

Final exam practice sheet

Math 1070–2, Spring 2008

1. Biologists who study the healing of skin wounds measured the rate at which new cells close a razor cut made in the skin of an anesthetized newt. Here are data from 18 newts, measured in micrometers (millionths of a meter) per hour:

29	27	34	40	22	28	14	35	26
35	12	30	23	18	11	22	23	33

Compute a 95% confidence interval for the mean healing rate of newts. What assumptions are you making, if any? Explain [carefully].

2. *Forbes*, a business magazine, reports that 4567 companies sold their first stock to the public between 1990 and 2000. The mean change in the stock price of these companies, since the first stock was issued, was +110%. The median change was –31%. Explain how this can happen.
3. A random sample of female college students has a mean height of **65** inches, which is greater than the **64**-inch mean height of all young women. Which, if any, of the bold numbers is a parameter? Which, if any, of the bold numbers is a statistic?
4. The average retail price of bananas in 1998 was 51 cents per pound (US Department of Agriculture, *Food Cost Review*). Recently, a random sample of 15 markets revealed the following banana prices per pound:

56	53	55	53	50
57	58	54	48	47
50	57	57	51	55

Find a 95% confidence interval for the true per-pound average price of bananas today.

5. A random-digit dialing telephone survey of 880 drivers asked, “Recalling the last ten traffic lights you drove through, how many of them were red when you entered the intersection?” Of the 880 respondents, 171 admitted that at least one light had been red. Give a 95% confidence interval for the proportion of all drivers who ran one or more of the last ten red lights that they encountered.
6. A *New York Times* poll on women’s issues interviewed 1025 women and 472 men, randomly selected from the US [excluding Alaska and Hawaii]. The poll announced a margin of error of ± 3 percentage points for 95% confidence in conclusions about women. The margin of error for results concerning men was ± 4 percentage points. Why is this larger than the margin of error for women?
7. In 2002, the Supreme Court ruled that schools could require random drug tests of students who participate in competitive after-school activities such as athletics. Does drug testing reduce use of illicit drugs? A study compared two similar high schools in Oregon. Wahtonka High School tested athletes at random, and Warrenton High School did not. In a confidential survey, 7 of 135 athletes at Wahtonka and 27 of 141 athletes at Warrenton said they were using drugs. Regards these athletes as simple random samples from the populations of athletes at similar schools with, and without, drug testing. If possible, then describe a 95% confidence interval for the difference between the proportion of athletes using drugs at schools with and without drug testing. If not possible, then explain [carefully] why not.

8. A simple random sample of 100 flights of airline 1 shows that 60 were on time. Another independent random sample of 150 flights for airline 2 shows that 75 were on time. We wish to know whether the two airlines are equally reliable. Perform a statistical test, and report your findings [carefully].
9. Scrapie is a degenerative disease of the nervous system. A study of the substance IDX, as a treatment for scrapie, used 20 infected hamsters as subjects. Ten, chosen at random, were injected with IDX. The other 10 were not treated. The researchers recorded how long the hamsters lived. They reported, “Thus, although all infected control hamsters had died by 94 days after infection (mean \pm SEM = 88.5 ± 1.9 days), IDX-treated hamsters lived up to 128 days (mean \pm SEM = 116 ± 5.6 days).” Readers are supposed to know that SEM stands for “standard error of the mean.” Fill in the values in this summary table:

Group	Treatment	n	\bar{x}	s
1	IDX	?	?	?
2	Untreated	?	?	?

10. In a certain study, each of 50 subjects tastes two unmarked cups of coffee and says which he or she prefers. One cup in each pair contains instant coffee; the other, fresh-brewed coffee. Thirty-one of the subjects prefer the fresh-brewed coffee. Is it true that a majority of people prefer the taste of fresh-brewed coffee? Report [carefully] a complete analysis.
11. Mammals and birds sleep. Fruit flies show a daily cycle of rest and activity; but does their rest qualify as sleep? As a small part of a larger study, researchers used infrared motion sensors to see how many flies moved in response to low-level vibrations. Here are the results:

	No. didn't respond to vibration	No. responded to vibration
Fly walking	10	54
Fly resting	28	4

Is there good reason to think that resting flies respond differently than flies that are walking? [If this is so, then we have some evidence that flies might be sleeping.] Explain your procedure[s], as well as final answer.

