MAT 135, Discussion Questions 4.18

1. Why do we do hypothesis testing?

in order to test the evidence for claims

2. The null hypothesis the default assumption we make in the absence of evidence or based on previous information. Why do we want to set up our test to make these assumptions difficult to reject? (Consider: we presume innocence (the null hypothesis) in legal proceedings. Why would presuming guilt be a bad idea? Apply your answer to the more general case.)

we can control the chance of a serious mistake more easily. We want to be sure it's safe so it's better to start w/ an assumption it's not than to assume it's safe and miss when it's wrong

3. What is another name for the alternative hypothesis?

experimental hypothesis

4. Which of the following hypothesis tests are set up correctly? If they are set up correctly, are they for a mean or a proportion? And which test in the calculator would you use for them? If they are not set up correctly, what is wrong with them?

a. $H_0: \mu = 100, H_a: \mu > 100$ OK

b. $H_0: p = 20, H_a: p \leq 20$ 20 is not a proportion value; no equality in Ha

c. $H_0: p \neq 0.25, H_a: p = 0.25$ switch ≠ / =

d. $H_0: \mu = 25, H_a: \mu = 100$ 2 values must be the same

e. $H_0: p = 0.6, H_a: p \neq 0.6$ OK

f. $H_0: \mu = 120, H_a: \mu = 150$ two values must be the same; can't have two equal signs

g. $H_0: p = 31, H_a: p \neq 31$ not a proportion value

h. $H_0: \mu = 0, H_a: \mu < 10$ values must be the same

5. A large company that produces allergy medications claims that Americans lose an average of 40 hours of work to problems related to seasonal allergies. A consumer advocacy group believes that this claim is actually just "hype" intended to sell more medication. The advocacy group would like to obtain statistical evidence about this issue and takes a random sample of 100 American workers. They find that these 100 people lost an average of 38 hours with a standard deviation of 9.5 hours. What are the null and alternative hypotheses in this situation? State them in correct notation.

$H_0: \mu = 40$
$H_a: \mu < 40$

6. How is the level of significance related to confidence level?

α = significance
$1 - \alpha$ = confidence

7. What is a Type I error? Under what circumstances does it occur?

the chance the null hypothesis is correct but by chance we think it is unlikely to be true.

8. What is a Type II error? Under what circumstances does it occur?

the chance the null hypothesis is false but we are unable to establish that.

9. In the context of a legal analogy, the following table illustrates the relationship between correct decisions and Type I and Type II errors.

		True State of Nature	
		H_0(Innocent)	H_1 (Guilty)
Conclusion Drawn	H_0 (Innocent)	Correct	Type II Error
	H_1(Guilty)	Type I Error	Correct

Create a similar table for the problem scenario in #5 above.

Conclusion		True State of Nature	
		Ho $\mu \geq 40$	Ha $\mu < 40$
	Ho $\mu \geq 40$	Correct	Type II error
	Ha $\mu < 40$	Type I error	Correct