CS421 - Computer Modeling and Simulation

Quiz 3

Dated: 1st June, 2022
Time Allowed: 15 minutes

Question 1:

Suppose for a simulation involving test scores, we need random numbers in a normal distribution with mean 70 and standard deviation 8. Suppose 5.32 and 0.754 are uniformly distributed random numbers between 0 and 2π and between 0.0 and 1.0, respectively. Using these values, evaluate the following, rounding to two decimal places:

a. a
b. b
c. The normally distributed number employing sine
d. The normally distributed number employing cosine

Question 2:

Consider the following description of a segment that returns the direction (N, E, S, or W) a simulated animal moves:

if a random number, rand, is < 0.12
return N
else if rand < 0.26
return E
else if rand < 0.69
return S
else
return W
Give the probability that the animal moves in each of the following directions:
a. N b. E c. S d. W

Question 3:

Consider the following linear congruential random number generator:
$r_0 = 8697$
$r_n = (229r_{n-1}) \bmod 349$, for $n > 0$

a. Compute the next three random numbers.

b. From the sequence of integers in Part a, compute an appropriate sequence of floating-point numbers between 0 and 1.
c. Give the maximum number of random numbers this function can generate.

Hint: For finding the remainder by calculator, you can simply multiply the decimal portion of the answer of division by the dividend.