Worksheet – Sections 7.2

Sample statistic: a variable measured from the sample used to estimate a population parameter. It is

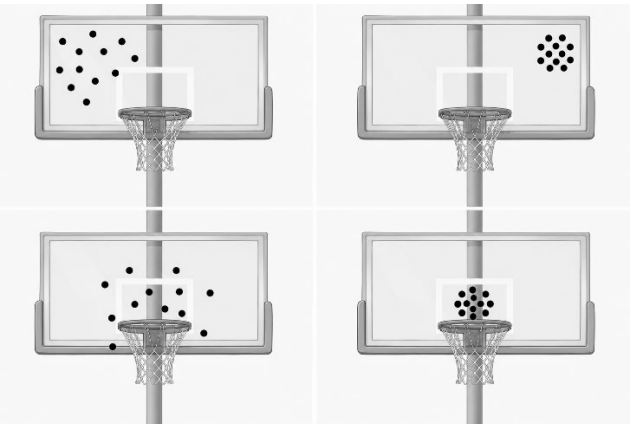
- **unbiased** if the average among all samplings is the population parameter,
- **precise** if there is low variability among different samplings.

Sample proportion $\hat{p}$ as an estimator for population proportion p: It is unbiased. The precision improves as the sample size increases. If the sample size is n then the standard deviation of $\hat{p}$ (called *standard error*) is

$$SE = \sqrt{\frac{p(1-p)}{n}} \qquad \text{(regardless of the population size)}$$

Simulate sampling proportions with StatCrunch: Applets → Sampling Distributions → Binary

1) In a basketball game, a player tries 4 different throwing techniques. For each technique, he/she throws the ball 15 times. The landing position is an estimator for a perfect throw. Compare the bias (low/high) and precision (low/high) of each throwing technique.



2) Suppose 18% of a certain population wear glasses. Use StatCrunch for the following problems:

(a) Sample a group of 5 people and find the proportion of people wearing glasses.

(b) Sample a group of 5 people 3 times and find the average proportion.

(c) Sample a group of 5 people 1000 times and find the average proportion and standard deviation.

(d) Sample a group of 20 people 1000 times and find the average proportion and standard deviation.

(e) Sample a group of 100 people 1000 times and find the average proportion and standard deviation.

3) Find the relative error between $\hat{p}$ and p in Problem 2 c), d), e).

4) Find the standard error of $\hat{p}$ for the sample sizes 5, 20, 100 in Problem 2.