Regression analysis

For each task, Please:

1. Fit a linear regression model and interpret the coefficients. Additionally, assess the significance of the predictor variable (5% significance level)

2. Check regression assumptions using appropriate techniques (e.g., residual plots, normality tests).

3. Make individual response predictions for a new observation using the fitted regression model.

4. Make mean response predictions for a new observation with a confidence interval (95% confidence interval).

5. Use the Rmd template that is given before and report on a word document.

Task a:

Objective: Investigate the relationship between fertilizer usage and crop yield.

Data:

Fertilizer Usage (kg/acre): [50, 70, 90, 110, 130, 150, 170, 190, 210, 230, 250, 270, 290, 310, 330, 350, 370, 390, 410, 430]

Crop Yield (tons/acre): [2.8, 3.4, 3.7, 4.9, 5.6, 6.2, 6.9, 7.7, 8.4, 8.9, 9.8, 10.5, 11.3, 11.8, 12.6, 13.3, 14.2, 14.8, 15.6, 16.2]

Task b:

Objective: Analyze the impact of irrigation frequency on plant height.

Data:

Irrigation Frequency (times/week): [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20]

Plant Height (cm): [10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 105]

Task c:

Objective: Explore the relationship between sunlight exposure and fruit weight.

Data:

Sunlight Exposure (hours/day): [6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25]

Fruit Weight (grams): [50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240]

Task d:

Objective: Investigate the correlation between soil pH level and crop yield.

Data:

Soil pH Level: [4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5, 9.0, 9.5, 10.0, 10.5, 11.0, 11.5, 12.0, 12.5, 13.0, 13.5, 14.0]

Crop Yield (tons/acre): [3.2, 3.7, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5, 9.0, 9.5, 10.0, 10.5, 11.0, 11.5, 12.0, 12.5]

Task e:

Objective: Examine the impact of temperature on seed germination time.

Data:

Temperature (°C): [10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48]

Germination Time (days): [7, 6.8, 6.5, 6.2, 6, 5.8, 5.5, 5.3, 5.2, 5, 4.8, 4.7, 4.5, 4.3, 4.2, 4.1, 4, 3.8, 3.7, 3.5]