SIXTH LECTURE SUMMARY

CONFIDENCE INTERVAL FOR :

SOLVING THE TWO INEQUALITIES IN

$$\Pr\left(-1.96<\frac{\bar{x}-\mu}{s/\sqrt{n}}<1.96\right)=95\%$$

FOR : (ASSUMING THAT $\bar{x}$ AND s HAVE ALREADY BEEN COMPUTED), WE GET:

$$\bar{x}-1.96\times\frac{s}{\sqrt{n}}<\mu<\bar{x}+1.96\times\frac{s}{\sqrt{n}}$$

CALLED THE 95% CONFIDENCE INTERVAL FOR THE UNKNOWN VALUE OF :.

$\bar{x}$ IS THE POINT ESTIMATE OF :

$1.96\times\frac{s}{\sqrt{n}}$ / E IS THE MAXIMAL ERROR TOLERANCE (MARGIN OF ERROR, ALSO EFFECTIVELY THE ACCURACY, THE ±) OF THE FORMULA

IN GENERAL, THE TWO LIMITS ARE COMPUTED BY:

$$\bar{x} \pm z_c \times \frac{s}{\sqrt{n}}$$

WHERE z_c IS THE CORRESPONDING CRITICAL VALUE (TABLE 5 b - IF WE CAN FIND IT THERE), DETERMINED BASED ON THE LEVEL OF CONFIDENCE (CHOSEN BY US)

REPLACE z_c BY t_c (TABLE 6 OR INSERT) WHENEVER $n < 30$ AND THE POPULATION IS NORMAL (d.f. = n - 1)

REPLACE s BY F WHENEVER THE LATTER IS AVAILABLE (THEN, USE z_c FOR ANY n)

TO ESTIMATE HOW LARGE A SAMPLE WE NEED, USE:

$$n = \left(\frac{z_c \times s}{E} \right)^2$$

WHERE E IS THE DESIRED MAXIMAL ERROR TOLERANCE (THE ACCURACY WE WANT TO ACHIEVE).

NOTE THAT AN s (PREVIOUS SMALL SAMPLE), OR A KNOWN F (IN PLACE OF s) ARE NEEDED.

CONFIDENCE INTERVAL FOR p

(POPULATION PROPORTION)

$$\hat{p} \pm z_c \times \sqrt{\frac{\hat{p} \times \hat{q}}{n}}$$

WHERE $\hat{p}$ IS THE SAMPLE PROPORTION OF 'SUCCESSES', $\hat{q} = 1 - \hat{p}$, AND n MUST BE 'LARGE' (AT LEAST 30).

TO ESTIMATE HOW LARGE AN n WE NEED, USE:

$$\hat{p} \times \hat{q} \times \left(\frac{z_c}{E} \right)^2$$

IF A PREVIOUS (SMALL SAMPLE) ESTIMATE OF $\hat{p}$ IS AVAILABLE,

OTHERWISE, USE

$$n = \frac{1}{4} \times \left(\frac{z_c}{E} \right)^2$$

(THE ‘WORST CASE’ SCENARIO)

THE ANSWER MUST BE AN INTEGER
(ROUND UPWARDS, TO BE ON A SAVE SIDE)