

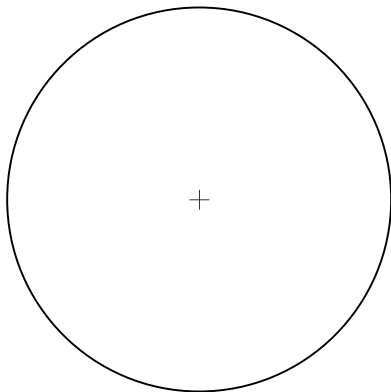
**Statistics Final Exam  
Spring 2001**

Instructions Show all work.

1. To estimate the time State College students living off-campus spend commuting to class each week, a random sample of 45 such students was surveyed. What is the population? What is the sample?
  
2. Classify each according to its highest level of measurement: conditional (C); ordinal (O); interval (I); ratio (R); nominal (N)
  - a. The model year of a car.                    C    O    I    R    N
  
  - b. The price of a car.                            C    O    I    R    N
  
  - c. The color of the car                        C    O    I    R    N
  
3. Suppose you consider all students enrolled at Palomar and report the age of each student. What style of data gathering was used? Circle the correct response.

sampling            experiment            census            pairing            simulation

4. Opera Alive sponsors three major opera productions each year. Contributions provide 27% of the necessary funds, ticket sales provide 42%, and national grant money provides the rest. Draw (a) an accurate circle graph and (b) a Pareto chart to show how the production costs are met.



5. In a French class, the weights of the course grade are: Final Exam (40%); Midterm (30%); Attendance (10%); Lab (20%). If each of the activities are on a 100 point scale and George earned 93 points on the Final, 82 points on the midterm, 75 points on attendance, and 80 points on the Lab. Find his overall weighted average in the French class.

6. To estimate the amount of time visitors spend in a regional park, a sample of 30 people gave the following information on the estimated number of hours they spent in the park.

8    5    9    12    15    18    2    3    5    4  
 2    8    6    10    13    14    8    10    9    13  
 21    2    4    3    6    7    6    7    6    16

- a. Find the mean, median, mode, standard deviation of the sample.
- b. Make a frequency table using 5 classes. Find the class width. Show the classes, class boundaries, and class marks?

<b>Class Boundaries</b>	<b>Midpoint</b>	<b>Frequency</b>	<b>Cumulative Frequency</b>	

- c. Make a histogram (label it).
- d. Make an ogive (label it).

e. What is the shape of the distribution in the histogram. Circle the correct response.

uniform   skewed-left   skewed-right   symmetrical   normal   standard

f. Find the 10% trimmed mean of the sample.

7. You roll two dice, a red one and a green one. What is the probability of getting:

a. a number less than 5 on both dice?

b. a sum of 8 on the two die?

c. a 5 on both?

8. Sixty-one policemen were asked how many years they served the police force. The results were grouped into 5-year intervals:

<b>Number of Years</b>	1-5	6-10	11-15	16-20	21-25
<b>Number of Policemen</b>	20	12	14	10	5

Estimate the mean number of years of service and standard deviation for the years of service.

9. Suppose ten qualified people apply for a job. Three will be selected to interview. How many different groups (sets) of three people can be interviewed?

10. Ten horses are entered in a horse race. How many different ways can three horses out of the ten come in first, second, and third?
  
  
  
  
  
  
  
  
  
  
11. Jim, a salesman, makes a sale on about 15% of his telemarketing calls. How many calls does Jim have to make in one day if he wants to be 70% sure of making at least 3 sales per day?
  
  
  
  
  
  
  
  
  
  
12. A safety engineer claims that 20% of all automobile accidents are due to mechanical failure. Given a random sample of 10 accidents, what is the probability that
  - a. 3 are due to mechanical failure.
  
  
  
  
  
  
  
  
  
  
  - b. at most 2 are due to mechanical failure.
  
  
  
  
  
  
  
  
  
  
  - c. What is the expected number of accidents due to mechanical failure? What is the standard deviation of the probability distribution?
  
  
  
  
  
  
  
  
  
  
13. Cars arrive at the gate of a parking structure at a rate of 6 per hour. What is the probability that exactly two cars arrive in a 20 minute period?

14. What is the probability that it takes exactly 13 rolls of a die to get the first 3 to appear on the upper face of the die?
  
15. Find the z-value (the value on the axis of the standard normal curve) if 22% of the data lies to the right of z.
  
16. Suppose the Nippon automobile averages 44 mpg with a standard deviation of 6 mpg. Find the probability that
  - a. Assuming a normal distribution, find the probability that one Nippon car chosen at random will get between 40 and 42 mpg.
  
  - b. Find the probability that the mean mileage of ten randomly chosen Nippon cars will get between 44 and 45 mpg?
  
17. A career center conducted a study of a random sample of 200 job openings and found that 120 required high skill training. Find the 92% confidence interval for the proportion of job requiring high skill training. Interpret the result in an English sentence.

