1) A certain cigarette brand advertises that the mean nicotine content of their cigarettes is 1.5 mg, but you are suspicious and plan to investigate the advertised claim by testing the hypotheses
H_o: $\mu = 1.5$ versus H_a: $\mu > 1.5$ at the 0.05 significance level. You will do so by measuring the nicotine content of 30 randomly selected cigarettes of this brand.
   (a) Describe what a Type I error would be in this context.
   (b) Describe what a Type II error would be in this context.
   (c) From the perspective of public health, which error—Type I or Type II—is more serious? Explain.
   (d) Explain why it might be a good idea to increase the significance level to 0.10 for this test.
   (e) You have determined that at the 0.05 significance level, the power of the test against the alternative $\mu = 1.75$ is 0.88. Explain what the power of the test means in the context of the problem.
   (f) What impact will reducing the significance level to 0.01 have on the power of the test?

2) LeRoy, a starting player for a major college basketball team, made only 40% of his free throws last season. During the summer, he worked on developing a softer shot in hopes of improving his free throw accuracy. In the first eight games of this season, LeRoy made 25 free throws in 40 attempts. You want to investigate whether LeRoy's work over the summer will result in a higher proportion of free-throw successes this season. What conclusion would you draw at the $\alpha = 0.01$ level about LeRoy's free throw shooting? Justify your answer with a complete significance test.

3) Does too much sleep impair intellectual performance? Researchers examined this commonly held belief by comparing the performance of subjects on the mornings following (a) two normal night's sleep and (b) two nights of "extended sleep." The order of these two treatments was determined randomly. In the morning they were given a number of tests of ability to think quickly and clearly. One test was for vigilance where the lower the score, the more vigilant the subject, (vigilance = alertness). The following data were collected:

Subject		Vigilance Score								
Subject	A	B	C	D	E	F	G	H	I	J
Normal Sleep	8	9	14	4	12	11	3	26	3	8
Extended Sleep	8	9	17	2	21	16	9	38	10	0

Carry out an appropriate test to help answer the researchers' question.

4) Television networks rely heavily on ratings of television shows when deciding whether to renew a show for another season. Suppose the Hyena network has decided that "Miniature Golf with the Stars" will only be renewed if it can be established that more than 12% of people in a nationwide poll watch the show. Let p= the true proportion of people in the country who watch the show.
   (a) State the null and alternative hypotheses for this test.
   (b) Describe a Type I and Type II error in this context, and explain the consequences of each type of error.
   (c) The network determines that for a sample size of 2000, the power of this test at a 5% significance level for H_a: $p = 0.14$ is only 0.39. Explain what the power of the test measures in the context of the problem.
   (d) Based on your answers to (b) and (c), would $\alpha = 0.10$ or $\alpha = 0.01$ be a better significance level for this test? Explain your choice.