1. A bowl contains 3 chips: the chips labeled 0, 2, and 4. A chip is randomly selected from the bowl. Let X denote the number printed on the chip. The probability mass function (probability distribution) of X is

$x:$	0	2	4
$P(X=x):$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$

   (a) Find the mean of X, i.e. find $\mu = E(X) = \sum_x xP(X = x)$.

   (b) Find the standard deviation of X, i.e. find $\sigma = SD(X) = \sqrt{\sum_x (x-\mu)^2 P(X = x)}$.

   (c) Suppose 2 chips are randomly selected from the bowl *with* replacement. Find the sampling distribution of $\bar{X}$.

   (d) Suppose 2 chips are randomly selected from the bowl *with* replacement. Find $P(\bar{X} \leq 1)$.

   (e) Determine the mean of $\bar{X}$, i.e. compute $\mu_{\bar{X}} = E(\bar{X}) = \sum_{\bar{x}} \bar{x}P(\bar{X} = \bar{x})$.

   (f) According to the theorem given in class, the mean of $\bar{X}$ is $\mu_{\bar{X}} = E(\bar{X}) = \mu$. Does this hold true when you compare parts (1e) and (1a)?

   (g) Determine the standard deviation of $\bar{X}$, i.e. compute $\sigma_{\bar{X}} = SD(\bar{X}) = \sqrt{\sum_{\bar{x}} (\bar{x} - \mu_{\bar{X}})^2 P(\bar{X} = \bar{x})}$.

   (h) According to the theorem given in class, the standard deviation of $\bar{X}$ is $\sigma_{\bar{X}} = SD(\bar{X}) = \sigma/\sqrt{n}$. Compute $\sigma/\sqrt{n}$ (remember, we derived σ in part (1b)). Does this equal the result from part (1g)?

   (i) Suppose 100 chips are randomly selected from the bowl with replacement. Let $\bar{X}$ denote the mean of the selected chips. Find what is the approximate distribution of $\bar{X}$?

   (j) Suppose 100 chips are randomly selected from the bowl with replacement. Let $\bar{X}$ denote the mean of the selected chips. Approximate the probability that $\bar{X}$ is between 2.1 and 2.4.