Multiple Choice Key

1. b
2. b
3. c
4. b
5. a
6. c
7. b
8. c
9. a
10. d
11. a
12. c
13. d
14. c
15. a
16. d
17. b
18. a
19. c
20. d
21. b
22. c
23. b
24. d
25. c

-Tie Breaker Question 1-

ABBREVIATED Question: Describe the following data as Categorical or Quantitative. If you describe the data as Categorical you must also indicate whether it is nominal, binary/dichotomous, or ordinal. If you describe the data as Quantitative you must also indicate if it is discrete or continuous.

Solution:

- State of Residence
  - Categorical; Nominal

- Number of Children
  - Quantitative; Discrete

- Time Spent Working per Week (hours)
  - Quantitative; Continuous (theoretically)

- Pell Grant Received (Yes/No)
  - Categorical; Binary/Dichotomous

- Distance from Hometown (miles)
  - Quantitative; Continuous (theoretically)

Rubric: 0 pts to 5 pts Possible

1 point for each completely correct description above
½ point for each partially correct description above
    e.g., Distance from Hometown (miles) described as Quantitative but Discrete (rather than Continuous)
0 points for each incorrect description above

-Tie Breaker Question 2-

ABBREVIATED Question: Do the data indicate that average product prices are significantly higher on Amazon compared to Walmart? Conduct an appropriate hypothesis test to answer this question using a 0.05 significance level. Provide the hypotheses, test statistic(s), p-value(s), and a formal conclusion.

Solution:

Notice that we have two paired/dependent samples here, as the Amazon and Walmart observations are paired by product type

- **Hypotheses**

$$\begin{cases} H_0: \mu_d = 0 \\ H_1: \mu_d > 0 \end{cases}$$

    where $d = \text{Amazon} - \text{Walmart}$

- **Test Statistic**
  $t = 1.382, \, df = 4$

- **P-Value**
  $p - value = 0.120$

- **Formal Conclusion at $\alpha = 0.05$ (in terms of H_0)**
  Fail to reject the null hypothesis at the 5% significance level. There is not sufficient evidence to support the claim that average product prices are significantly higher on Amazon compared to Walmart.

Rubric: 0 pts to 4 pts Possible

1 point for each completely correct answer and 0 points for each incorrect answer of the following tie breaker components: (1) hypotheses, (2) test statistic, (3) p-value, and (4) formal conclusion

-Tie Breaker Question 3-

ABBREVIATED Question: Data (current as of February 23, 2020) resulted in the following simple linear regression equation $\hat{y} = 12244.12 - 1.86x$, where x represents the distance between a country and the outbreak epicenter (in kilometers) and y represents the number of novel coronavirus cases in a country.

One currently affected country is approximately 6085 kilometers from the outbreak epicenter and has a residual of -480. What was the ***observed*** number of novel coronavirus cases in the country? Round to the nearest whole number. You must provide reasoning for your answer.

Solution: $\text{Cases}_{\text{Observed}} = y \approx 446$

*** Steps**

1. Notice that a residual is equal to the observed value minus the predicted value i.e.

$$\text{Residual} = \text{Cases}_{\text{Observed}} - \text{Cases}_{\text{Predicted}} = y - \hat{y}$$

2. Thus, we know that $-480 = \text{Cases}_{\text{Observed}} - \text{Cases}_{\text{Predicted}} = y - \hat{y}$

   We are looking for $\text{Cases}_{\text{Observed}}$

   At first it looks like this would be impossible to find until we realize we can calculate the

   predicted amount of cases provided i.e. $\text{Cases}_{\text{Predicted}}$ from the SLR equation as

$$\text{Cases}_{\text{Predicted}} = \hat{y} = 12244.12 - 1.86 * 6085 \approx 926.02$$

3. So, now, we have the following:

$$-480 = \text{Cases}_{\text{Observed}} - (926.02)$$

   And solving for $\text{Cases}_{\text{Observed}}$, we find that

$$\text{Cases}_{\text{Observed}} = y \approx 446$$

Rubric: 0 pts to 3 pts Possible

1 point for each completely correct step and 0 points for each incorrect step on the problem steps labeled #1-3 above i.e., one point is possible for each of the following: (1) correct definition of residual, (2) correct calculation of predicted number of cases from SLR equation, (3) correct calculation of observed number of cases

If the correct final solution is provided but a step (#1-3) is skipped, 3 points should be awarded as long as sufficient work was shown or sufficient reasoning was provided for the answer.