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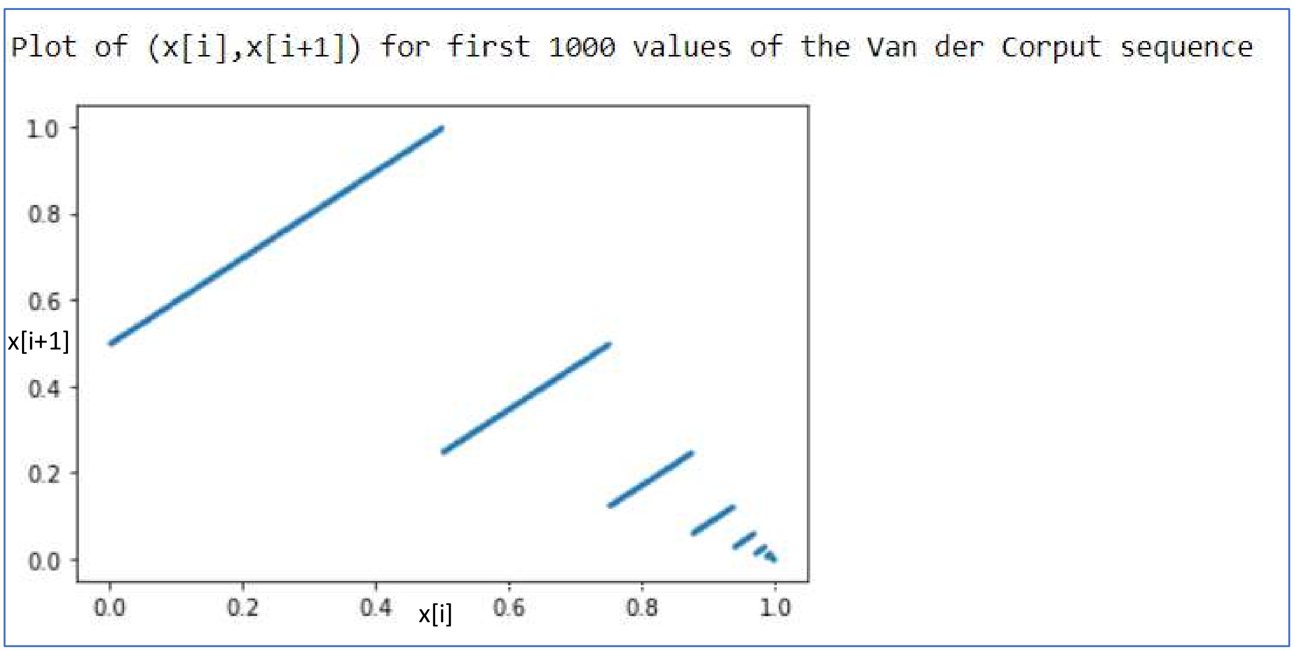
Q1.

```
The first 25 values of the Van der Corput sequence are:
x0 : 0
x1 : 0.5
x2 : 0.25
x3 : 0.75
x4 : 0.125
x5 : 0.625
x6 : 0.375
x7 : 0.875
x8 : 0.0625
x9 : 0.5625
x10 : 0.3125
x11 : 0.8125
x12 : 0.1875
x13 : 0.6875
x14 : 0.4375
x15 : 0.9375
x16 : 0.03125
x17 : 0.53125
x18 : 0.28125
x19 : 0.78125
x20 : 0.15625
x21 : 0.65625
x22 : 0.40625
x23 : 0.90625
x24 : 0.09375
x25 : 0.59375
```

The left screenshot shows the initial 26 values (including **0**) of the Van Der Corupt sequence using the radical inverse function **xi: = ϕ2(i)**. The generation of the Van Der Corupt sequence has been implemented in the **gen_vander_corupt_seq()** function in the code.

