Practical 5

Pencil & paper questions

There is no lab associated with this practical.

1. Show that
$$\sum_{i=1}^{n}(x_i - \bar{x})^2 = \sum_{i=1}^{n} x_i^2 - n\bar{x}^2.$$

2. Consider the congruential generator
$$r_{i+1} = (ar_i + b) \bmod m \quad \text{for} \quad i = 0, 1, \ldots$$
with seed $r_0 = 8$, a multiplier of 17, an additive constant of 5 and a modulo of 16.
   a) What are the first five terms of the sequence produced by this generator?
   b) What is the period (cycle length) for this generator?
   c) Is this the maximum possible period for this choice of m? Justify your answer.

3. In each of the following questions use these $U(0,1)$ random numbers:
$$0.4129, 0.7642, 0.9251$$
   a) Simulate three random numbers from the $Bern(0.6)$ distribution.
   b) Simulate three random numbers from the $Geom(0.5)$ distribution.
   c) Simulate three random numbers from the $Po(5)$ distribution.
   d) Simulate three random numbers from the $Bin(10, 0.5)$ distribution.