Name: **Student No.:**
EID: **Tutorial Session Code:**

GE2262 Business Statistics, 2020/21 Semester A
Individual Assignment 2

Instructions:

1. Fill in your particulars at the top of this page.
2. Answer all questions in the space provided below.
3. Show all calculations clearly.
4. Display all non-integer numeric values to 4 decimal places.
5. Late submission penalty: deduct 10% of the base score per day.

Question 1 (6 marks)

The weights of female students are normally distributed with a mean of 110 lbs and a standard deviation of 20 lbs. What is the cut off value for the top 5% of the weights? If the weight of Yan-Yee is 150 lbs, will she be in the top 5%?

Let X be the weight of a selected female student
Let *x* be the cut off value for the top 5% of the weights
P(X < x) = 0.95

$P(Z < \frac{x-110}{20}) = 0.95$

$$\frac{x-110}{20} = 1.645$$

x = 142.9 lbs

Yan-Yee will be in the top 5% as her weight is 150 lbs which is greater than the cut off value.

Question 2 (11 marks)

Systolic blood pressure for women between the ages of 18 and 24 is normally distributed with a mean of 114.8 (mm of mercury) and a standard deviation of 13.1 (mm of mercury).

(a) What is the probability that an individual woman has a blood pressure above 125? (5 marks)

Let X be the Systolic blood pressure for women between the ages of 18 and 24

μ = 114.8 (mm of mercury) σ = 13.1 (mm of mercury)

P(X > 125)

= P(Z>$\frac{125-114.8}{13.1}$)

= P(Z > 0.78)

= 1 – 0.7823

= 0.2177

(b) Suppose a random sample of n = 50 women is selected and the mean blood pressure for the sample is computed. What is the probability that the mean blood pressure for the sample will be above 125? (6 marks)

n = 50 μ = 114.8 (mm of mercury) σ = 13.1 (mm of mercury)

P($\bar{X} > 125$)

= P(Z>$\frac{125-114.8}{\frac{13.1}{\sqrt{50}}}$)

= P(Z > 5.51)

$\cong 0$

Hence, it is nearly impossible that the sample mean blood pressure is above 125

Question 3 (13 marks)

The IQ test scores of 30 Form 6 students in Kowloon Tong district are shown below.

114	123	142	76	92	81	124	134	113	95
118	120	143	142	101	108	137	129	86	72
81	73	64	102	67	73	138	146	126	112

(a) Treat the 30 students as a random sample from the population of all Form 6 students in the district. Assuming that the population standard deviation of IQ scores is known to be 23, find a 95% confidence interval for the mean score of the population. (8 marks)

Large sample, σ is known, use $\overline{X} - Z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}} \le \mu \le \overline{X} + Z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}}$

n = 30, σ = 23, $\overline{X}$ = 107.7333, $Z_{\frac{\alpha}{2}}$ =1.96

A 95% confidence interval for μ is given by

$\overline{X} - Z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}} \le \mu \le \overline{X} + Z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}}$

$107.7333 - 1.96 * \frac{23}{\sqrt{30}} \le \mu \le 107.7333 + 1.96 * \frac{23}{\sqrt{30}}$

$99.5029 \le \mu \le 115.9637$

We are 95% confident that the mean score of the population is estimated to be between 99.5029 and 115.9637.

(b) How large a sample of students would be needed in order to estimate the mean IQ score within ± 8 points with 90% confidence? (5 marks)

Z = 1.645, σ = 23, E = 8

$$n = \frac{Z^2\sigma^2}{E^2}$$
$$= \frac{(1.645)^2 23^2}{8^2}$$
= 22.3767

≈ 23 (round-up)

Hence, in order to estimate the mean IQ score within ± 8 points with 90% confidence, 23 students would be needed.