

LAST NAME (Print): **KEY**

Statistics 111 **Quiz 17**

1. You want to claim that women are more likely to major in statistics than are men.

In symbols, what is your alternative hypothesis? $H_0 : p_w - p_m > 0$

TA: You should accept any equivalent statement; e.g., $p_w > p_m$.

2.25 Of 100 men, 10 major in statistics. Of 150 women, 30 major in statistics. What is the value of your test statistic?

$$ts = \frac{(30/150) - (10/100)}{\sqrt{[(0.2 * 0.8)/150 + (0.1 * 0.9)/100]}} = 2.25$$

0.01 What is your P-value? **From the z-table, 0.013**

1.65 or 1.64 If your Type I error rate is 0.05, what is the numerical value of your critical value?

At that Type I error rate, what conclusion do you reach?

We reject the null; women are more likely to major in statistics.

- _____ 2. A broker says a random stock in the UK has mean return of at least 1%. You know the standard deviation in return percentages is 5%. You sample 100 stocks, and take $\alpha = 0.05$. What is the power of a test to discover that the broker is wrong, if the true mean is 0.75%?

$$\begin{aligned} \text{power} &= \mathbb{P}[ts < cv_\alpha] \\ &= \mathbb{P}\left[\frac{\bar{X} - 1}{(5/\sqrt{100})} < -1.645\right] \\ &= \mathbb{P}\left[\frac{\bar{X} - (0.75) + (0.75) - 1}{(5/\sqrt{100})} < -1.645\right] \\ &= \mathbb{P}\left[\frac{\bar{X} - (0.75)}{(5/\sqrt{100})} < -1.645 - \frac{(0.75) - 1}{(5/\sqrt{100})}\right] \end{aligned}$$

$$= \mathbb{P}[Z < -1.145]$$

$$= 0.13$$

3. Which statements are true? **B, E**

- A. For fixed n , as the alpha level decreases, the power increases.
- B. For fixed α , as the sample size increases, the power increases.
- C. The significance probability is the chance of obtaining results that are as or more supportive of the null hypothesis, when the alternative hypothesis is true.
- D. A good researcher will make many different tests at the 0.05 level, but only report those that are significant.
- E. A Type II error occurs when you fail to reject the null, and the null is false.