Lecture/text homework assignment # 10

For all of these problems you will need to figure out if they are one sided (=directional) or two sided (= non-directional). This will be true for the rest of the semester as well.

1) Malaria is a disease that destroys red blood cells (the parasite invades red blood cells, multiplies, and then infects more red blood cells). In a recent study (Kotepul, et al., 2015) looking at various blood counts, the authors found the following results. Results are in billion red blood cells / cubic mm. Note that I have deliberately modified these results (*do not use R*):

	n	$\bar{y}$	*s*
Low infection	527	4.16	2.23
High infection	157	4.51	2.34

Is there a difference in red blood cell count?
(*Hint:* please *think* about this before you just start working on the problem!)

2) In women, calcitonin levels decrease after menopause. A study to examine this was done in 1989 by Reginster et. al. They found the following results in pg/ml (*you may use R if you wish*):

Before menopause:	86	104	74	86	86	50	83	71	119	83
After menopause:	42	25	51	72						

Use a Mann-Whitney U test. Use $\alpha = .01$. Do calcitonin levels drop after menopause?

3) An earlier statistics class used to have a lab. During lab students would count corn kernels. Here are some counts for corn kernels:

purple round: 221   purple wrinkled: 99   yellow round: 56   yellow wrinkled: 32

Is there any reason to doubt the expected ration of 9:3:3:1 (the counts above are given in order)?

4) You want to know if an octopus (octopi are very intelligent!) can tell the difference between circles and rectangles. You provide each octopus with one circular disk and one flattened rectangle. You hide food under the rectangle. After several trials, you then count how many times the octopus picks up the circle and how many times it picks up the rectangle. You get the following results:

Circles: 8   Rectangles: 22

Can the octopus tell the difference between circles and rectangles?
*(Hint: if the octopus **can't** tell the difference, what's the probability that he/she will pick a circle?)*

5) In an investigation of daylight savings time, researchers at the University of Colorado found 302 traffic deaths in 10 years for the Monday following the spring time change. On a regular Monday there are about 258 traffic deaths in 10 years. Does daylight savings time increase the number of traffic deaths?
(Many countries are in the process of getting rid of the time change - even though the Senate did vote to stop the time change the legislation seems to have stalled (as usual!)).

6) Epistasis is a phenomenon in which one gene controls the expression of another. In one case, a dihybrid cross should yield a 9:3:4 ratio.

You collect the following data on mice:

black coat: 120   brown coat: 39   white coat: 48

Is there any reason to doubt the ratio of 9 black : 3 brown : 4 white?

Be prepared to discuss these problems in recitation Wednesday, July 10th.