SEVENTH LECTURE SUMMARY

CONFIDENCE INTERVAL FOR $:_1 - :_2$

(DIFFERENCE OF TWO POPULATION MEANS)

$$\bar{x}_1 - \bar{x}_2 \pm z_c \times \sqrt{\frac{s_1{}^2}{n_1} + \frac{s_2{}^2}{n_2}}$$

WHEN BOTH n_1 AND n_2 ARE 'LARGE' (>30).

FOR <u>SMALL</u> SAMPLES, WE NEED:
<u>NORMAL</u> POPULATIONS, WITH THE <u>SAME</u> F

$$\bar{x}_1 - \bar{x}_2 \pm t_c \times \sqrt{\frac{1}{n_1} + \frac{1}{n_2}} \times \sqrt{\frac{(n_1 - 1)\, s_1^2 + (n_2 - 1)\, s_2^2}{n_1 + n_2 - 2}}$$

CONFIDENCE INTERVAL FOR $p_1 - p_2$

(DIFFERENCE IN POPULATION PROPORTIONS)

$$\hat{p}_1 - \hat{p}_2 \pm z_c \cdot \sqrt{\frac{\hat{p}_1 \hat{q}_1}{n_1} + \frac{\hat{p}_2 \hat{q}_2}{n_2}}$$

BOTH n_1 AND n_2 MUST BE LARGE (IN THE $pn>0$ AND $qn>5$ SENSE)

HYPOTHESES TESTING

(CONCERNING POPULATION MEAN :)

NULL HYPOTHESIS H_0: : = 13.4

ALTERNATE HYPOTHESIS H_1:

ONE TAIL: : < 13.4 OR : > 13.4

TWO TAIL: : ... 13.4

TEST STATISTIC: $$\frac{\bar{x}-13.4}{s/\sqrt{n}}$$

CRITICAL VALUES (REGION): $-z_c$ OR z_c OR $\pm z_c$ FOR LEFT-TAIL, RIGHT-TAIL AND TWO-TAIL TEST, RESPECTIVELY, USING THE LAST ROW OF **TABLE 6** UNDER "' (ONE-TAIL TESTS) OR "" (TWO-TAIL TEST)

" IS THE LEVEL OF SIGNIFICANCE (USUALLY 5 %), WHICH SETS THE PROBABILITY OF TYPE I ERROR (REJECTING H_0 WHEN TRUE) - MAKING THIS ERROR USUALLY RESULTS IN SERIOUS CONSEQUENCES

FAILING TO REJECT H_0 WHEN <u>FALSE</u> IS CALLED TYPE II ERROR - ITS PROBABILITY DEPENDS ON HOW CLOSE IS : TO $:_0$ (IT CAN BE AS HIGH AS 1 - ")

P VALUE IS THE (STANDARD NORMAL) TAIL AREA <u>BEYOND</u> THE VALUE OF THE COMPUTED TEST STATISTIC, FURTHER MULTIPLIED BY 2 FOR A TWO-TAIL TEST. HERE, WE FREQUENTLY HAVE TO DEAL WITH z VALUES BIGGER THAN 3.69 (THE END OF OUR NORMAL TABLES), AND HAVE TO USE MINITAB INSTEAD

SMALL SAMPLE MODIFICATION
(POPULATION MUST BE NORMAL):

INSTEAD OF z_c , USE t_c WITH *n - 1* d.f.

NOTE: A TWO-TAIL TEST AT AN " (5%) LEVEL OF SIGNIFICANCE CAN BE ALSO (EQUIVALENTLY) CARRIED OUT BY CONSTRUCTING THE CORRESPONDING 1 - " (95%) CONFIDENCE INTERVAL (REJECT H_0 IF ITS CLAIMED VALUE LIES OUTSIDE THIS INTERVAL).

TEST FOR A POPULATION PROPORTION *p*

H_0: $p = 0.28$ H_1: p ... 0.28 (OR ONE TAIL)

TEST STATISTIC: $$\frac{\hat{p}-0.28}{\sqrt{\frac{0.28\times 0.72}{n}}}$$

HAS (WHEN H_0 TRUE), THE STANDARD NORMAL DISTRIBUTION (*n* MUST BE LARGE)