Practice Problems — Statistics 10

Source: Much of this review material is adapted from review materials prepared by Vivian Lew and Michael Tsiang for their Stats 10 class.

Problem 1 The average gas mileage of the top selling minivans for each U.S. car manufacturer would best be modeled as what type of variable?

(a) Numerical variable

(b) Categorical variable

(c) Neither

Problem 2 A zip code would best be modeled as what type of variable?

(a) Numerical variable

(b) Categorical variable

(c) Neither

Problem 3 The distribution of marital status for members of a randomly selected group of adults would best be visualized by which plot?

(a) Boxplot

(b) Histogram

(c) Bar chart

(d) Scatterplot

Problem 4 This statement: "People with diabetes are at higher risk for certain cancers than those without the blood sugar disease, suggests a new study based on a telephone survey of nearly 400,000 adults." is referring to a:

(a) Observational study

(b) Controlled experiment

Problem 5 From the internet "One large study that included more than 2,800 people offered one of three mental training programs focused on memory, reasoning, or processing speed. The participants randomly assigned to the memory group, for instance, went through 10 hour-long training sessions that taught methods for remembering written materials, such as word lists. Two years after the training programs, people who participated in a mental exercise performed better on related tasks than others who did not participate." This is an example of a(n)

(a) Observational study

(b) Controlled experiment

The following information is used in Problems 6, 7, 8, 9, and 10.

A group of elementary school students is given a reading test and the scores are reported by reading grade level. The *five-number summaries* for the boys and girls given the test are shown below:

Boys	2.0	3.9	4.3	4.9	6.0
Girls	2.8	3.8	4.5	5.2	5.9

Problem 6 Which group had the highest score?

(a) Boys

(b) Girls

(c) They are equal

Problem 7 Which group had the greater range?

(a) Boys

(b) Girls

(c) They are equal

Problem 8 Which group had the greater interquartile range?

(a) Boys

(b) Girls

(c) They are equal

Problem 9 Which group, if any, had a potential outlier?

(a) Boys

(b) Girls

(c) Neither group

Problem 10 Which group generally performed better on this test?

(a) Boys

(b) Girls

(c) The groups performed equally well

Problem 11 Ten parents were asked the ages of their oldest child. The results are shown below.

29 12 10 6 22 19 16 14 2 28

What is the interquartile range for this set of data?

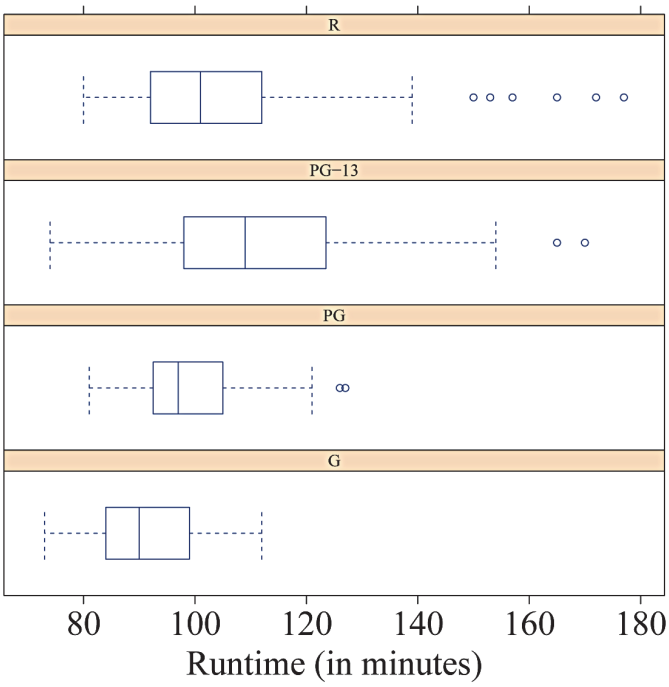
(a) 10

(b) 12

(c) 15

(d) 27

Problem 12 The boxplots below represent movie runtimes (length of a movie in minutes) for movies that have been rated by the Motion Picture Association of America (MPAA) as R, PG-13, PG, and G. List ratings according to their median runtimes, from longest to shortest.



(a) R, PG-13, PG, G

(b) G, PG, PG-13, R

(c) G, PG, R, PG-13

(d) PG-13, R, PG, G

Problem 13 Consider the following statement: "Researchers from a prestigious university conducted a large study and determined that children who participated in school music programs scored higher on math exams in later grades than those who did not." Suppose that upon hearing this, Pawnee City Councilman Jeremy Jamm states that all children should participate in school music programs. What is wrong with the councilman's statement?

(a) He does not realize that difference in scores is due to the placebo effect.

(b) The councilman thinks the study is an anecdote even though it is an observational study.

(c) The councilman confused association with causation.

