**Nana Boateng**

**Simulation and Computing**

**homework**

|  |  |  |  |
| --- | --- | --- | --- |
| **m** | **127** |  |  |
| **m-1** | **126** |  |  |
| **factors of m** | **2** | **3** | 7 |
| **phi(m-1)** | **phi(2)\*phi(3)\*phi(7)** |  |  |
| **a** | **3** |  |  |
| **(m-1)/2** | **63** |  |  |
| **(m-1)/3** | **42** |  |  |
| **(m-1)/7** | **18** |  |  |
| **a^18mod127** | **94** |  |  |
| **a^42mod127** | **55** |  |  |
| **a^63mod127** | **98** |  |  |

**a=3,m=127**

|  |  |  |
| --- | --- | --- |
|  |  |  |
| GCD(K,m-1)=1 |  | Primitive roots |
| 1 |  | 3 |
| 5 |  | 116 |
| 11 |  | 109 |
| 13 |  | 92 |
| 17 |  | 86 |
| 19 |  | 12 |
| 23 |  | 83 |
| 25 |  | 112 |
| 29 |  | 55 |
| 31 |  | 114 |
| 37 |  | 48 |
| 41 |  | 78 |
| 43 |  | 67 |
| 47 |  | 93 |
| 53 |  | 106 |
| 55 |  | 65 |
| 59 |  | 58 |
| 61 |  | 14 |
| 65 |  | 118 |
| 67 |  | 46 |
| 71 |  | 43 |
| 73 |  | 6 |
| 79 |  | 56 |
| 83 |  | 91 |
| 85 |  | 19 |
| 89 |  | 15 |
| 95 |  | 39 |
| 97 |  | 97 |
| 101 |  | 110 |
| 103 |  | 101 |
| 107 |  | 53 |
| 109 |  | 96 |
| 113 |  | 29 |
| 115 |  | 7 |
| 121 |  | 23 |
| 125 |  | 85 |

**Graph of a=3,m=127**

|  |  |  |  |
| --- | --- | --- | --- |
| m | 127 |  |  |
| m-1 | 126 |  |  |
| factors of m | 2 | 3 | 7 |
| phi(m-1) | phi(2)\*phi(3)\*phi(7) | | |
| a | 11 |  |  |
| (m-1)/2 | 63 |  |  |
| (m-1)/3 | 42 |  |  |
| (m-1)/7 | 18 |  |  |
| a^18mod127 | 80 |  |  |
| a^42mod127 | 7 |  |  |
| a^63mod127 | 114 |  |  |

**Graph of a=11,m=127**

**The graph of a=11,shows the points uniformly spread out on the graph and therefore an a=11 seeems to be a better choice than a=3**

|  |  |  |
| --- | --- | --- |
| **m** | **128** |  |
| **phi(m-1)** | **126** |  |
| **factors of m** | **1** | **127** |
| **m-1** | **127** |  |
| **a** | **3** |  |

**Graph of m=128,a=3**

|  |  |  |
| --- | --- | --- |
| **m** | **128** |  |
| **phi(m-1)** | **126** |  |
| **factors of m** | **1** | **127** |
| **m-1** | **127** |  |
| **a** | **11** |  |
|  |  |  |

**Graph of m=128,a=11**

**The graph of a=11,shows the points uniformly spread out on the graph and therefore an a=11 seeems to be a better choice than a=3**