

**BIO 300 ASSIGNMENT #4**

**NOTE:** This assignment is due Friday, October 15th.

1. Researchers in Alberta investigated the ability of a ginseng extract to fight the common cold. The scientists gave 160 individuals two 200-mg capsules per day of the extract during the four winter months of 2003-2004 and placebo pills to the remaining 163 individuals. Of those taking the extract, 59 reported having at least one cold while 85 of those taking the placebo reported at least one cold. Test whether getting a cold was independent of use of the extract.
  
2. The study of spatial distribution of vegetation often makes use of random samples of “quadrats”, rectangular plots of fixed size placed at random over the sampling region (e.g., field or forest). The number of plants of each type that are rooted within quadrats is then counted. In one such study, an investigator counted the number of white pine seedlings growing in eighty  $10 \times 10 \text{ m}^2$  quadrats to test whether the distribution of pine seedlings in the forest was random, clumped, or dispersed. She obtained the following counts:

Number of seedlings	Number of quadrats
0	27
1	6
2	5
3	18
4	11
5	11
6	2
$\geq 7$	0
<b>Total</b>	80

- a) If the null hypothesis of a random distribution of pine seedlings across the forest is correct, to what theoretical probability distribution should the observed frequencies of quadrats containing 0, 1, 2, etc seedlings conform?
- b) Carry out a formal test of the null hypothesis.
- c) If the null hypothesis is rejected in (b), determine which non-random pattern best describes the spatial distribution of seedlings: clumped or dispersed?

3. Random samples of 1,522 people of English descent and 1,029 people of Chinese descent were classified according to the M-N system of blood type, with the results displayed below. Test whether people of English and Chinese descent differ in their blood type frequencies.

Blood type	Number		Percent	
	English	Chinese	English	Chinese
M	464	342	30.5	33.2
N	346	187	22.7	18.2
MN	712	500	46.8	48.6
Total	1,522	1,029	100.0	100.0

4. A recently-published study investigated regions of the brain involved in self-recognition. Ten subjects were randomly assigned to two groups. Anaesthesia was used to inactivate one of the cerebral hemispheres of the brain of all ten subjects. The left hemisphere was anaesthetised in one group, whereas the other group was subjected to right-hemisphere inactivation. Subjects were then shown a picture generated by averaging (“morphing”) images of the face of a famous celebrity (e.g., Marilyn Monroe) and their own face, and told to remember the picture. After recovery from anaesthesia, patients were presented with two pictures and asked to choose the one they had been shown earlier while under anaesthesia. The two pictures were the original two images from which the morphed image had been generated (i.e., “self” and “celebrity”, but separately this time). All 5 patients whose left hemisphere had been inactivated chose the picture of “self”. Four of the 5 patients whose right hemisphere had been anaesthetised chose the “celebrity” picture instead; the 5<sup>th</sup> chose “self”. Explain what test would you use to determine whether the treatment (left vs right hemisphere inactivation) influenced recognition of “self” vs “celebrity”, and why you would choose this test (don’t carry out the test, just name it and justify your answer).
5. Can newborn infants distinguish between languages? A recent test determined this by measuring change in the rates that infants suck on pacifiers when language spoken to them was changed. Thirteen infants were habituated to 10 sentences uttered by two speakers in English. They were then switched to 10 sentences uttered in Japanese by the same speakers. Ten of 13 infants increased their sucking rates after the language switch, whereas the remaining three infants decreased their sucking rate. Test whether rate of change in sucking increased when language was changed.