate integer.

False corresponds to OFF, and True corresponds to ON.

```
>>>new_switch_states_to_num(False, False, False)  
0  
>>>new_switch_states_to_num(True, False, False)  
4  
>>>new_switch_states_to_num(True, True, True)  
7  
...
```



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