

# MA1008 Introduction to Computational Thinking Quiz 1.

Answer all the questions in the spaces provided.  
AY 2021/2022, Week 5, Semester 1

## SOLUTIONS

When the student's solution is different, it could be an alternative solution. Please check.

1. In basic computer hardware, CPU (central processing unit) executes the instructions, memory stores the data, I/O (input/output) unit interacts with the user and system bus conveys data between the modules. [2 marks each] (8 marks)

2. State (a) the result and (b) its data type of each of the following operations. (12 marks)

i. False or "False" and True True, Boolean

ii.  $16 / -2 ** 2 * 5$  -20.0, float

iii. "MA1008" \* 3 + 8 Error, should be "8",  
"MA1008MA1008MA10088", string  
[Note: Student could offer different correct answers.]

iv.  $49 ** (1 / 2) + \text{int}(3.74)$  10.0, float [3 marks each]

3. i. The following program reads in a number  $n$  and prints a symmetric triangle consisting of  $n$  rows of "#", starting with one "#" in the first row, and then each subsequent row containing the next higher odd number of "#". Below are two examples. Fill in the blanks to complete the program. (6 marks)

```
n = 3      #      n = 4      #
      ###      ###
     #####      #####
           #####
```

```
n = int(input("Enter the number of rows: "))
```

```
for i in range(1, n+1):
```

```
    print(" " * (n-i) + "#" * (i*2-1))
```

- ii. Provide a modified version of the above program such that, if  $n = 4$ , it produces the following rectangular pattern containing the above triangle, with the spaces filled by "O". You may leave out the input line and provide only the modified for loop in your answer. (6 marks)

```
OOO#OOO
OO###OO
O#####
#####

for i in range(1, n+1):
    print("O" * (n-i) + " " * (i*2-1) + "O" * (n-i))
```

4. You are given two angles, A and B, of a triangle in radians. The following code checks if the triangle is a right-angle triangle. Assume that the library `math` has been imported.

```
if A + B == math.pi/2:
    print("Right-angle triangle")
else:
    print("Not right-angle triangle")
```

The code does not work correctly. (a) Explain why. (b) Provide a remedy. (10 marks)

- (a) It doesn't work correctly because floating point number representation is not exact. So the sum of A & B cannot be exactly equal to  $\pi/2$ , which in itself is also not accurate.  
 (b) By using a tolerance value as in the code below

```
eps = 1e-8
if abs(A + B - math.pi/2) < eps:
    print("Right-angle triangle")
else:
    print("Not right-angle triangle")
```

[It's OK if student doesn't provide the code and explain the solution instead.]

5. The program below prints all the even numbers between 0 and 1000, inclusive, that are divisible by 3 but not divisible by 15. It also excludes those numbers greater than 500 that are divisible by 7. It also prints a comma and a space after each number and 10 numbers a row. Fill in the blanks to complete the program. (14 marks)

```
n = 0 # n counts the numbers printed [1 mark]

for i in range(0, 1001, 2): [2 marks]

    if i%3==0 and i%15!=0 and not (i>500 and i%7==0): [5 marks]

        print(i, end = ", ") [1 mark]

        n += 1 [1 mark]

        if n%10 == 0: [2 marks]

            print() [2 marks]
```

6. Write a nested for loop or while loop for the following mathematical equation:

$$S = \frac{a^2+b^2-c^2}{2ab} + \sum_{i=1}^n \left( \frac{1}{i} + \sum_{j=0}^i (i+j)^2 \right) \quad (10 \text{ marks})$$

```
S = (a*a + b*b - c*c) / (2*a*b)
for i in range(1, n+1):
    S += 1/i
    for j in range(0, i+1):
        S += (i+j)**2
```

[Alternative solution possible. Pls confirm solution if different.]

7. What are printed in the following programs:

(5 marks each)

i. `x = 5`  
`for i in range(5, 30, 5):`  
    `x += i`  
`print(x)`

80

ii. `y = 20`  
`for j in range(30, 5, -8):`  
    `y -= j*2`  
`print(y)`

-40

-84

-112

-124

[Answers need to be as given above in 4 lines]

8. For each of the three programs below, state (a) what is printed and (b) the value of `i` upon exiting the loop. (12 marks)

```
for i in range(5):
    if i > 2:
        break
    print(i, end="")
```

(a) 012

(b) i=3

```
for i in range(5):
    if i > 2:
        continue
    print(i, end="")
```

(a) 012

(b) i=4

```
for i in range(5):
    if i > 2:
        pass
    print(i, end="")
```

(a) 01234

(b) i=4

9. The following program computes the area of a triangle given the length its three sides,  $a$ ,  $b$  and  $c$ , using the formula,  $\text{area} = \sqrt{s(s-a)(s-b)(s-c)}$ , where  $s = (a+b+c)/2$ . It first ensures that the triangle is valid by checking that the sum of any two sides is greater than the third. But the program has errors. Circle the errors and provide the correct program. (12 marks)

```
a = float(input(Side a =))
b = float(input(Side b =))
c = float(input(Side c =))
```

```
s = a + b + c / 2
if a+b>c or b+c>a or c+a>b
area = Sqrt(s(s-a)(s-b)(s-c))
else print("Not a triangle")
print("The area" = area)
```

import math

```
a = float(input("Side a ="))
b = float(input("Side b ="))
c = float(input("Side c ="))
```

```
s = (a + b + c) / 2
if a+b>c and b+c>a and c+a>b:
    area = math.sqrt(s*(s-a)*(s-b)*(s-c))
    print("The area =", area)
else:
    print("Not a triangle")
```

[Note: `import math` is not required if the student uses `**0.5` instead of `sqrt()`.

Award 1 mark for every valid correction, -1 mark for every wrong correction, up to max of 12 marks. Uncorrected errors 0 mark, no deduction either.]