VCU Bioinformatics and Bioengineering Summer Symposium
Communal Problem Set

1. (Patrick's question) Of 24 BBSI participants at Wednesday's dinner, 7 were locals. 5 of them sat at the same table, one of 4 tables seating 6 people. You think to yourself, "This is no accident." Maybe so. What is the likelihood of 5 locals sitting at the same table if everyone chose seats at random?

2. The 500 gallon fuel oil tank buried in your front yard has sprung a leak and you need to replace it. You'd like to minimize the damage to your lawn. You know precisely where the center of the tank is, and if you knew where the outer limits of the tank were, you could precisely dig down. Presuming that the tank is spherical, where should you dig? No calculators on this very common sort of problem.

3. You are about to return from a journey that marks the high point in your life. You have made contact with the Most High Grand Zen Master and have been bestowed with a great pearl, a set of 102 haikus (in Japanese, with no punctuation or spaces) that contain the secret of life. You know from your last trip (a visit to the Second Most High Grand Zen Master) that Customs at the airport will thoroughly search your luggage and stamp on any paper they find "WE THANKS TO YOU FOR VISITING OUR HUMBLE COUNTRY!" in letters so big that whatever else is on the paper will be unreadable. Your only chance to bring the haikus out of the country is to put them on your miniscule 64 Kbyte memory device. Unfortunately, your last visit taught you that the device is not miniscule enough: Customs will surely find the device and write (electronically) on it:

```
WE THANKS TO YOU FOR VISITING OUR HUMBLE COUNTRY! WE THANKS
TO YOU FOR VISITING OUR HUMBLE COUNTRY! WE THANKS TO YOU...
```

with the basic unit repeated as text 1280 times contiguously. How can you use the memory device to bring the haikus out of the country and thereby enjoy eternal peace?

4. An ice cube is floating on water. The ice cube melts. Does the water level rise, fall, or stay the same? You may think you know the answer to this one. Not good enough. You get this question right only if:

- 12 of you submit the same answer
- That answer accords with reality

5. Two fictional characters, each related in a different way to woods, each meeting the leading figures of his age. Who are they?

6. Two Blanches: One wants to marry H-, but one of her friends doesn't think much of him. The other Blanche wants to marry H- but her enemy doesn't think he exists. Who are they?

7. They have two functional lungs. Who are they?

8. He is one of three people who actually KNOWS the 11 secret herbs and spices in Kentucky Fried Chicken (one of the few traits of his that are printable). Who is he?

9. Orienting your arch to the wind is a good way to:

   a. Rid your feet of offensive odor
   b. Test whether a model of a bridge is structurally sound
   c. Achieve a good exit
   d. Land a good salmon

10. You are a practicing hematologist who has 25 patients who have come to you because of complaints associated with sickle cell anemia, an autosomal recessive disorder. In examining the families of these patients, you find that all parents have a normal phenotype, and the families have a total of 53 children, of which 32 have sickle cell anemia. Since sickle cell anemia is a rare disease, this frequency strikes you as abnormal, and you suspect an environmental cause to the disease, something in our water or air that is increasing the incidence of sickle cell anemia beyond what you would expect from pure genetic considerations.

   a. What number of affected children out of 53 would you have expected to be affected if the disease is determined solely by the known genetic transmission of sickle cell anemia?

   b. How do you account for the actual results?