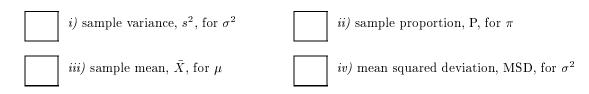
## Quiz 7 Week of March 9, 1998

1) Which of the following estimators are unbiased for the indicated parameters?



2) Suppose two Stat 110B students, each interested in estimating the fraction,  $\pi$ , of Duke students who believe Duke will win the upcoming NCAA tournament, each ask a random sample of 50 students if they think the Blue Devils will win. Denote by  $P_1$  the proportion of individuals polled by student 1 that predict Duke will win, likewise denote by  $P_2$  the proportion of individuals polled by student 2 that predict Duke will win.

**a)** Are  $P_1$  and  $P_2$  unbiased estimators of  $\pi$ ? Why/why not?

b) What is the mean squared error (MSE) of  $P_1$  (or  $P_2$ ) for estimating  $\pi$  (written as a function of  $\pi$ )?

c) Suppose the students combine their results and estimate  $\pi$  using the average of their respective estimates,  $P = 0.5P_1 + 0.5P_2$ . What is the mean squared error (MSE) of P for estimating  $\pi$  (again, written as a function of  $\pi$ )? Assume, a bit unrealistically, that the samples are independent

d) Which estimator,  $P_1$  or P, is more efficient for estimating  $\pi$ ? Why?