Name: _____   Spring 2004
                            First Year Seminar
                                  Final

There are a total of five questions on this exam. You must answer all five questions. For
questions 1-3, you must answer all parts. For questions 4 and 5, you may choose only
one part to answer. This is a timed exam; you will have 3 hours for the whole exam.

1. **[20 points]** Read the accompanying AP article about how people resemble their dogs.
    You may find it helpful to focus first on the underlined portion of the article.
    a) **[8 points]** (Calculation) The students who performed the experiment had to, in
        each case, judge which of two dogs matched a particular owner. What is the
        probability of them getting it right, just due to chance? For the purebred dogs,
        how many times did they attempt to match a dog to its owner? How many times
        would you expect them to get it right? What is the standard deviation for this
        number? How many standard deviations were they away from the mean?
    b) **[3 points]** (1-2 sentences) From a statistical standpoint, how convincing is the
        argument that people choose dogs that look like themselves?
    c) **[5 points]** (3-4 sentences) Ignoring statistical considerations, how well could we
        conclude from such an experiment that "when people pick a dog, they look for
        one that, at some level, bears some resemblance to them"?
    d) **[4 points]** (2-3 sentences) The article makes many, many other statements; for
        example, it describes what type of people choose a French Bulldog. How
        convincing is the evidence that is offered to support this description?
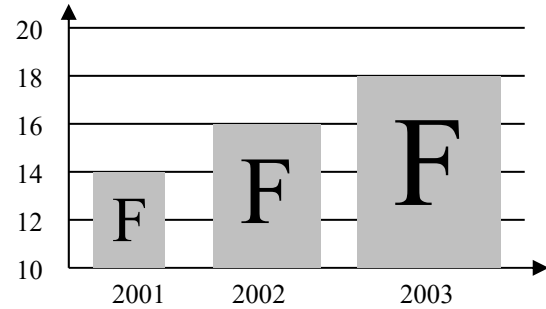
2. **[20 points]** Dr. Carlson gives a series of standard lectures to his astronomy class. On
    the first test, student Joe gets 20 questions out of 33 right. Dr. Carlson then gives a
    series of lectures using a technique called "peer instruction." On the second test, Joe
    gets 31 out of 33 right. Dr. Carlson concludes that "peer instruction is a better way to
    teach astronomy." You may find the table below helpful for this question.
    a) **[6 points]** (Calculation) On test
        1, what is the probability and
        uncertainty on that probability
        for Joe getting questions right
        on test 1? What is the
        probability and uncertainty on
        that probability for test 2?

Technique	Q's	Right	μ_P	σ_P
Standard	33	20		
Peer	33	31		

    b) **[6 points]** (1-2 sentences) What is the z-value for the differences between these
        two tests? Based on statistics alone, how likely do you think that peer instruction
        is actually better than standard lectures?
    c) **[8 points]** (3-4 sentences) Ignoring statistical considerations, how justified is Dr.
        Carlson in concluding that peer instruction is the better technique? Give at least
        three reasons, besides statistics, that this might be a hasty conclusion.

3. **[15 points]** Dr. Carlson has noticed a disturbing trend in his large English class – the number of cases of plagiarism has been on the rise, as illustrated by the graphic at the right.

   a) **[8 points]** Pick any two years – are there really more cases of plagiarism in one year than another?

   b) **[7 points]** Explain two ways the graphic at the right is misleading.

4. **[20 points]** Write an essay for ONE of the following TWO topics:

   (A) A man claims that he can dowse, that is to say, he can detect underground water with the help of a willow stick. He says that with the help of his stick, he can find water underground, and when people dig, they usually find water. "I'm 90% accurate!" he claims. He even shows you a clip when he was on Jay Leno - three wells were dug, at his direction, and two of them produced water. Is this a good demonstration? Why or why not? How would you devise a good test of this phenomenon? In other words, how would you tell if he really can dowse?

   (B) Psychic Sam can "cross over;" he can put himself into a trance which allows him to contact the dead. He gives you a demo - he picks someone from the audience, tells the man that his grandmother loves him, is watching over him. Which grandmother, asks the man? "Her name - has an M in it -"
   "Mary? I hardly remember her."
   "Yes, that's it," says Sam. "She had pets?"
   "Yes," says the man.
   "I thought so," says Sam. "She loves them, and they are with her now."
   "Yes, her cats died too," says the man.
   The psychic then points out to you that he correctly predicted her name, the fact that she had cats, the fact that they were together in heaven. Clearly, he has demonstrated his powers.
   Give me your opinion on all of this. Has he demonstrated his powers? If he were cooperative, how would you test his powers to see if he really could contact the dead?

5. **[25 points]** (Long Essay) Write an essay on <u>ONE</u> of the following <u>TWO</u> topics

   (A) Describe several common features of near death experiences (NDE's). What explanations can be given for some of the remarkable things experienced by people who have had NDE's, such as common features across cultures, seeing themselves from above, accurate reporting of actual events, and meeting deceased people?

   (B) Explain some of the characteristics that distinguish a science from a pseudoscience. Pick a particular pseudoscience, and illustrate how at least half of your characteristics might apply to that pseudoscience.