

# Probability + Statistics

## Preclass Problems - Nov 30

4.4

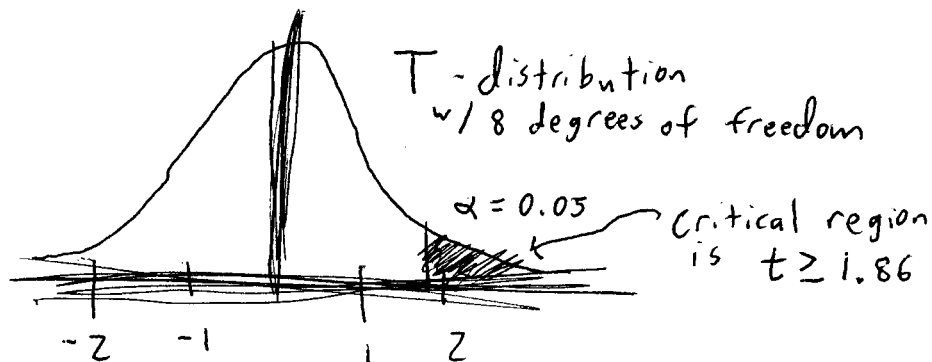
#2) a)  $H_0: \mu = 3.4$

b)  $H_1: \mu > 3.4$

c)  $t = \frac{\bar{x} - 3.4}{s/\sqrt{n}}$

c)  $r = n - 1 = 9 - 1 = 8$  degrees of freedom

$t_{0.05}(8) = 1.86$



d)  $\bar{x} = 3.556$

$s = 0.167$

$$t = \frac{\bar{x} - 3.4}{s/\sqrt{n}}$$
$$= \frac{3.556 - 3.4}{0.167/\sqrt{9}}$$
$$= 2.802$$

f)  $2.802 \geq 1.860 \therefore$  reject  $H_0$

g)  $0.01 < P\text{-value} < 0.025$ ;  $P\text{-value} = 0.0116$

#4)  $Z_{0.05} = 1.645$

$$Z = \frac{\bar{x} - \mu_0}{\sqrt{s^2/n}}$$

$$= \frac{2.07 - 0}{\sqrt{84.63/51}}$$

$$= 1.607$$

$1.607 < 1.645$

∴ fail to reject  $H_0$

#6) a)  $\chi^2 = \frac{(n-1)(s^2)}{\sigma_0^2}$

$$= \frac{(25-1)(s^2)}{140^2}$$

$$\chi_{0.05}^2(24) = 36.42$$

Critical region:  $\chi^2 \geq 36.42$

b)  ~~$s^2 = 827.4933$~~   
 ~~$\chi^2 = (24)(827.4933)$~~   
 ~~$= 19859.84$~~

$$\chi^2 = 29.18$$

$29.18 < 36.42$  so fail to reject  $H_0$

c)  ~~$\chi^2 = 19859.84$~~

$$[0, \bar{X} + Z_{\alpha} \left( \frac{\sigma}{\sqrt{n}} \right)]$$

$$[0, 667.920 + Z_{0.02} \left( \frac{140}{5} \right)]$$

$$[0, 725.432]$$

#10) a)  $P(Y \geq 13) = 1 - P(Y \leq 12)$

$$= 1 - 0.8462 \quad [n=25, X=12, P=0.4]$$

$$= 0.1538$$

b)  $P(Y \leq 12; P=0.60) = 1 - P(Y \leq 12; P=0.4)$

$$= 1 - 0.8462$$

$$= 0.1538$$

c)  $P(Y \geq 15; P=0.4) = \cancel{1 - P(Y \leq 14; P=0.4)}$

$$= 1 - 0.9656 = 0.0344$$

4.5

$$\#2) a) t = \frac{\bar{X} - \bar{Y}}{\sqrt{\frac{12s_x^2 + 15s_y^2}{27} \left(\frac{1}{13} + \frac{1}{16}\right)}} \leq -t_{0.05}(27) = -1.703$$

$$b) t = -0.869 > -1.703 \therefore \text{do not reject } H_0$$

$$c) 0.1 < P\text{-value} < 0.25$$

$$d) \frac{s_x^2}{s_y^2} = \frac{(25.6)^2}{(28.3)^2} = 0.818 < 2.96 = F_{0.025}(12, 15)$$

$$\frac{s_y^2}{s_x^2} = 1.222 < 3.18 = F_{0.025}(15, 12)$$

Do not reject equality of variances

$$\#4) a) \text{ Assuming } \sigma_x^2 = \sigma_y^2$$

$$|t| = \frac{|\bar{X} - \bar{Y}|}{\sqrt{\frac{9s_x^2 + 9s_y^2}{18} \left(\frac{1}{10} + \frac{1}{10}\right)}} \geq t_{0.025}(18) = 2.101$$

$$b) |-2.151| > 2.101 \therefore \text{reject } H_0$$

$$c) 0.01 < P\text{-value} < 0.05$$

$$e) 1.318 < 4.03 = F_{0.025}(9, 9)$$

$$1/1.318 = 0.759 < 4.03 = F_{0.025}(9, 9)$$

Do not reject  $\sigma_x^2 = \sigma_y^2$

$$\#6) a) t = \frac{80.464 - 80.378 - 0}{\sqrt{\frac{9(0.0316) + 9(0.0195)}{18}} \sqrt{\frac{1}{10} + \frac{1}{10}}} = 1.203$$

$$0.2 < P\text{-value} < 0.50; \quad P\text{-value} = 0.2446$$

$$b) F = \frac{0.0316}{0.0195} = 1.621; \quad \text{Do not reject } H_0$$