# Quiz 2

2020. 06. 04

1. (30%) A sample size of $400$ provides a sample mean of $50$ and sample standard deviation of $40$.
   (a) As $\alpha = 0.1$, test the hypothesis $H_0: \mu \leq 45$ $vs.$ $H_a: \mu > 45$ by the ***p-value method***.
   (b) Use ***confidence interval method*** to test the hypothesis
   $H_0: \mu = 55$ $vs.$ $H_a: \mu \neq 55$ at $\alpha = 0.01$.

2. (30%) Sample assembly times for a particular manufactured part were

| | | | | |
|---|---|---|---|---|
| 20 | 18 | 17 | 22 | 18 |

   Assume that the population has a normal distribution.
   (a) As $\alpha = 0.05$, test the hypothesis $H_0: \mu \geq 21$ $vs.$ $H_a: \mu < 21$ by the ***classical (critical value) method***.
   (b) Test the hypothesis $H_0: \mu = 20$ $vs.$ $H_a: \mu \neq 20$ by the ***confidence interval method*** at $\alpha = 0.1$.

3. (30%) A new soft drink is being market tested. A sample of $400$ individuals participated in the taste test and $100$ indicated they like the taste. Let *p* be the proportion of those who like the taste.
   (a) Test $H_0: p \leq 0.2$ $vs.$ $H_a: p > 0.2$ by the ***classical (critical value) method*** at $\alpha = 0.01$.
   (b) Test $H_0: p = 0.3$ $vs.$ $H_a: p \neq 0.3$ by the ***p-value method*** at $\alpha = 0.05$.

4. (20%) A random sample of $2400$ people was taken. $1440$ of the people in the sample favored candidate A. Let $p$ be the proportion in favor of candidate A.
   (a) Find the 95% confidence interval for the population proportion $p$.
   (b) With a 90% confidence interval of length 0.02, what size sample would be required to estimate the population proportion $p$?

5. (10%) Suppose $e^{\bar{X}}$ is the point estimator of the parameter $e^{\mu}$ and $e^{\bar{X}} \approx N\left(e^{\mu}, e^{2\mu}\sigma_{\bar{X}}^2\right)$ as the sample size is large, where $\mu$ is a unknown parameter and $\sigma_{\bar{X}}^2$ is assumed to be known. Please derive the sensible test for the hypothesis

$$H_0: e^{\mu} \geq 2 \quad vs. \quad H_a: e^{\mu} < 2$$

   at $\alpha = 0.1$ as the sample size is large.