**AP Test Review – Sampling Distributions**

I. General Features of Sampling Distributions

 A. Parameter

 a) describes population

 b) common examples: µ, p, σ, β, y

 B. Statistic

 a) describes a sample

 b) common examples: $\overbar{x}$, $\hat{p}$, s, b, $\hat{y}$

 C. Population Distribution vs. Sample Distribution

 D. Variability and bias

When thinking about variability and bias, this of our 4 “bullseye” drawings.

 a) want low variability

 b) want low bias, so we use unbiased estimators

II. Sample Proportions

 A. Mean of $\hat{p}$

 a) $μ\_{\hat{p}}=p$

 b) unbiased estimator

 B. Standard Deviation of $\hat{p}$

 a) $σ\_{\hat{p}}=\sqrt{\frac{p(1-p)}{n}}$

 b) need to check 10% condition

 c) as n gets larger, the standard deviation decreases

 C. Normal Approximation

 a) check if large counts is met: np ≥ 10 and n(1-p) ≥ 10

 b) if large counts checks, the sampling distribution of $\hat{p}$ will follow the N(p, $\sqrt{\frac{p(1-p)}{n}}$ )

III. Sample Means

A. Mean of $\overbar{x}$

 a) $μ\_{\overbar{x}}= μ$

 b) unbiased estimator

 B. Standard deviation of $\overbar{x}$

 a) $σ\_{\overbar{x}}=\frac{σ}{\sqrt{n}}$

 b) need to check 10% condition

 c) as n gets larger, the standard deviation decreases

 C. Normal Approximation

a) if the population distribution is Normal, then the sampling distribution of $\overbar{x}$ follows the N(µ, $\frac{σ}{\sqrt{n}}$)

Central Limit Theorem: Using an SRS of size n with mean µ and standard deviation σ, when n is large, the sampling distribution of $\overbar{x}$ is approximately Normal

b) if not, check the Central Limit Theorem (n≥30)

c) then follow the N(µ, $\frac{σ}{\sqrt{n}}$)

Tips and Common Mistakes:

* When using parameters, say “true mean” or “population mean”, etc.
* Be careful to distinguish between sampling distribution and distribution of a sample
* Large samples reduce variability, but do not reduce/eliminate bias
* Watch out for your use of variables, i.e. as statistic vs. parameter
* CLT refers to **shape** of the distribution, and does not reduce variability