Midterm *2021. 4. 20*

1. (30%) A sample size of 900 provides a sample mean of 55 and sample standard deviation of 45.

(a) Find the 90% confidence interval for the population mean.

(b) With a 95% confidence interval of length 2, what sample size would be required to estimate the population mean?

2. (30%) The following data have been collected for a sample from a normal population

2	**4**	**7**	**11**

(a) Find the 95% confidence interval for the population mean.

(b) With a 99% confidence level, what sample size would be required to estimate the population mean with margin error equal to 1.5?

3. (30%) A sample size of 2500 provided a sample proportion of $\bar{p} = 0.2$.

(a) Find the 95% confidence interval for the population proportion.

(b) With a 95% confidence interval, what sample size would be required to estimate the population proportion with margin error equal to 0.01?

4. (35%) A sample size of 225 provides a sample mean of 37 and sample standard deviation of 30.

(a) (10%) As $\alpha = 0.05$, test the hypothesis

$$H_0: \mu \leq 41 \ \ vs. H_a: \mu > 41$$

by the classical method, i.e., by using the critical value.

(b) (10%) As $\alpha = 0.01$, test the hypothesis

$$H_0: \mu \geq 34 \ \ vs. H_a: \mu < 34$$

by the classical method, i.e., by using the critical value.

(c) (15%) As $\alpha = 0.05$, test the hypotheses in (a) and (b), i.e.,

(i) $H_0: \mu \leq 41 \ \ vs. H_a: \mu > 41$

(ii) $H_0: \mu \geq 34 \ \ vs. H_a: \mu < 34$

by using the p-value method.

5. (10%) 2100 customers are asked whether they like or dislike some new drink. The responses are given below:

Response	Liked	Disliked
Number of Customers	c	$2100 - c$

If the length of a 95% confidence interval for the proportion p of all customers

who will like the new drink is 0.0392, find c.

Equations:

Confidence interval:

$$\text{(point estimate)} \pm \pm [(z\alpha/_2,\ t_{n-1,}\alpha/_2\ )*$$

$$\text{(standard error of point estimate)]}$$

Sample size for an interval estimate:

$$n = \frac{\left(z\alpha/_2\right)^2 s^2}{E^2}, n = \frac{\left(z\alpha/_2\right)^2 \bar{p}(1-\bar{p})}{E^2}$$