

1. Identify each of the following variables as categorical (C) or quantitative (Q).

- a. Eye color \_\_\_\_\_
- b. Political party \_\_\_\_\_
- c. Time in hours spent studying last week \_\_\_\_\_
- d. Number of calories in a serving of cereal \_\_\_\_\_

2. The scores on a midterm exam are shown in the stem-and-leaf plot below on the right.

a. Find the five-number summary.

**Variable: Midterm Score**

Leaf unit = 1

6 : 13

6 : 68

7 : 0133

7 : 5589

b. Find the IQR.

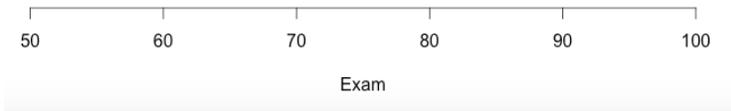
8 : 0222334

8 : 556779

c. Draw a box plot (aka, box-and-whisker plot) below.

9 : 1224

9 : 68



3. Height has an approximately bell-shaped distribution. For a sample of heights of college students collected, the males had  $\bar{x} = 69.6$  and  $s = 4.2$ . Use the empirical rule to describe the distribution of heights for male college students. (Fill in blanks with *numbers rounded to 1 decimal place*.)

- a. Approximately 68% of the observations fall between \_\_\_\_\_ inches and \_\_\_\_\_ inches.
- b. Approximately 95% of the observations fall between \_\_\_\_\_ inches and \_\_\_\_\_ inches.
- c. All or nearly all of the observations fall between \_\_\_\_\_ inches and \_\_\_\_\_ inches.

4. For the distribution described in the previous problem...

- a. ... what is the *z*-score for a male student who is 73 inches tall?
- b. ...how tall is a male student whose *z*-score is -2.3?

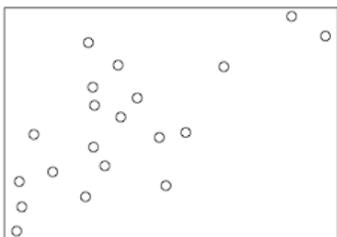
5. From a sample of 31,604 pregnancies, the *Journal of the American Medical Association* found that babies whose mothers had one or two alcoholic drinks daily weighed an average of about 3 ounces less than those of nondrinking mothers. Is this an observational study or an experiment? Give a reason for your choice.

- a. Identify the response variable and the explanatory variable.
- b. Characterize each of your variables as categorical or quantitative.
- c. Was this research an observational study or an experiment? Explain.

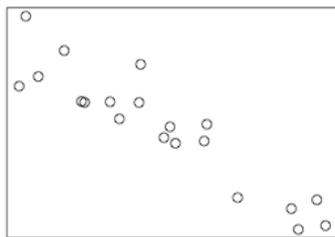
6. A survey includes the question, “Taken all together, would you say you are very happy, pretty happy, or not too happy?” The table below uses the survey to cross-tabulate happiness with family income, measured as the response to the question, “Compared with families in general, would you say that your family income is below average, average, or above average?” Answer the questions that follow. *Express proportions rounded to two decimal places.*

Income	Happiness			TOTAL
	Not too happy	Pretty happy	Very happy	
Above average	78	307	105	490
Average	76	232	107	415
Below average	51	251	93	395
TOTAL	205	790	305	1,300

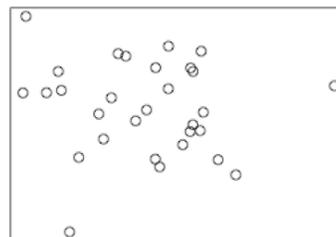
- What proportion of the people with above average income report being very happy?
  - What proportion of the people with average income report being very happy?
  - What proportion of the people with below average income report being very happy?
  - Explain why your answers to (a), (b) and (c) do or do not lead you to believe there is an association between happiness and income level.
7. Match the scatter plots with the correlation coefficients  $r = -0.9$ ,  $r = 0.7$ , and  $r = -0.1$ .



$r =$  \_\_\_\_\_



$r =$  \_\_\_\_\_



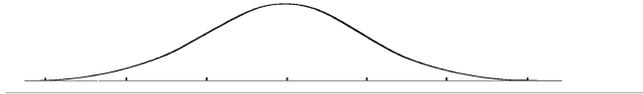
$r =$  \_\_\_\_\_

8. In examining data about old automobiles, we find the regression line  $\hat{y} = 38.3 - 5.4x$  describes a strong relationship between the response variable  $y$ , gas mileage in miles per gallon, and the explanatory variable  $x$ , weight of the car **in thousands of pounds**.
- Predict the gas mileage for a car that weighs 2,500 pounds. (Note that this is 2.5 thousand pounds, so  $x = 2.5$ .) *Give your answer rounded to one decimal place.*
  - In the context of this problem, write a sentence that interprets the slope of the regression line above.
  - Is the correlation between these variables positive or negative? Explain in one sentence.
  - I had an old Mazda that weighed exactly 2620 pounds and gets 22.0 miles per gallon. What is the predicted gas mileage for this car using the linear regression model above? What is the residual value? *Give your answers rounded to one decimal place.*

