

HOMEWORK
BIOSTATISTICS (STAT:3510; BOGNAR)

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

$$\begin{array}{rcccc} & x : & 0 & 2 & 4 \\ P(X = x) : & & \frac{1}{3} & \frac{1}{3} & \frac{1}{3} \end{array}$$

- (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) Determine the mean of \bar{X} , i.e. compute $\mu_{\bar{X}} = E(\bar{X}) = \sum_{\bar{x}} \bar{x}P(\bar{X} = \bar{x})$.
- (e) 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 (1d) and (1a)?
- (f) Determine the standard deviation of \bar{X} , i.e. compute $\sigma_{\bar{X}} = SD(\bar{X}) = \sqrt{\sum_{\bar{x}} (\bar{x} - \mu_{\bar{X}})^2 P(\bar{X} = \bar{x})}$.
- (g) According to the theorem given in class, the standard deviation of \bar{X} is $\sigma_{\bar{X}} = SD(\bar{X}) = \sigma/\sqrt{n}$. Compute σ/\sqrt{n} (remember, we derived σ in part (1b)). Does this equal the result from part (1f)?