12. In a study of 1993 Math SAT scores, the Educational Testing Service computed the average score for each of the 51 states, and the percentage of the high-school seniors in that state who took the test. [D.C. as considered as a state.] The correlation between these two variables was -0.86 .
- (a) True or False: Test scores tend to be lower in the states where a higher percentage of the students take the test. If true, then how do you explain this? If false, then what accounts for the negative correlation?
- (b) In New York, the average score was only 471. But in Wyoming, the average score was 507. True or False: The data show that on average, the schools in Wyoming are doing a better job at teaching math than the schools in New York. Explain [carefully].
13. A nation-wide random survey of 1500 adults asked about attitudes toward “alternative medicines” such as acupuncture, massage therapy, and herbal therapy. Among the respondents, 660 said they would use alternative medicine if traditional medicine was not producing the results that they wanted. If possible, then find a 95% confidence interval for the proportion of all adults who would use alternative medicine. If not possible, then explain [carefully] why not.
14. A monthly opinion survey is based on a sample of 1500 persons, “scientifically chosen as a representative cross section of the American public.” The press release warns that the estimates are subject to chance error, but guarantees that they are “reliable to within two percentage points.” The word “reliable” is ambiguous. According to statistical theory, the guarantee should be interpreted as one of the following:
- (a) In virtually all these surveys, the estimates will be within two percentage points of the parameters.

- (b) In most such surveys, the estimates will be within two percentage points of the parameters, but in some definite percentage of the time larger errors are expected.

Choose the correct answer, and explain your reasoning [carefully].

15. A Gallup Poll in December 2000 asked “Do you think this country would be governed better or governed worse if more women were in political office?” Of the 1026 adults in the sample, 57% said “better.”
- (a) Compute a 95% confidence interval for the percentage of all eligible voters in the US who think it would be better if we had more women in political office. What assumptions are you making? Explain carefully.
- (b) Explain to someone, who knows no statistics, what the phrase “95% confidence” means here.
16. A study of the career plans of young women and men sent questionnaires to all 722 members of the senior class in the College of Business Administration at the University of Illinois. One question asked which majors within the business program the students had chosen. Here are the data from the students who responded:

	Female	Male
Accounting	68	56
Administration	91	40
Economics	5	6
Finance	61	59

What percent of the students did not respond? Does this percentage have adverse effects on subsequent analyses of this data set?

17. In order to find if, on average, men and women differ in height, a group took two independent samples of 100 men and 130 women each. The average male measured at 5'9", and the average female at 5'5", while the standard deviations were 5.5" and 4.8", respectively. Find a 90%-confidence interval for the average difference between men's and women's heights. You may need the fact that one foot is equal to twelve inches.
18. Below are some data on the heights, in inches, of 11 adult brother-sister pairs:

Brother	71	68	66	67	70	71	70	73	72	65	66
Sister	69	64	65	63	65	62	65	64	66	59	62

If Damien is 70 inches tall, use regression to predict his sister's height.

19. A new article reports that of the 411 players on National Basketball Association rosters in February 1998, only 139 “made more than the league average salary” of \$2.36 million. Is \$2.36 million the mean or median salary for NBA players? Explain your answer carefully.
20. A random-digit dialing sample of 2092 adults found that 1318 used the internet. Of the users, 1041 said that they expect businesses to have websites that give product information; 294 of the 774 non-users said this also.
- (a) Produce a 95% confidence interval for the proportion of all adults who use the internet.
- (b) Produce a 95% confidence interval to compare the proportions of users and non-users who expect business to have websites.