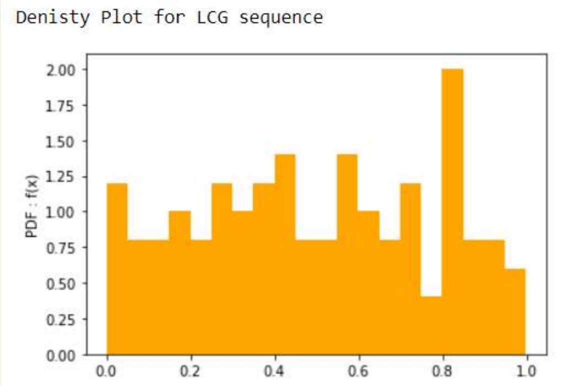
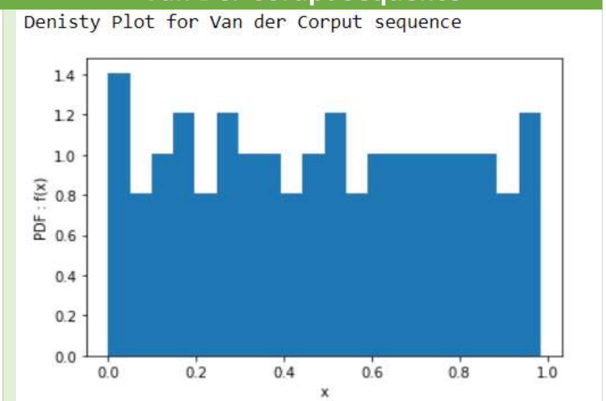
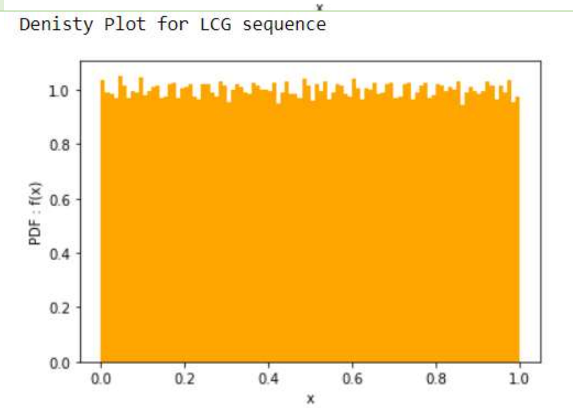
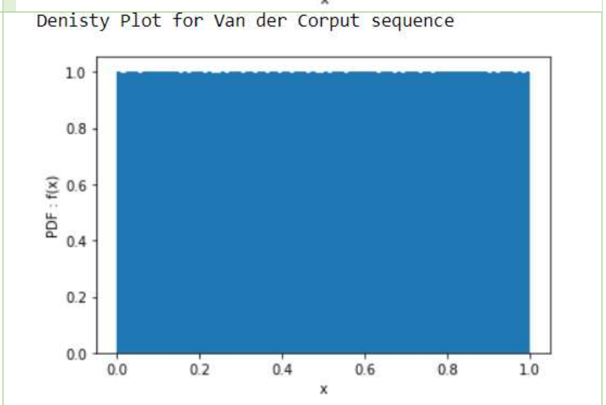
The below screenshot shows the pattern of **(x[i], x[i+1])** of the Van Der Corupt sequence. The scatter plot displays a series of line segments with **slope 1** and decreasing lengths. The line segments seem to converge to the point **(1,0)**. The plot is not random, and noticeable linear dependency is observed.



Details of LCG used:

```
Details for LCG : Linear Congruent Generator
a = 1597 , b = 51749 , m = 244944 , x0 = 1
```

Comparison of density plots of **LCG** and **Van Der Corupt** Sequence for n = 100 and n = 100000 is as follows:

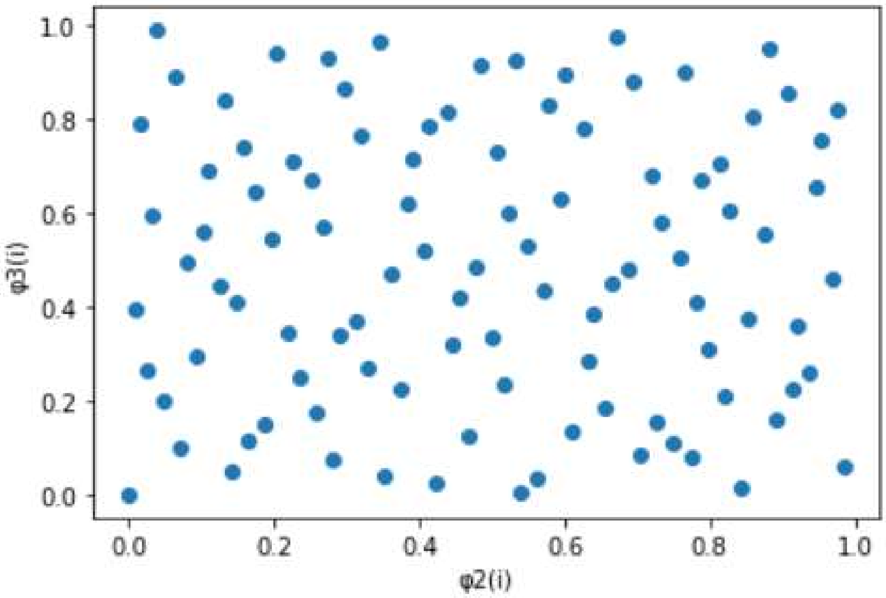
n	LCG	Van Der Corupt Sequence
100		
100000		

It can be observed that for **n = 100**, the **Van der Corupt Sequence** and the **LCG** sequence somewhat mimic uniformity. But **100** is a very less value to judge the uniformity of a sequence. For **n = 100000**, both the sequence strongly displays strong signs of uniformity. In fact, **Van der corrupt** sequence mimics uniformity better than the **LCG** itself.

Q2.

Firstly, first **100** values of the **Halton Sequence x_i = (ϕ2(i), ϕ3(i))** were generated. A 2D plot was created using python matplotlib module of python. Similarly, first **100000** values of the **Halton Sequence x_i = (ϕ2(i),ϕ3(i))** was then generated. It was also plotted out. The plots are shown in the next page. For **n = 100**, the plot is very less dense, and the points are scattered out without any specific pattern. The points are spread out haphazardly on the 1x1 square in the 2D plane. For **n = 100000**, points fill the entire 1x1 square on the 2D plane. This shows that for larger values of n, Halton sequence mimics uniformity strongly, making it a great sequence for generating random numbers.

2-D plot for the Halton Sequence (100 numbers)



2-D plot for the Halton Sequence (100000 numbers)