18. A park ranger has timed the mating calls of 22 bull elk. The mean was 14.6 sec with a standard deviation of 2.8 sec. Find a 0.96 confidence interval for the mean duration of mating calls in bull elk. What is the corresponding maximum error in using 14.6 sec as an estimate for the mean duration of mating calls in all bull elk?
19. A random sample of 50 cars was used to estimate the average miles per gallon cars get in highway driving. The sample standard deviation was 5.7 mpg. How many more cars must be sampled to be 90% confident that the sample mean is within 1 mpg of the actual mean?
20. A washing machine manufacturer claims that 85% of its washers last 5 years before repairs are necessary. A random sample of 95 washers showed that 73 of them lasted 5 years before a repair. Is the manufacturer's claim too high? Use a 1% level of significance. State and test your hypotheses. Make and justify a statistical conclusion. Summarize your conclusion in English.

21. The Smokey Bear Trucking Company claims that the average weight of a fully loaded moving van is 12,000 pounds. A sample of 30 Smokey Bear moving vans shows the average weight is 12,200 pounds with a standard deviation of 500 pounds. Use a 4% significance level.
- a. Does this indicate that the average weight of Smokey Bear moving vans is more than 12,000 pounds? State and test your hypotheses. Make and justify a statistical conclusion. Summarize your conclusion in English.
- b. Suppose the sample size was only 20. Does this indicate that the average weight of Smokey Bear moving vans is more than 12,000 pounds? Why/Why not?

22. A new overtime policy was implemented that decreased the pay factor for overtime work. A random sample of 12 employees were selected. Their overtime hours for a randomly selected week before and for another randomly selected week after the new policy were recorded as follows:

<b>employee</b>	1	2	3	4	5	6	7	8	9	10	11	12
<b>hrs before</b>	5	4	2	8	10	4	9	3	6	0	1	5
<b>hrs after</b>	3	7	5	3	7	4	4	1	2	3	2	2

Did the average number of overtime hours decrease after the policy went into effect? Use a 1% level of significance. State and test your hypotheses. Make and justify a statistical conclusion. Summarize your conclusion in English.

23. For the past seven days data has been collected at Wall Red Department store for the variables  $x$  = total number of people entering the store (in hundreds) and  $y$  = total store sales (in thousands of dollars) that day:

<b>x</b>	5.8	6.1	3.2	2.4	7.5	8.1	4.4
<b>y</b>	12.6	13.4	7.6	5.8	15.9	17	9.7

- a. Are  $x$  and  $y$  positively correlated at a 1% level of significance? State and test your hypotheses. Make and justify a statistical conclusion. Summarize your conclusion in English.
  
- b. Find the coefficient of determination and interpret its meaning in the context of this problem.
  
- c. Use the least-squares regression line to predict the amount in sales on a day 400 people enter the store.

24. Is interest in physical fitness independent of education level? A random sample of 220 people with different education levels were asked to rate their interest in physical fitness (none, mild, or strong). The results follow.

	<b>No High School Diploma</b>	<b>Completed High School</b>	<b>College Graduate</b>
<b>No Interest</b>	20	25	17
<b>Mild Interest</b>	40	50	30
<b>Strong Interest</b>	10	8	20

- a. Test the above question at a 5% level of significance. State and test your hypotheses. Make and justify a statistical conclusion. Summarize your conclusion in English.
- b. Assuming were true, what would be the expected number of people to be college graduates and be mildly interested in physical fitness out of a random sample of 220 people.

25. Marc is a sociologist studying the TV choices 19-25 year old people. He surveyed a random sample of 200 people in this age group and asked which type of TV program they preferred to watch. The data, along with the distribution of preferred programs identified in a study done 10 years ago follow.

<b>program type</b>	<b>percent ten years ago</b>	<b>number in current sample</b>
New	7	20
Sitcom	18	30
Sports	40	76
Public TV	5	14
Action	15	32
Talk Show	15	28

Are the TV preferences for this age group now different now than they were ten years ago? Use a 1% level of significance. State and test your hypotheses. Make and justify a statistical conclusion. Summarize your conclusion in English.

26. Circle True if the statement is always true, otherwise circle False.
- True False The mean is a more resistant measure than the median.
- True False The range is a more resistant measure than the standard deviation.
- True False The coefficient of variation expresses the standard deviation as a percentage of the mean.
- True False If you scored in the 75th percentile, then 74% of the scores are at or below your score.
- True False If A and B are independent, then  $P(A \text{ and } B) = P(A) P(B)$
- True False When drawing a card from a standard deck, the event of drawing a Jack and the event of drawing a heart are mutually exclusive.
- True False In a random sample, if  $x$  = the time required to finish an exam, then  $x$  is an example of a continuous random variable.
- True False If  $p = q$ , then the binomial distribution is approximated by a standard normal distribution.
- True False Geometric experiments (geometric distributions) have a fixed number of trials.
- True False The level of significance is the probability of rejecting a true null hypothesis.
- True False A frequency distribution and its' corresponding relative frequency distribution have the exact same shape.
- True False In a standard normal distribution, the mean is always zero.
- True False If  $np > 5$  and  $nq > 5$ , then the geometric distribution is approximately normal.
- True False In hypothesis testing, if the p-value is one, then we always accept the alternate hypothesis.
- True False If  $H_0$  is rejected for  $\alpha = 0.01$ , then  $H_0$  is also rejected for any  $\alpha > 0.01$ .

True False If  $r = 0.90$  is the correlation coefficient between dependent variable  $y$  and independent variable  $x$ , then 10% of the variation in the variable  $y$  is unexplained by the least-squares line and the variable  $x$ .