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SCHOOL OF ADVANCED SCIENCES

Winter Semester 2024-2025

Practice Problems : Module 1

Programme Name & Branch	**: MSc. & Data Science**
Slot	**: A2+TA2**
Course Name & code	**: Regression Analysis and Predictive Models & PMDT504L**
Faculty Name	**: Dr. Jisha Francis**
Due Date	**: 3 Jan, 2025**

Simple Linear Regression Model Questions

1. Heights of Fathers and Daughters

The following data represents the heights of fathers and their daughters:

Table 1: Height Data

Height of Father (cm)	Height of Daughter (cm)
65	67
66	68
67	64
67	69
68	72
69	70
71	69
73	73

1. Fit a linear regression model to predict the height of the daughter (y) based on the height of the father (x).
2. Use the fitted model to predict the height of a daughter when the father's height is 70 cm.
3. Compute the residuals for the given data points.
4. Plot the fitted regression model and the given data points on a graph.

2. History and Algebra Scores

The scores of students in History and Algebra are shown below:

Table 2: Scores Data

History	Algebra
35	30
23	33
47	45
17	23
10	8
43	49
9	12
6	4
28	31

1. Fit a linear regression model to predict Algebra scores (y) based on History scores (x).
2. Predict the Algebra score for a student who scored 40 in History.
3. Compute the residuals for the given data points.
4. Plot the fitted regression model and the data points.

3. Cell Growth and pH Levels

The data below represents the growth of a cell culture (optical density) measured at different pH levels:

Table 3: Experiment Results

pH	Optical Density
3	0.1
4	0.2
4.5	0.25
5	0.32
5.5	0.33
6	0.35
6.5	0.47
7	0.49
7.5	0.53

1. Fit a linear regression model to predict Optical Density (y) based on pH (x).
2. Use the fitted model to predict the Optical Density at pH $= 6.2$.
3. Compute the residuals for the given data points.
4. Plot the fitted regression line and the given data points.

4. Height and IQ Scores

The heights of high school girls and their corresponding IQ scores are given below:

Height (in), x	IQ Score, y
62	109
58	102
65	107
67	114
59	96
64	110
65	116
57	128

1. Fit two regression models: one to predict y (IQ Score) based on x (Height) and another to predict x (Height) based on y (IQ Score).
2. Predict the IQ score for a height of 63 inches using the appropriate model.
3. Compute the residuals for the given data points.
4. Plot the regression model(s) and data points on a graph.