

Questions 1-4 are multiple choice. Circle the letter of the best response. [3 pts each]

1. Suppose I collect a random sample of 30 ages of Hope faculty. From the data collected, I compute a 95% confidence interval for the mean of the population and get 45 to 52 years old. Which of the following describes such a 95% confidence interval?
 - a) 95% of all ages of Hope faculty fall in the interval.
 - b) If this process were repeated many times, we would expect 95% of the resulting intervals to contain the mean age of all Hope faculty.
 - c) If this process were repeated many times, we would expect 95% of the resulting sample means to be contained in the interval 45 to 52.
 - d) 95% of the time, the mean age of all Hope faculty will be between 45 and 52 years.

2. A researcher wants to determine if women have more prescriptions for drugs than men do. A simple random sample of 500 men and 500 women is taken and the researcher concludes that women have more prescriptions than men (P -value = 0.01). This means:
 - a) The number of prescriptions for men and women are identical, except for 1% of them.
 - b) The number of prescriptions for men and women are different, except for 1% of them.
 - c) If women do have more prescriptions for drugs than men, the chance of obtaining a difference in the number as large as that observed in the sample is 0.01.
 - d) If there is no difference in number of prescriptions for drugs between men and women, the chance of obtaining a difference as large as that observed in the sample is 0.01.

3. The least-squares regression line is:
 - a) The line that makes the square of the correlation in the data as large as possible.
 - b) The line that best splits the data in half, with half of the points above the line and half below the line.
 - c) The line that makes the sum of the squares of the vertical distances of the data points from the line as small as possible.
 - d) The line that contains the most points possible in a scatterplot.

4. The sampling distribution of the mean is:
 - a) The probability that we obtain the mean in repeated random samples.
 - b) The mean of the distribution of the sample.
 - c) The distribution of values taken by the mean in all possible samples of the same size from the same population.
 - d) The distribution of the population mean over many populations.

5. The following table gives the gestation period and the average life expectancy for 10 mammals.
[18 pts.]

Animal	Gestation Period (days)	Life Expectancy (years)
Black Bear	219	18
Cat	63	12
Dog	63	12
Goat	151	8
Lion	100	15
Pig	90	12
Rabbit	31	5
Squirrel	44	10
Tiger	105	16
Wolf	63	5

- a) For this sample, find the mean for the gestation period.
- b) Find the standard deviation, s , for the gestation period.
- c) Sketch a scatterplot where the gestation period is the explanatory variable and life expectancy is the response variable.
- d) Find the regression equation that can be used to predict the life expectancy given the gestation period.
- e) Find the correlation between the life expectancy and the gestation period.

- f) Is there a positive relationship between gestation period and life expectancy for mammals? Test this at the 5% level and give your hypotheses, test statistics, P -value, and conclusion.

We wish to predict the life expectancy for mammals that have a gestation period of 63 days. We did this using Minitab with the following results.

Fit	SE Fit	95% CI	95% PI
9.89	1.35	(6.77, 13.01)	(0.74, 19.05)

- g) Suppose we wish to estimate the life expectancy for a mammal that has a gestation period of 63 days. Give a 95% interval for this.
- h) Suppose we wish to estimate the mean the life expectancy for a mammal that has a gestation period of 63 days. Give a 95% interval for this.
6. According to a recent Harris Poll, 23% of Americans smoke. Assume this is true. Suppose a random sample of 25 Americans is taken. [8 pts.]
- a) What is the probability that exactly 8 of them smoke?
- b) What is the probability that more than 8 of them smoke?
- c) What is the probability that fewer than 8 of them smoke?

7. According to an article in the *Journal of the American Medical Association*, adult body temperatures are normally distributed with mean of $\mu = 98.2^\circ \text{ F}$ with a standard deviation of $\sigma = 0.7^\circ \text{ F}$. [9 pts.]

- a) What percent of all body temperatures are above 98.6° F ?

- b) To be in the lowest 5% of body temperatures, below what temperature would someone have to be?

- c) What is the probability that a random sample of 12 people would have a mean body temperature of more than 98.6° F ?

8. The following two-way table shows who survived the sinking of the Titanic based on whether they were crew members or passengers booked in first, second, or third class staterooms. For parts c and d, let A be the event that a randomly chosen person survived and T be the event that a randomly chosen person was in third class. Leave your answers as fractions. [8 pts]

	Crew	First	Second	Third	Total
Alive	212	202	118	178	710
Dead	673	123	167	528	1491
Total	885	325	285	706	2201

- a) What proportion of all those on board were in first-class?

- b) What proportion of those in first-class survived?

- c) Find $P(T \text{ and } A)$.

- d) Find $P(T | A)$.

9. There are four multiple choice questions on this test. Each has four possible answers. Suppose you are just guessing at the answers. [6 pts.]

a) What is the probability that you would get all four questions wrong?

b) What is the probability that you would get at least two questions wrong?

10. A 1992 poll conducted by the University of Montana classified respondents by gender and political party, as shown in the following table. [9 pts]

	Democrat	Republican	TOTAL
Male	36	45	81
Female	48	33	81
TOTAL	84	78	162

a) Is there a relationship between gender and party affiliation? Test this at the $\alpha = 0.05$ level by writing out the hypotheses, finding a test statistic, finding a P -value, and writing a conclusion.

b) Suppose that gender and party affiliation were independent. What would the expected frequencies be for these two variables? Put your answers in the table below.

	Democrat	Republican
Male		
Female		

11. In a Gallup poll conducted last week, 56% of a random sample of 507 college football fans across the country said they would like to see Florida play Ohio State in the national championship game. Can we conclude that a majority of all college football fans would like to see Florida play Ohio State in the national championship game? Test this at the $\alpha = 0.05$ level [9 pts.]

a) State the null and alternative hypotheses.

b) Find the test statistic and P -value.

c) State the conclusion in words.

12. Statistics students at the Air Force Academy were interested in estimating the mean number of chocolate chips in bags of Chips Ahoy. (They wanted to test the claim that there were “1000 chips in every bag.”) They counted the chips in 16 bags and found a mean of $\bar{x} = 1238.2$ chips and a standard deviation of $s = 94.3$ chips. Assume the statistics came from a random sample and are accurate. Find a 95% confidence interval for the mean number of chips in a bag of Chips Ahoy cookies. [6 pts]

13. How much more sugar do children's cereals have than adult's cereals? To answer this question data were obtained as to the sugar content (as a percentage of weight) of several national brand of children's and adult's cereals. Of the 19 children's cereals sampled, the mean amount was 46.8 with a standard deviation of 6.42. Of the 28 adult's cereals sampled, the mean amount was 10.15 with a standard deviation of 7.61. Assume these statistics are accurate and come from a random sample. Find a 95% confidence interval for the difference in the mean sugar content for children's cereals and adult cereals. [6 pts.]

14. What colors attract insects best? Experimenters placed six blue, six green and six yellow board at random in a field of oats. Each board was covered with a sticky substance that would trap the insects. The number of cereal leaf beetles trapped was recorded below. Test at the 5% level to determine if there is a relationship between the color of the board and the mean number of insect trapped. [9 pts.]

Blue	Green	Yellow
16	37	45
11	32	59
20	20	48
21	29	46
14	37	38
7	32	47

a) State the null and alternative hypotheses.

b) Find the test statistic and P -value.

c) State the conclusion in words.