(d) There is nothing wrong with the councilman's statement.

Problem 14 The current mean price of gasoline in the United States is \$3.63 per gallon with a standard deviation of \$0.21. Please assume that gas prices are symmetric and unimodal for the purposes of this question. Gas in San Francisco, CA, is selling for \$4.02 per gallon today. What is this price in standard units? Assuming the Empirical Rule applies, would this price be unusual or not? Please round to the nearest hundredth.

(a) $z = 1.86$; This price would be unusual.

(b) $z = -1.86$; This price would be unusual.

(c) $z = 1.86$; This price would not be unusual.

(d) $z = -1.86$; This price would not be unusual.

Problem 15 Which one of the following best describes the relationship between the correlation and the slope of the regression line modeling the relationship between X and Y?

(a) The correlation between X and Y equals the slope of the regression line modeling the relationship between X and Y.

(b) When the correlation between X and Y is zero, the slope of the regression line modeling the relationship between X and Y is negative.

(c) The sign of the correlation between X and Y is the same as the sign of the slope of the regression line modeling the relationship between X and Y.

(d) The correlation between X and Y is not related to the slope of the regression line modeling the relationship between X and Y.

(e) When the correlation between X and Y is zero, the slope of the regression line modeling the relationship between X and Y is positive.

The following information is used in Problems 16, 17, and 18.

The following linear regression model can be used to predict ticket sales at a popular water park:

$$\text{Predicted ticket sales per hour } = -631.25 + 11.25 \text{ Current temperature (in °F)}$$

Problem 16 What is the predicted number of tickets sold per hour if the temperature is 86°F? Round to the nearest whole ticket.

(a) About 252 tickets

(b) About 276 tickets

(c) About 301 tickets

(d) About 336 tickets

Problem 17 Choose the statement that best states the meaning of the slope in this context.

(a) The slope tells us that if ticket sales are decreasing there must have been a drop in temperature.

(b) The slope tells us that a one degree increase in temperature is associated with an average increase in ticket sales of 11.25 tickets.

(c) The slope tells us that high temperatures are causing more people to buy tickets to the water park.

(d) None of the above

Problem 18 In this context, does the intercept have a reasonable interpretation?

(a) Yes, it is reasonable for people to go to a water park when it is 0°F, so park managers might want to know how many tickets they would sell on average on a 0°F day.

(b) No, at a temperate of 0°F, ticket sales would be −631.25 and it is not reasonable (or possible) to have negative ticket sales.

(c) Not enough information available

Problem 19 A horticulturist conducted an experiment on 110 thirty-six inch plant boxes to see if the amount of plant food given to the plant boxes was associated with the number of tomatoes harvested from the plants. The mean amount of plant food given was 27.8 milliliters with a standard deviation of 2.1 milliliters. The mean number of tomatoes harvested was 7.5 with a standard deviation of 1.5. The correlation coefficient was 0.7691. Use the information given to calculate the slope of the linear model that predicts the number of tomatoes harvested from the amount of plant food given. Round to the nearest hundredth.

(a) −7.50

(b) 1.08

(c) 0.55

(d) The slope cannot be determined without the actual data.

Problem 20 In the NBA, the correlation between "steals per game" and "blocked shots per game" is found to be 0.8045. Choose the statement that is true about the coefficient of determination.

(a) The coefficient of determination, r^2, is equal to approximately 0.6472.

(b) The coefficient of determination states that about 64.72% of the variation in the blocked shots per game is explained by steals per game.

(c) When given as a percent, the coefficient of determination is always between 0 and 100%.

(d) All of the above are true statements.

Problem 21 Is the following an example of theoretical probability or empirical probability? A card player declares that there is a one in thirteen chance that the next card pulled from a well-shuffled, full deck will be a Queen.

(a) Theoretical

(b) Empirical

The following information is used in Problems 22 and 23.
A random sample of 130 Americans was asked whether they believed intelligent life on other planets exists. Of 60 males in the random sample, 25 believed, and of all the females in the random sample, 20 believed. Please assume that the 130 Americans were classified into only two genders, male and female.

Problem 22 One person is selected randomly from the 130, what is the probability that this person believes intelligent life on other planets exists?

(a) .346

(b) .702

(c) .119

(d) .030

Problem 23 One person is selected randomly from the 130, what is the probability that this person does not believe intelligent life on other planets exists or is male?

(a) .846

(b) .302

(c) .558

(d) .609

Problem 24 Hannah worried that she would be late to an early morning exam, she set TWO alarm clocks. Suppose Alarm Clock 1 is 60% reliable, meaning it will wake her up 6 times out of 10. Suppose Alarm Clock 2 is 90% reliable. What is the chance at least one of the alarms will wake her up?

(a) .96

(b) .90

(c) .75

(d) .54