Task 2:

X1 = 3.0086

X2 = 1.3546

X = 4.36

Task 3:

9

Task 4:

11

Task 5:

13

Task 6:

15

Task 7:

2n – 1

Task 8:

The sum is around 11, the same reward value as from Example 1

Task 9:

The sum is 9, the same as the reward value from Example 2

Task 10:

For this task, I used nested for loops to calculate the number of times the value X appears in array[y] and array[z]. I did it this way and not with a 3D array because it was faster to run and easier to understand/debug.

After running the experiment for task 10, we observe that out expected value is as follows:

$A_k[I,I] \approx 0.2$

$A_k[I,J] \approx 0.04$ when I != J.

Thus, the expected reward is ≈ 9.

Task 11:

The expected value for Ak[i; i] is the probability that the i-th random number is k. As there are n possible outcomes for the i-th random number and each are equally probable, the probability that the i-th random number is k is 1 = n.

The expected value for Ak[i; j], where i is not equal to j, is the probability that both the i-th and j-th random numbers are k. As the two events (the i-th random number is k and the j-th random number is k) are independent, the probability that both i-th and j-th random numbers are k is 1 / n * 1 / n. The expected reward is the sum of the expected values for each entries of the n matrices.

There are n diagonal entries in each of the n matrices. Each diagonal entry has an expected value of 1 n. There are n^2 – n non-diagonal entries in each of the n matrices. Each non-diagonal entry has an expected value of 1 / n * 1/ n.

The expected value for $A_k[i,j]$ is

$n * n * 1 / n + n * (n^2 - n) * 1 / n * 1 / n$

$= n + (n - 1)$

$= 2n - 1$