1. Flower lengths for the H. CARIBAEA YELLOW Heliconia are listed below.   
   Answer parts a – d below.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 36.78 | 37.02 | 36.52 | 36.11 | 36.03 | 35.45 | 38.13 | 37.10 |
| 35.17 | 36.82 | 36.66 | 35.68 | 36.03 | 34.57 | 34.63 |  |

* 1. Find the 5-number summary for this data. **Place answers in table below for credit.** (5 points)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Min | Q1 | Median | Q3 | Max |
|  |  |  |  |  |

* 1. Are there any outliers? Which data points, if any, are outliers? Use the 1.5 times IQR rule and show your work. (5 points)
  2. Calculate the mean **AND** sample standard deviation of this data. Use your calculator but show an abbreviated form of the formula with the data.   
     (5 points)
     1. mean: 35.86; std: 0.9753
     2. mean: 36.18; std: 0.9753
     3. mean: 36.18; std: 0.8004
     4. mean: 35.86; std: 0.8004
  3. Draw a stem plot, histogram, **OR** box plot to illustrate the distribution.   
     (5 points)

1. The toco toucan, the largest member of the toucan family, possesses the largest beak relative to its body size of all birds. The large surface area may be an important mechanism for radiating heat and cooling the bird. The following scatter plot illustrates the relationship between the percent of total body heat loss from the beak and temperature in degrees Celsius.

*r* = 0.9

 = 21.9°C

= 4.66°C

 = 47.9%

= 11.15%

1. Calculate the intercept and slope of the regression line. (8 points)
2. **Complete the sentence (circle answer for each of the 4 parts below):** (8 points)

For every unit increase in **1.)** [**temperature** | **total body heat loss from the beak**], the **2.)** [**temperature** | **total body heat loss from the beak**] **3.)** [**increases** | **decreases**] by **4.)** [**the predicted value from** | **the slope of**] the regression line.

1. The temperature in degrees Celsius explains \_\_\_\_\_\_\_\_\_\_\_ % of the total body heat loss from the beak. (6 points)
2. A researcher wants to determine whether the rate of water flow (in liters per second) over an experimental soil bed can be used to predict the amount of soil washed away (in kilograms). The researcher measures the amount of soil washed away for various flow rates, and from these data calculates the least-squares regression line to be

amount of eroded soil = 0.4 + 1.3 × (flow rate)

1. The least-squares line would predict the amount of eroded soil when water is flowing at a rate of 1.2 liters per second to be \_\_\_\_\_\_\_\_\_\_\_. (4 points)
2. If the actual amount of eroded soil when water flows at a rate of 0.96 liters per second is 1.57, what is the residual for the regression line point (0.96, 1.65)?   
   (4 points)
3. The following table gives the gender and college of study for students at a Northeastern university.

Female Male Total

Pharmacy 70 80 150

Liberal Arts 5,668 4,697 10,365

Education 1,904 1,589 3,493

Nursing 1,660 970 2,630

Total 9,302 7,336 16,638

One student is to be selected at random.

* 1. The probability that the selected student is female is…(2pts)
  2. The probability that the selected student is enrolled in the school of education given that the student is female is…(3pts)
  3. The probability that the selected student is male given that the student is enrolled in Nursing is…(3pts)

For the following four problems, tell me whether or not the question can be answered and justify your response. **DO NOT CALCULATE THE ANSWER.** Just perform the necessary checks to determine if you can answer the question. Don’t make any assumptions that are not provided in the problems.

