1. **Explain when a z-test would be appropriate over a t-test**

**ANSWER**

A Z-test is any statistical test for which the distribution of the test statistic under the null hypothesis can be approximated by a normal distribution. Because of the central limit theorem, many test statistics are approximately normally distributed for large samples. For each significance level, the Z-test has a single critical value (for example, 1.96 for 5% two tailed) which makes it more convenient than the Student's t-test which has separate critical values for each sample size. Therefore, many statistical tests can be conveniently performed as approximateZ-tests if the sample size is large or the population variance known. If the population variance is unknown (and therefore has to be estimated from the sample itself) and the sample size is not large (n < 30), the Student's t-test may be more appropriate.Nuisance parameters should be known, or estimated with high accuracy. Z-tests focus on a singleparameter, and treat all other unknown parameters as being fixed at their true values.

1. **Researchers routinely choose an alpha level of 0.05 for testing their hypotheses. What are some experiments for which you might want a lower alpha level (e.g., 0.01)? What are some situations in which you might accept a higher level (e.g., 0.1)?**

The answer to this question can be somewhat arbitrary because it is a judgment call. Each alpha level is dependent on the circumstances that surround a particular study. For example, if I were doing a test for cancer and that test would determine if I should remove some cancerous organ then I would want to set the alpha level very stringent at 0.01. I certainly do not want to remove an organ if it is cancer free. On the other hand if I set the alpha level too stringent and I determine that the organ does not have cancer, when in fact it does then the patient may die prematurely because I made a type II error, failure to detect a difference when one in fact does exist. As you can see this is a delicate balance. Situations where you might raise the alpha to 0.1 can vary greatly. The obvious one that many of you mentioned is when the results of the study are not that critical. For example, Iam trying to see if a mood therapy has an effect, I might raise my alpha to find my effect even though I increase the chance of making a type I error. In the beginning of the class when a number of you mentioned that certain studies are biased because the results didn’t seem right, well they could have raised their alpha to 0.25 to say their product is better, and the statistics will support that claim, however the chance of making a type I error is 25%! This is why it is important to know statistics to make decisions that are important to you. Generally the only reason that you would raise your type I error rate is if you have a limitedsample size (too small a sample and you will not find your effect at the traditional 0.05) or ifyou do not have the money to conduct the study at the 0.05 level (this usually only happens in the private sector, published research is generally not accepted if it is at 0.1 especially if an adequate sample size was feasible). Moreover, choosing between a type I error or a type II error is a trade off, the more stringent the type I error the greater the change for a type II error. So the question becomes which is the lesser of two evils. Is it better to stay there is an effect when there wasn’t (type I error) or is it better to say there was not effect when there was (type II error)? There are other factors involved, but that is basically what it comes down to