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1. Given a random sample of size n from a population with mean μ and variance σ^2, show that the statistic
$$\frac{1}{n}\sum_{i=1}^{n}(X_i-\mu)^2$$
is an unbiased estimator of σ^2. How is this statistic different from the sample variance?

2. If Θ_1 and Θ_2 are unbiased estimators of the same parameter θ, what condition must be imposed on the constants k_1 and k_2 so that the statistic
$$k_1\Theta_1+k_2\Theta_2$$
is an unbiased estimator of θ?

3. If $X_1, X_2, \ldots, X_n$ constitute a random sample from a population with mean μ, what condition must be imposed on the constants $a_1, a_2, \ldots, a_n$ so that the statistic
$$a_1X_1+a_2X_2+\cdots+a_nX_n$$
is an unbiased estimator of μ?

4. If a random sample of size 20 from a normal population with variance 225 has a mean of 64.3, construct a 95% confidence interval for the population mean μ.

5. An industrial engineer wants to determine the average amount of time it takes an adult to assemble an "easy-to-assemble" toy. Use the following random sample data (in minutes) to construct and interpret a 95% confidence interval for the mean of the population.

17	13	18	19	17	21	29	22	16	28	21	15
26	23	24	20	8	17	17	21	32	18	25	22
16	10	20	22	19	14	30	22	12	24	28	11

6. A study is made to determine the proportion of voters in a sizeable community who favor the construction of a nuclear power plant. If 140 of 400 voters selected at random favor the project, construct and interpret a 99% confidence interval for the actual proportion of the population that favors the nuclear plant.