1. The amount of baggage a plane passenger checks is random, with a mean of 20 lbs and a standard deviation of 30 pounds. What is the probability that a passenger checks more than 30 pounds of baggage? (5 pts)
2. The amount of baggage a plane passenger checks is random, with a mean of 20 lbs and a standard deviation of 30 pounds. A plane carries 100 passengers. It can handle 3000 pounds of checked baggage, that is, a maximum of 30 pounds per passenger. What is the probability that a random load of 100 passengers will check too much baggage for the plane to handle?   
   (5 pts)
3. The scores of students on the ACT college entrance examination have a normal distribution with mean 18.6 and standard deviation of 5.9. What is the probability that a single student randomly chosen has an ACT score less 21? (5 pts)
4. A multiple choice test consists of 40 questions and each question has four answers from which to choose so for each question, there is a 25% chance of answering correctly. If a student guesses every answer, find the probability that the student will get more than half of the questions correct. Can you use the normal approximation to the binomial to answer this question? (5 pts)
5. Based upon past experience, 75% of all customers at Jay’s Diner order the chocolate cake for dessert. If a random sample of five customers is selected, what is the probability that… (9pts) Show work for credit.
   1. None order the chocolate cake?
6. 0.0146
7. 0.00098
8. 0.0098
9. 0.0014
   1. At least three order the chocolate cake?
      1. 0.2637
      2. 0.7363
      3. 0.8965
      4. 0.6592
   2. Not more than two order the chocolate cake?
      1. 0.1035
      2. 0.0408
      3. 0.0879
      4. 0.1143
10. The SAT scores of students who major in mathematics or statistics is normally distributed with mean 613 and standard deviation of 38. What is the probability that a single student randomly chosen has an SAT score less than 550? **You do not need to check any conditions.** (5pts)
11. The SAT scores of students who major in English is normally distributed with mean 577 and standard deviation of 49. What is the probability that 30 randomly chosen students have a mean score greater than 600? **You do not need to check any conditions.** (5pts)
12. Fifty-five percent of American households own two or more pets. A random sample of 200 American households is selected. Let *X* be the number of households selected that own two or more pets.
13. The mean of *X* is…(2pts)
14. The standard deviation of X is…(2pts)
15. Interpret the mean and standard deviation in terms of the situation. (3pts)

1. Using the normal approximation, the probability that at least 100 of the households selected own at least two or more pets is… **You do not need to check any conditions.** (5pts)
2. A car manufacturer claims that its top-selling sedan gets 32 miles per gallon on the highway. A government inspector is interested in whether or not the actual gas mileage is living up to the company’s claim. The inspector randomly selects 30 cars just off the assembly line and tests the gas mileage for each car after it is run at highway speed for 30 minutes. She observed a mean 29 miles per gallon with a standard deviation of 1.5 miles per gallon.

Compute a 90% confidence interval for the true mean miles per gallon for all sedans.

* 1. (**32** | **30** | **29**) is the point estimate.
  2. (**0.05** | **1.5** | **0.274**) is the standard error of the point estimate.
  3. (**1.645** | **1.699** | **2.045**) is the critical value.
  4. (**0.451** | **0.085** | **0.466**) is the margin of error.
  5. WRITE the interval:
  6. INTERPRET the interval:
  7. Does this confidence interval contain the value 32 miles per gallon (the gas mileage claimed by the company)? What do you infer?
  8. The inspector wants to reduce the margin of error to 0.2 by conducting another study using a larger sample of cars. How large of a sample is needed to estimate the true mean gas mileage to within 0.2 with the same 90% level of confidence? Use the estimate of *s* from the existing sample.

1. A national survey of 1200 adults found that 450 of those surveyed were pro-choice on the abortion issue.

Construct a 95% confidence interval for p, the true proportion of all adults who are pro-choice.

1. (**450** | **0.450** | **0.375**) is the point estimate.
2. (**0.0149** | **0.014** | **0.0228**) is the standard error of the point estimate.
3. (**1.99** | **1.699** | **1.96**) is the critical value.
4. (**0.027** | **0.025** | **0.045**) is the margin of error.
5. WRITE the interval:
6. INTERPRET the interval:
7. It is desired to reduce the margin of error to 0.02 with a 95% level of confidence. Find the minimum sample size required to accomplish this goal. Use the estimate of *p* from the existing sample.