**A.P. Statistics – Linear Regression Worksheet**

The busiest season for Walmart is the Christmas holiday and weekends see a tremendous number of customers. Last year, Walmart conducted a study as to the amount of waiting in time in checkout lanes its customers had to wait. On Saturdays and Sundays of its holiday season, it opened a different number of checkout lanes for customers between 1 PM and 4 PM, its busiest times. The measurement was the average wait time for a customer to go through the lane and complete the transaction. A different number of lanes was opened each day. The data is below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Date | 11/22 | 11/23 | 11/29 | 11/30 | 12/6 | 12/7 | 12/14 | 12/15 | 12/21 | 12/22 | 12/29 | 12/30 |
| Weather | Sun | Cloudy | Sun | Rain | Sun | Sun | Cloudy | Cloudy | Cloudy | Rain | Snow | Sun |
| Lanes | 5 | 12 | 11 | 7 | 12 | 8 | 6 | 10 | 8 | 6 | 4 | 8 |
| Avg Wait  Time (Min) | 12.2 | 4.2 | 4.4 | 6.75 | 3.8 | 5.75 | 10.4 | 6.5 | 6.25 | 9.2 | 1.1 | 5.6 |

* 1. What is the explanatory variable? What is the response variable? .
  2. For answer # 1, make a scatterplot on your calculator and draw it below.
  3. There is a clear outlier on your scatterplot. Circle it.
  4. Give a reason that would justify eliminating the outlier.
  5. Generate the least squares regression line that describes the data (with the outlier eliminated). (2 dec places).
  6. Give the meaning of the slope in the LSRL.
  7. What specific point is the LSRL guaranteed to go through?
  8. Describe the data in terms of form, direction, and strength.
  9. Find the value of *r*. Interpret it.
  10. Find the value of *r*2 . Interpret it.
  11. What is the predicted average waiting time if Walmart opens 9 lanes?
  12. What is the predicted average waiting time if Walmart opens 7 lanes?
  13. What is the difference between the actual waiting time and predicted waiting time for 7 lanes?
  14. If Walmart decides that it wants its customers to wait no longer than 4.5 minutes, how many lanes should it open?
  15. If Walmart decides that it wants its customers to wait no longer than 10 minutes, how many lanes should it open?
  16. What is the predicted average waiting time if Walmart opens only one lane?
  17. What is the predicted average waiting time if Walmart opens 20 lanes?
  18. Why do the last two problems and answers make little sense for this problem?

On the same days of the previous problem, Walmart will need to hire extra staff to man the checkout lanes. They will have to pay out more money for the workers. The chart below describes how much money in pay it paid out during those hours on these specific days.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Date | 11/22 | 11/23 | 11/29 | 11/30 | 12/6 | 12/7 | 12/14 | 12/15 | 12/21 | 12/22 | 12/29 | 12/30 |
| Weather | Sun | Cloudy | Sun | Rain | Sun | Sun | Cloudy | Cloudy | Cloudy | Rain | Snow | Sun |
| Lanes | 5 | 12 | 11 | 7 | 12 | 8 | 6 | 10 | 8 | 6 | 4 | 8 |
| Avg Wait  Time (Min) | 12.2 | 4.2 | 4.4 | 6.75 | 3.8 | 5.75 | 10.4 | 6.5 | 6.25 | 9.2 | 1.1 | 5.6 |
| Salary for  extra staff | $213 | $451 | $444 | $256 | $498 | $301 | $229 | $364 | $291 | $253 | xxxx | $320 |

* 1. What is the explanatory variable? What is the response variable .
  2. For answer # 19, make a scatterplot on your calculator and draw it below.
  3. Generate the least squares regression line that describes the data and draw it on the graph above. 2 dec places)
  4. Give the meaning of the slope in the LSRL.
  5. What specific point is the LSRL guaranteed to go through?
  6. Describe the data in terms of form, direction, and strength.
  7. Find the value of *r*. Interpret it.
  8. Find the value of *r*2 . Interpret it.
  9. What is the predicted extra salary if Walmart opens 9 lanes?
  10. What is the predicted extra salary if Walmart opens 7 lanes?
  11. What is the difference between the actual extra salary and predicted extra salary for 7 lanes?
  12. If Walmart will pay no more than $500 in extra salary, find the maximum lanes it can open.
  13. If Walmart will pay no more than $250 in extra salary, how the maximum lanes it can open.
  14. What is the predicted extra salary if Walmart opens no lanes?
  15. What is the predicted extra salary if Walmart opens 50 lanes?
  16. Why do the last two problems and answers make little sense for this problem?
  17. A Walmart manager needs to decide how many lanes to open. Based on the data of the and the previous

page, explain the dilemma he has in making a decision.