CS 171 Assignment 1, Due on Sep. 6th 1pm *

1. Random DNA sequences

   The DNA is made of nucleotides, which is composed of one of four nitrogen-containing nucleobases (cytosine [C], guanine [G], adenine [A] or thymine [T]), a sugar called deoxyribose, and a phosphate group.

   (a) Write code to print to the console $1,000$ randomly generated DNA 3 mers (e.g. ACA, TCG. k-mers are subsequences of length k contained within a biological sequence). where the frequency of A,C,G and T is 25% and is uniformly sampled.

   (b)Have your code track how often it prints out the 3 mer (AAA) How often would you expect to see this 3mer by chance? Is Javas number close to the number that you would expect?

   (c) Modify your code so that the frequency of A,C,G and T is

$$\begin{aligned} p(A) &= 0.12 \\ p(C) &= 0.38 \\ p(G) &= 0.39 \\ p(T) &= 0.11 \end{aligned} \tag{1}$$

   What is the expected frequency now of AAA? Does Java produce AAA at close to the expected frequency?

2. Algebra: 2×2 Linear Equations

   Design a class named LinearEquation for a 2×2 system of linear equations:

$$\begin{aligned} ax + by &= e \\ cx + dy &= f \end{aligned} \tag{2}$$

   The class contains:

   - Private data fields a, b, c, d, e and f.
   - A constructor with the arguments for a, b, c, d, e and f.
   - Six getter methods for a, b, c, d, e and f.
   - A method named **isSolvable()** the returns true if $ad - bc \neq 0$.
   - Methods **getX()** and **getY()** that return the solution for the equation.

*Upload zipfile on Canvas or Send email to tli41@emory.edu