

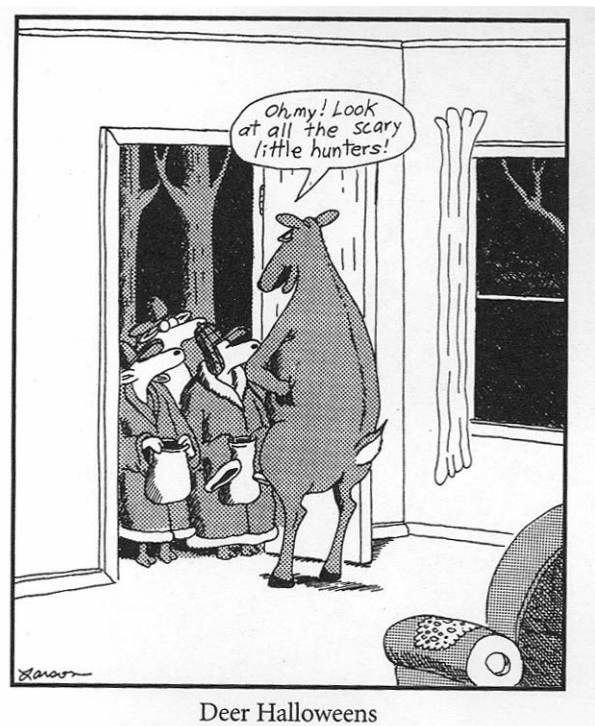
Name: _____

Problem	1	2	3	4 / 5	Total
Possible	31	28	20	21	100
Received					

FOR FULL CREDIT, SHOW ALL WORK RELATED TO FINDING EACH SOLUTION.

There are several 2-point problems in which I change the numbers/conditions a bit. The idea is that you should be able to figure out the resulting change without reworking the entire problem, especially since you will not have time to rework the problem.

Note: in the exam, CI means Confidence Interval.



31 points 1. In a sample of 100 children, 5 were found to be Vitamin D deficient. In your work below, use the Wilson-adjusted sample proportion \tilde{p} rather than \hat{p} .

/10 (a) Find a 98% CI for the proportion of all children who are Vitamin D deficient.

/2 (b) If the sample were 10 of 200 (rather than 5 of 100) Vitamin D deficient, compared to the CI you found in (a), the CI would now be (circle one):

Narrower Wider Same

/6 (c) Suppose that we want to find a **95%** CI whose total width is .04, that is, we want $t_{\alpha/2} \cdot SE_{\tilde{p}} \leq .02$. What sample size n would we need? In finding n , let's assume that we do not know what the sample proportion \tilde{p} will be.

Problem 1 continued

/9 (d) Suppose we believe that the true proportion of Vitamin D deficiency is .12 (i.e. 12%). Use the Chi-Square test with $\alpha = 0.05$ to test $H_0: p = .12$ with alternative $H_A: p \neq .12$.

/2 (e) Using your work from (d), what is your conclusion if using alternative $H_A: p > .12$?

/2 (f) Using your work from (d), what is your conclusion if using alternative $H_A: p < .12$?

28 points 2. The genders of random samples, one from each of three local schools, are given below.

	Pepperdine	USC	UCLA	Total
Male	50	30	20	100
Female	50	20	30	100
Total	100	50	50	200

/12 (a) Use a Chi-Square test to determine whether there is significant evidence that gender ratios differ at the three schools. Use $\alpha = 0.10$.

/2 (b) Suppose the results were instead as at right.

Which of the following would be true?

Just circle one of these four:

Larger χ_s^2 and larger P

Smaller χ_s^2 and larger P

Larger χ_s^2 and smaller P

Smaller χ_s^2 and smaller P

	Pepperdine	USC	UCLA
Male	50	40	10
Female	50	10	40

/12 (c) Focusing now on only Pepperdine and USC, find a 95% CI for the difference between the proportions of Pepperdine and USC Male students.

	Pepperdine	USC
Male	50	30
Female	50	20
Total	100	50

/2 (e) Suppose that the data were instead as at right (samples doubled).

Compared to the CI in (c), the new CI would be:

Narrower

Wider

Unchanged in width

	Pepperdine	USC
Male	100	60
Female	100	40

20 points 3. During a weight loss study, each of 7 subjects was given a particular drug that is meant to decrease hunger levels, as well as a placebo (at some other time, obviously). The hunger level data are shown at right. **For problems on this page, we are assuming pairing and normal distribution.**

Person	With Drug	With Placebo	Difference ($Y_1 - Y_2$)
1	82	81	1
2	65	54	11
3	52	72	-20
4	15	25	-10
5	61	101	-40
6	107	99	8
7	77	114	-37
Mean	65.6	78.0	-12.4
SD	28.5	30.8	20.7

/8 (a) Construct a 90% CI for the difference in mean difference in change.

/4 (b) For the CI you just found, approximately how large would the sample size have needed to be so that the margin of error $t_{\alpha/2} \cdot SE_{\bar{D}}$ would have been ≤ 5 ?

/6 (c) Compare the Drug and Placebo populations using a **t-test** at $\alpha = 0.10$. Use a **non-directional** alternative. What do you conclude about *Drug vs. Placebo*: is there significant evidence that the drug changes hunger level?

/2 (d) Using the work from (c), is there significant evidence that the drug decreases hunger level? (So this is now a directional test.)

14 points 4. Same data as Problem 3. **Assume pairing still, but do NOT assume normal distribution.**

Person	With Drug	With Placebo	Difference ($Y_1 - Y_2$)
1	82	81	1
2	65	54	11
3	52	72	-20
4	15	25	-10
5	61	101	-40
6	107	99	8
7	77	114	-37
Mean	65.6	78.0	-12.4
SD	28.5	30.8	20.7

/2 (b) If Person 1 with Drug were 83 rather than 82, how would W_s change? W_s would be:
 Larger Smaller No change

/2 (c) If Person 1 with Drug were 80 rather than 82, how would W_s change? W_s would be:
 Larger Smaller No change

/2 (d) If Person 1 with Drug were 90 rather than 82, how would W_s change? W_s would be:
 Larger Smaller No change

7 points 5. A study was conducted to determine whether a woman's risk of transmitting HIV to her unborn child is different for the younger vs. the older the child. A sample of 100 HIV-infected women who gave birth to two children found that, when only one of the two siblings had HIV, it occurred in 7 of the 100 older siblings and in 15 of the younger siblings, as shown in the table below.

		Younger sibling HIV?	
		Yes	No
Older sibling HIV?	Yes	2	7
	No	15	76

/5 (a) We are not interested in the case when **both** siblings are HIV positive or the case when **both** are not HIV positive. We are only interested in the two cases in which one sibling is HIV positive and the other is not (the 7 and 15). Test the hypothesis H_0 : *the probability of being HIV positive is the same for older siblings as it is for younger siblings* along with the alternative H_A : *the probabilities are different*. Use $\alpha = .10$.

/2 (b) Test the hypothesis if H_A is directional, that the younger sibling (15 in the table) is more likely than the older sibling to have HIV. Use $\alpha = .10$.