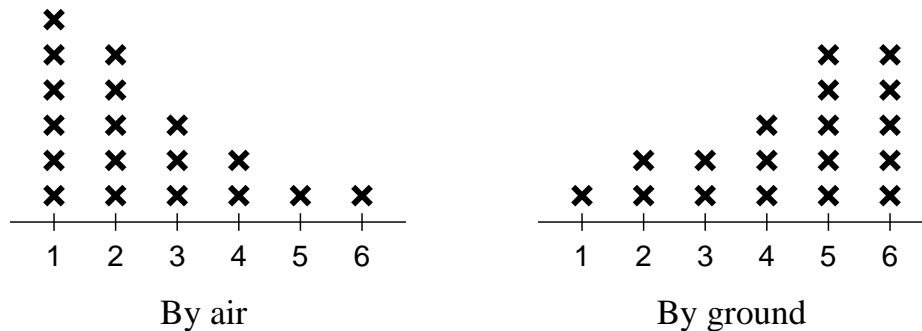


1. (12 pts) There have been reports that aspartame (an artificial sweetener) is associated with weight gain. Suppose a study is done of 100 subjects. Fifty of them (Group I) drink diet sodas and the other fifty (Group II) drink regular sodas. The researchers are interested in whether there is a difference in the weight gain or loss between the two groups.
 - (a) (4 pts) State the null and alternative hypothesis for this study.
 - (b) (4 pts) Suppose the researchers find the data to be statistically significant. Which hypothesis did they accept?
 - (c) (4 pts) If the data were statistically significant, which type of error could have been made?

2. (22 pts) Shipments of electronic components are shipped either by air or by ground transportation. The following frequency plots show the distributions of the number of damaged components per case by the two shipping methods.



When the cases arrive, they are identical in appearance. You are presented with a case. The hypotheses are

H_0 : The case was shipped by air.

H_1 : The case was shipped by ground.

You count the number of damaged components. Based on your count, you decide which shipping method you believe was used.

- (a) (3 pts) What is the direction of extreme in this situation?
- (b) (8 pts) Using the decision rule “Reject H_0 if the count is at least 5, find the values of α and β .”
- (c) (4 pts) What is the p -value of 4?
- (d) (3 pts) Describe a Type I error in this situation.
- (e) (4 pts) Describe a Type II error in this situation.

3. (16 pts) The following excerpt is from an article “New study links diet soda consumption to weight gain”¹, by Rallie McAllister, July 16, 2009.

If you drink diet sodas, you probably think you’re doing yourself a favor. After all, you’re missing out on all those calories in regular soft drinks, as well as the associated weight gain, right?

As it turns out, you may be temporarily avoiding some unwanted calories, but not necessarily the weight gain. In fact, data from the San Antonio Heart Study, conducted at the University of Texas Health Science Center at San Antonio, suggest that the more diet sodas a person drinks, the greater his or her risk of becoming overweight or obese.

Along with colleague Ken Williams, M.S., and principal investigator Michael Stern, M.D., Fowler examined the association between consumption of diet and regular soft drinks and weight gain in 622 non-overweight adults. The researchers measured each participant’s Body Mass Index (BMI) and individual soft drink consumption at the beginning of the study, and the participants returned for follow-up measurements 7 or 8 years later.

After adjusting for age, gender and ethnicity, the investigators found that regular soft drinks were not significantly associated with the development of obesity, but diet soft drinks were.

“Preliminary analysis of the data showed that for every can or bottle of diet soda that a normal-weight person drank per day, there was a 65 percent increase in the risk of becoming overweight,” Fowler noted.

- (a) (3 pts) Describe the population of interest.
 - (b) (3 pts) Describe the sample.
 - (c) (4 pts) Identify two variables that were observed or measured.
 - (d) (4 pts) For each of the variables in part (c), tell whether it is explanatory or response.
 - (e) (2 pts) Identify two confounding variables for which the researchers made “adjustments,” that is, they controlled for them.
4. (14 pts) The study described in the previous problem involved 622 adults. Suppose that the group consisted of 150 males and 472 females.
- (a) (4 pts) If the sample was *designed* to contain 150 males and 472 females, then what kind of sampling method was used?
 - (b) (6 pts) Suppose the males gained an average of 4 lbs and the females gained an average of 6 lbs. Give the overall average weight gain for the entire sample.
 - (c) (4 pts) Is your answer in part (b) a parameter or a statistic? Explain.

¹<http://rallieonhealth.com/article.php?ArticleID=415>

5. (10 pts) Describe each of the following variables as (1) qualitative, (2) quantitative discrete, or (3) quantitative continuous.
- (2 pts) Whether a woman takes tamoxifen (a drug that reduces the risk of breast cancer).
 - (2 pts) The number of in-school suspensions during the 2008-2009 school year at a middle school.
 - (2 pts) A person's cholesterol (HDL) level.
 - (2 pts) The number of H1N1 cases at a college in September 2009.
 - (2 pts) The drug that is administered to a patient to reduce fever.
6. (16 pts) The Dow Jones Industrial Average (DJIA) is an average of the stock prices of 30 corporations. The prices², as of 1:48 pm EDT, September 24, 2009, are shown in the table below. They have been arranged in increasing order.

Symbol	Name	Price	Symbol	Name	Price
AA	Alcoa Inc	13.54	JPM	JP Morgan Chase Co	44.68
PFE	Pfizer Inc	16.41	HPQ	Hewlett Packard Co	46.69
GE	Gen Electric Co	16.53	TRV	The Travelers Co	47.85
BAC	Bk of America CP	17.02	WMT	Wal Mart Stores	50.44
INTC	Intel Corporation	19.51	CAT	Caterpillar Inc	51.50
CSCO	Cisco Systems, Inc	22.56	BA	Boeing Co	51.73
MSFT	Microsoft Corporation	25.78	KO	Coca Cola Co, The	52.50
KFT	Kraft Foods Inc	26.48	MCD	McDonalds CP	56.11
HD	Home Depot Inc	26.99	PG	Procter Gamble Co	57.83
T	AT&T Inc	27.00	JNJ	Johnson and Johns DC	60.88
DIS	Walt Disney-Disney C	27.79	UTX	United Tech	62.24
VZ	Verizon Commun	30.09	XOM	Exxon Mobil CP	68.74
MRK	Merck Co Inc	30.94	CVX	Chevron Corp	70.67
DD	Du Pont E I De Nem	32.42	MMM	3M Company	74.13
AXP	Amer Express Inc	33.45	IBM	Intl Business Mach	120.81

- (4 pts) Which of the following would be appropriate displays of the distribution of prices? (Select as many as apply.)
 - Pie chart
 - Bar graph
 - Stem-and-leaf display
 - Histogram
 - (8 pts) Draw a display of (one of) the type(s) that you chose in part (a) for the price data.
 - (4 pts) Using appropriate statistical terminology, describe the shape of the distribution.
7. (10 pts) Using a seed of 212, select a simple random sample of 5 corporations from the list of 30 corporations in the previous problem. Give the symbols for the corporations in your sample.

²<http://finance.yahoo.com/q/cp?s=%5EDJIA>