Math 110

# Hypothesis Testing Outline

I. Is the problem asking you to test a claim?

A. About a single population mean, $\mu$?

1. Is σ known?

$$TS = Z = \frac{\bar{x} - \mu_0}{\left(\sigma / \sqrt{n}\right)}$$ Z-Test (Z-Test on calculator)

2. σ unknown?

$$TS = t = \frac{\bar{x} - \mu_0}{\left(s / \sqrt{n}\right)}$$ T-Test (T-Test on calculator)

B. About a single population proportion, p? 1-Prop Z-Test

$$TS = Z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0 \cdot q_0}{n}}}$$

$\hat{p} = \frac{x}{n}$, $x = \hat{p} \cdot n$ (1-Prop Z-test on calculator)

$q_0 = 1 - p_0$

C. About two population means?

1. Are the populations dependent?
Must have paired data.
Need to find the mean, $\bar{d}$, and standard deviation, $s_d$, of the Differences.

$$TS = t = \frac{\bar{d}}{\left(s_d / \sqrt{n}\right)}$$

n = # of pairs of data.

2. The populations are independent.

   a. Population st dev unknown (Pooled No or Pooled OFF) (2-Sample T-Test on calculator)

$$TS = t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

$$d.f = smaller\ of\ (n_1 - 1)\ or\ (n_2 - 1)$$

$$\mu_1 - \mu_2 = 0$$

D. About two population proportions? (2-Prop Z- Test on calculator)

$$TS = Z = \frac{(\hat{p}_1 - \hat{p}_2) - (p_1 - p_2)}{\sqrt{\frac{\bar{p} \cdot \bar{q}}{n_1} + \frac{\bar{p} \cdot \bar{q}}{n_2}}}$$

$$\bar{p} = \frac{x_1 + x_2}{n_1 + n_2}$$

$$\bar{q} = 1 - \bar{p}$$

$$p_1 - p_2 = 0$$

II. Is the problem asking you to test a claim about several population proportions or to test a distribution?

$$TS = \chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}, \quad O = given$$

$$d.f. = k - 1,\ k = \#\ of\ categories$$

$$E_i = np_i$$

III. Is the problem asking you to test a claim about independence? ( $\chi^2$ test on Calculator)

$$TS = \chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}, \quad O = given$$

$$d.f. = (\#\,rows - 1)(\#\,cols - 1)$$

$$E_i = \frac{(row\ total) \cdot (col\ total)}{grand\ total}\ _i$$

IV. Is the problem asking you to test a claim about several population means?
Sample sizes are equal. (ANOVA test on calculator)

$$TS = f = \frac{n(\text{variance of } \bar{x})}{(\text{mean of } s^2)}$$

$$df(num) = k - 1$$

$$df(denom) = k(n-1)$$

$$k = \#of\ pop$$

$$n = sample\ size$$

V. Is the problem asking you to test a claim about a linear relationship?
Use your calculator to find the linear correlation coefficient, the regression line equation, and the mean and standard deviation of both variables.

If the TS = r > CV, "There is a significant positive linear relationship between the paired data."

If the TS = r < CV, "There is a significant negative linear relationship between the paired data."

If the TS = r is not in the CR, "There is no significant linear relationship between the paired data."

If there is a linear relationship between the paired data, use the regression line equation for your prediction.

If there is no linear relationship between the paired data, the best predicted value is $\bar{y}$.