Exercise 11. Answer Sheet

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Problem 1. (40 points) Consider constructing a random number generator for integers from 1 to 6 using the simplest linear congruential method.

a) What is the equation of this generator? Put your answer here.

$$Xn + 1 = (A * Xn + C) \bmod M$$

b) Which values of the parameter $A \in [1, 6]$ give the longest sequence? Put your answer here.

A=3, C=4, M=11, X_0=1

$$X1 = (3 * 1 + 4) \bmod 11 = 7$$
$$X2 = (3 * 7 + 4) \bmod 11 = 3$$
$$X3 = (3 * 3 + 4) \bmod 11 = 2$$
$$X4 = (3 * 2 + 4) \bmod 11 = 10$$
$$X5 = (3 * 10 + 4) \bmod 11 = 1$$
$$X6 = (3 * 1 + 4) \bmod 11 = 7$$

Answer: 4

Problem 2. (60 points) Write a program implementing the 3 algorithms from the lecture. Upload your code.

a) (20 points) Fill the following table with the first 5 random numbers generated by each of the algorithms?

	1	2	3	4	5
Rand1					
Rand2					
Rand3					

b) (40 points) Generate N = {10, 1000, 1000000} real random numbers in the interval (0.0, 1.0) using each algorithm. Make a program to calculate a histogram of the number distribution (in %) for 10 intervals and fill the table (upload your code):

N	0.0-0.1	0.1-0.2	0.2-0.3	0.3-0.4	0.4-0.5	0.5-0.6	0.6-0.7	0.7-0.8	0.8-0.9	0.9-1.0
Rand1										
10										
1000										
1000000										
Rand2										
10										
1000										

1000000										
Rand3										
10										
1000										
1000000										