

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.

Remember - do not use R unless the problem says you may use R.

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***):

	<i>n</i>	$\bar{y}$	<i>s</i>
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 problem before you just start working on it! ***Really!***)

2) Estrogen levels during pregnancy are very variable, but generally increase. You compare the estrogen levels of women in the first trimester vs. those in the second trimester with the following results (in pg/mL):

First trimester:	1012	1354	1361	1388	1446	1694	1794	1839	13162
Second trimester:	3890	3949	7111	7629	11105	14929			

Use a Mann-Whitney U test. Use $\alpha = .05$. Do estrogen levels increase from the first to second trimester?

3) You measure blood sugar levels of 9 volunteers before and after an hour after eating a carbohydrate rich meal. (You expect blood sugar levels to *peak* about an hour after eating.)

Is there an increase in blood sugar levels after eating?

Volunteer	1	2	3	4	5	6	7	8	9
Before	95	88	86	86	88	88	87	86	88
After	139	146	131	124	123	134	134	124	126

4) You want to know if crows can tell the difference between different shapes of triangles (crows are amazingly intelligent). You take a drawing of right triangle and a drawing of an equilateral triangle and show it to a crow. If the crow picks the equilateral triangle you reward it with a crow treat. Otherwise it gets nothing. You write down how often the crow picks each triangle:

Right: 3

Equilateral: 22

Can the crow tell the difference between right and equilateral triangles?

(Hint: if the crow can't tell the difference, what's the probability that he/she will pick a right triangle?)

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 - legislation seems to have stalled in our country (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 12:3:1 ratio.

You collect the following data on summer squash:

white: 125 yellow: 21 green: 15

Is there any reason to doubt the ratio of 12 white : 3 yellow : 1 green

Be prepared to discuss these problems in recitation Monday, July 6th.

Remember: Copying answers from other students, web sites, previous classes or using AI is a violation of the honor code!!