451

(1)

6-5

HW due Thurs:

Math Dept office

(3rd floor of Newberger)

or my office: NH M329

Applications of the Central Limit Theorem

Example. In a population of students the mean age is 22, $\sigma = 3$, and distribution is skewed to the right. We take a sample of size 40. Find the probability that the average age of those 40 students is > 23.

(2)

$P(\bar{x} > 23)$

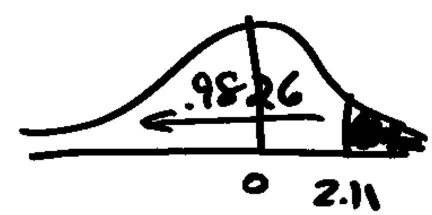
The distr. of $\bar{x}$ will be approximately normal, with $\mu_{\bar{x}} = \mu$ and

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

So $\mu_{\bar{x}} = 22$ and $\sigma_{\bar{x}} = \dfrac{3}{\sqrt{40}}$

$P(\bar{x} > 23) = P(z > 2.11)$

$$\frac{23-22}{3/\sqrt{40}}$$



$= 1 - .9826 = .0174$

③

Confidence intervals for μ

$\bar{x} \pm z \frac{\sigma}{\sqrt{n}}$ OR $\bar{x} \pm t \frac{s}{\sqrt{n}}$

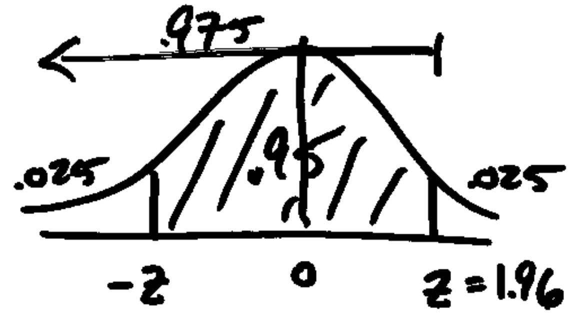
Example: In a sample of 15 people from a symmetric population, we find an average income of \$42,000. From past surveys, we know $\sigma = \$10,000$.

Find a 95% confidence interval for μ.

$\bar{x} \pm z \frac{\sigma}{\sqrt{n}}$

$\bar{x} = 42,000$, $\sigma = 10,000$, $n = 15$

④



$42000 \pm 1.96 \frac{10,000}{\sqrt{15}}$

42000 ± 5061

If you are given a desired margin of error, say e, then

$e = z \frac{\sigma}{\sqrt{n}}$ & solve for n

$n = \left(\frac{z\sigma}{e}\right)^2$

In our example, suppose our desired margin of error is ± 1000

$$n = \left[\frac{1.96\,(10000)}{1000}\right]^2 = 374.8$$

$$\rightarrow 375$$

In a sample of 30 people, we find an average height of 70" and a standard deviation of 2.5". Find a 99% conf. int. for the population mean height.

$$\bar{x} \pm t\,\frac{s}{\sqrt{n}}$$

$\bar{x} = 70$, $s = 2.5$, $n = 30$

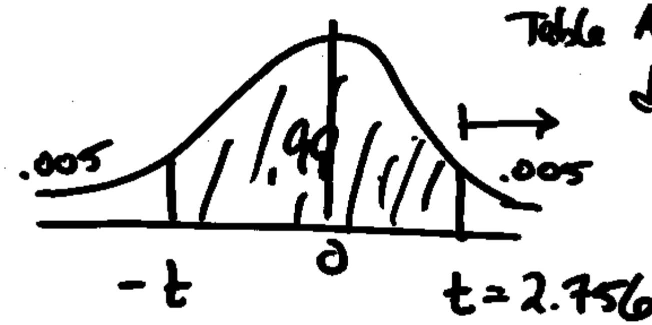


Table A-4

$df = n-1$

$= 29$

$$70 \pm 2.756\,\frac{2.5}{\sqrt{30}}$$

$$70 \pm 1.258$$

Suppose we want a margin of error of $\pm .5$

$$n = \left(\frac{z\sigma}{e}\right)^2 = \left[\frac{(2.576)(2.5)}{.5}\right]^2$$

z, not t

$$= 166$$

Practice problems: p. 285

4, 8, 14, 16

Final: Probability distributions

Discrete	Continuous
Discrete uniform	uniform
Bernoulli	exponential
Binomial	gamma
Geometric	normal
Negative Binomial	chi-squared
Poisson	t
Hypergeometric	