

Skill Test

Individual work with acknowledged discussions

You answers should be 500-600 words approx.

Please answer these questions as an individual in an overleaf document and submit the PDF formatted output downloaded from Overleaf

This assignment is classed as Individual Work so will follow normal university conventions on plagiarism.

1. You are encouraged to discuss questions, methodology, and ideas with your classmates however your submission must be your own work.
i.e. Your own interpretation of the discussions and your own writing.
2. We recommend you do not exchange papers or show your written assignment workings to others.
3. If two submission have answers that are the same that will be considered plagiarism. I will give no marks for both versions.

Rubric

All questions marks are shown. All marks are allocated as

1. Half marks for working/explanation
2. Half marks for complete/correct answer

Question 1 (1 mark) *An important feature of Object Oriented programming is encapsulation. Describe an example where you would expect to see encapsulation used in a program.*

Question 2 (1 mark)

1. *A program to generate all the permutations of a set is run on a computer that writes the output to a file at a rate of 1500 permutations per second. How long will it take the computer to generate all the complete permutations of a set with 6 (distinct) elements?*
2. *What is the big-O time complexity of Arithmetic. Show working.*

```
def Arithmetic (n)
  for i in range (1,n):
```

```
    for j in range (1, (i+1)/3):  
        a+=n^i - j  
    return a
```

Question 3 (2 mark)

1. Write in pseudo code an algorithm for finding the average value in a sequence, P , of n integers.
2. What is your time complexity and space complexity? Note this will depend on your code.

Question 4 (2 mark)

1. Write a recursive function to list all binary numbers (ie strings of 0's and 1's) of length n (where n is even) with equal sum for the digits in the first $n/2$ digits as in the last $n/2$ digits.
2. What is your time complexity and space complexity? Note this will depend on your code.

Question 5 (1 mark) . Why do the push and pop operations on the Stack and queue and dequeue operations on the Queue all have to be $O(1)$ in any data structure implementation.

Question 6 (3 mark)

1. Write **pseudo code** for a calculation of the Greatest Common Divisor of two numbers - there are many ways of doing this.
2. What is the time complexity in Big-O of this calculation
3. Show that the output of the code is the *greatest* Common Divisor