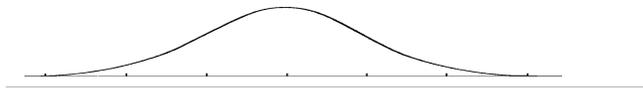
9. Demonstrate your understanding of the construction of a 95% confidence interval for a population proportion  $p$  from a sample proportion of  $\hat{p} = 0.36$  gathered from a random sample of size  $n = 400$ .
- Show your calculation of approximate standard error.
  - Show your calculation of margin of error.
  - Write your final answer in interval notation. (You don't have to write an English sentence.)

10. Answer each of the following probability questions by finding the area of the appropriate region under the curve. Sketch the area you are trying to find, and then find it using a table or calculator.

a. Find  $\text{Prob}(z < 0.15)$



b. Find  $\text{Prob}(-1.5 < z < 1.5)$



11. Circle TRUE or FALSE for each of the following statements.

- |    |      |       |  |
|----|------|-------|--|
| a. | TRUE | FALSE | The population proportion is the point estimate for the sample proportion.   |
| b. | TRUE | FALSE | When the $P$ -value is larger than the significance level, we say we have confidence that the null hypothesis is true. |
| c. | TRUE | FALSE | Decreasing the sample size will decrease the margin of error in a 95% confidence interval.                             |
| d. | TRUE | FALSE | A 90% confidence interval for a proportion will be wider than a 99% confidence interval for the same sample size.      |

12. A Zogby Interactive survey conducted in February 2008 found that 1525 of 1974 randomly selected adult Americans believe that traditional journalism is out of touch with what Americans want from their news.

a. What is the point estimate of the population proportion who believe journalism is out of touch with what Americans want? (Show your work.)

b. A 99% confidence interval for this situation turns out to be (0.748, 0.797). Finish the sentence reporting the result in the context of the problem. (Use plain English, not statistics words.)

I am 99% confident that \_\_\_\_\_  
 \_\_\_\_\_

13. Birth weights at a local hospital have a normal distribution with mean 90 oz. and standard deviation 8 oz.

a) A particular baby weighs 105 oz. Calculate the corresponding  $z$ -score. Show your work.

b) Using calculator or Table A, answer the question: What is the probability that a baby born at this hospital will weigh *more than* 86 oz?

14. A newspaper headline states that 90% of all American adults own a cell phone. A statistics student decides to investigate whether or not this claim is true. Using data from a national survey of 950 adults, she sees that 838 of them report owning a cell phone.

- What proportion is being tested?  $p =$  the proportion of \_\_\_\_\_ who \_\_\_\_\_.
- What are the hypotheses?  $H_0:$  \_\_\_\_\_  $H_a:$  \_\_\_\_\_
- Calculate the standard error based on the intention to use a sample size of  $n = 950$ .
- Show how to calculate the value for  $\hat{p}$ , its appropriate  $z$ -score and the resulting  $P$ -value. Include a sketch showing the  $P$ -value as area under a curve.



$\hat{p}$  distribution

- With a predetermined significance level of  $\alpha = 0.05$ , you would \_\_\_\_\_ the null hypothesis. (Fill in the blank with the correct term or phrase.)
- Write a final conclusion in English.

15. Let  $p_1$  represent the proportion of all male SU students who vote Republican, and  $p_2$  represent the proportion of all female SU students who vote Democrat. A recent survey of 430 randomly chosen SU students resulted in the counts shown in the table below:

	Democrat	Independent	Other	Republican	TOTALS
Female	100	20	20	90	230
Male	75	30	5	90	200
TOTALS	175	50	25	180	430

- From the data, find the value of the point estimates  $\hat{p}_1$  and  $\hat{p}_2$  for the parameters  $p_1$  and  $p_2$ , respectively. Show your work.
- Construct a 90% confidence interval for the difference  $p_1 - p_2$ . Write the final answer in the form, "I am 90% confident that  $p_1 - p_2$  is between \_\_\_\_\_ and \_\_\_\_\_." (Using a calculator is ok!)
- Based on your answer to part (b) explain what you can conclude (with 90% confidence) about SU having a higher percentage of Democrats among females than among males. Be sure to demonstrate that you know how the answer to (b) leads to the answer to (c).