

MATH 217
Exam III
Maymester 2008

To receive full credit you *must* **show all work** and **circle all answers**.

1. (10 points) It is commonly believed that circus clowns can run 20 mph. You believe this to be too low (you seem to recall a clown catching your car once when you were traveling at least 30mph). You collect an SRS of clowns to test your belief. Carefully state your null and alternative hypotheses. Is this a one-sided or two-sided hypothesis?
2. (10 points) Calculate the mean and standard deviation for the data set $\{12, 14, 10, 9\}$.
3. (10 points) Slugs are reported to live to 8 months. You believe slugs live longer than this. You observe 30 slugs and obtain an average life expectancy of 7.5 months with a standard deviation of 0.1 month. Does this data support your hypothesis at the 0.05-level? Carefully explain why or why not.
4. (14 points) You wish to figure out whether or not black cats are unlucky. To test this hypothesis you obtain an SRS of 4 black cat owners and an SRS of 12 non-black cat owners. You measure the number of unlucky incidents that occur to each group during a one-month period. Let \bar{x}_B and s_B represent the mean and standard deviation for the black cat owners and let \bar{x}_N and s_N be the mean and standard deviation for non-black cat owners. You obtain $\bar{x}_B = 12$, $s_B = 1$, $\bar{x}_N = 11.1$ and $s_N = 2$. Calculate the p-value for this study.
5. (14 points) You are testing the hypothesis that wombats in captivity eat more than wild wombats. Wild wombats eat 2 pounds of food per day. You observe 24 captive wombats and discover that the average amount of food eaten per day is 2.25 pounds. The standard deviation of your sample is 0.5 pounds. Perform the appropriate test (either by finding a z-score or a t-score) and explain why you are either convinced or unconvinced by the evidence.

6. (12 points) You are trying to create a race of super-babies. To do this you are attempting to raise their pain threshold via an intense program of diet and Mozart. The average pain threshold is 22. You successfully raise 8 super-babies. These 8 babies have an average pain threshold of 22.2 with an observed standard deviation of 0.8.
 - (a) Construct a 95% confidence interval for the average pain threshold of your super-babies.
 - (b) Does your confidence interval justify your belief that your babies will have a higher pain threshold? Why or why not?
7. (10 points) The height of the average Ewok is reported to be 36 inches. You believe this to be an overestimate. You know that the standard deviation for Ewok height is 1.1 inches. You sample 25 Ewoks and find their average height to be 35 inches. Is this result significant at the 0.05-level?
8. (10 points) You are sampling from a population with standard deviation of 5. You sample 25 individuals and you obtain an average of 484. Construct a 90% confidence interval for the mean.
9. (10 points) You are sampling from a population with an unknown standard deviation. You sample 25 individuals and you obtain an average of 484 and a standard deviation (from your sample) of 8. Construct a 90% confidence interval for the mean.

BONUS

Each bonus problem is worth 6 pts. All work must be shown with a clearly marked answer.

1. How many individuals would you need to sample from a population with standard deviation 12 in order to get the margin of error for a 95% confidence interval to be 6?
2. Carefully explain, in your own words, what the p -value for a test statistic tells you.