Ⅰ. Short Review

1. Z score
   - $Z = \frac{X-\mu}{\sigma}$, $\frac{X-\bar{X}}{s}$

     $\therefore$ $X = \mu + Z\sigma$, $\bar{X} + Zs$

   - Look at the table in your textbook. ((b) and (c) column) ; Proportions are not percentages.
   - Pr($x \geq a$), Pr ($a \leq x \leq b$) , What value in 95% , 95 percentile and etc. : to be covered in session

2. Sampling Distribution of Means
   - $\mu_{\bar{x}}$: Sample mean is average of means ($\bar{X}_1$, $\bar{X}_2$, $\bar{X}_3$ ……)
   - Three properties : ① the sampling distribution of means approximates the normal curve. (the central limits theorem, n≥30) ② $\mu_{\bar{x}} = \mu$ ③ $\sigma_{\bar{x}}$ (or standard error of $\bar{X}$) $<$ σ : $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$, $\widehat{\sigma_{\bar{x}}}$ ($s_{\bar{x}}$) = $\frac{s}{\sqrt{n}}$ (not n-1)
   - $Z = \frac{X - \mu_{\bar{x}}}{\sigma_{\bar{x}}} = \frac{X - \mu_{\bar{x}}}{\frac{\sigma}{\sqrt{n}}}$
   - Sample size : if $n \geq 30$, normal distribution. We can use Z score
     However, if n < 30, we should use "(student) t-distribution"
     : Look at the table. α: level of significance.(0.5), df : degree of freedom : n-1.

3. Confidence Interval
   - CI : $\bar{X} \pm Z(\text{or } t)\sigma_{\bar{x}}$: For 95% confidence interval, Z = 1.96
     For t score, look for t score in the table.
   - n ⇧ → $\sigma_{\bar{x}}$⇩ / $\sigma_{\bar{x}}$ ⇧ → CI ⇧

	Obs	Mean	Variation	Standard deviation
Sample	X	$\bar{X}$	s^2	s
Population	X	μ	σ^2	σ
Distribution of Sample mean	$\bar{X}$	$\mu_{\bar{x}}$	$\sigma_{\bar{x}}^2$	$\sigma_{\bar{x}}$

Ⅱ. Problems

<Examples in Lecture Note>

(1) Using the IQ example, with a population average =100 and population standard deviation =15, calculate the probability that a randomly selected person would have:

1. An IQ of 115 or more
2. An IQ between 110 and 120
3. An IQ between 80 and 90
4. An IQ between 70 and 100

- The probability that randomly selected 2 people, having IQ of 110 or more. (each selection is independent).

(2) Using the assumptions that the true mean of hourly wage for UTD students is \$6, with a standard deviation of \$0.50, what is the probability of the following events:

1. Finding a sample mean of \$7 or more with a sample size of 25
2. Finding a sample mean of \$7 or more with a sample size of 100
3. Finding a sample mean of between \$4.50 and \$5.50 with a sample size of 100?

<Session Problem>

(1) Test scores' population variance is 25, and random sample of 50 produced a mean of 82

- Find a 90% confidence interval

- We just have 25 observations with $\sum f(x - \bar{x})^2$ = 384, but this is not population. Sample mean is 82. Find a 95% confidence interval.