Explanatory Variable = Meals

Response Variable = Mercury

Form : Somewhat linear

Direction : Positively Associated

Strength : Not very strong

Chart, scatter chart

Description automatically generated

2.)

The correlation coefficient is 0.6991094, this is a moderate positive relationship.

3.)

Least squares equation y= 1.687643 + 0.27595X

Text

Description automatically generated

Chart, scatter chart

Description automatically generated

4)

|  |  |  |
| --- | --- | --- |
|  | Standard Deviation | Mean |
| Meals | 6.404702 | 8.3 |
| Mercury | 2.528044 | 3.97803 |

B0 = 3.97803 – 8.3\*0.27595 = 1.687643

This is the y intercept, it ensures the line passes through a point (mean(x), mean(y)).

B1 = 0.6991094\*(2.528044/6.404702) = 0.27595

This is the slope of the regression line, it gives the predicted change in the response variable for a one unit increase, as well as insight to the direction of the relationship between variables.

Text

Description automatically generated

5.)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Sum of Squares | Degrees of Freedom | Mean Square | F statistic | P value |
| Regression | 309.24 | 1 | 309.239 | 93.689 | 6.01E-16 |
| Residual | 323.47 | 98 | 3.301 |  |  |
| Total | 632.71 |  |  |  |  |

Step 1

* H0:B1=0 (there is no linear association)
* H1:B1≠0   (there is a linear association)
* α=0.10

Step 2

Test Statistic:

* F=MS Reg/MS Res with 1 and 98 degrees of freedom

Step 3

F Critical Value

1, 98 degrees of freedom

α = .1

Decision Rule: Reject H0 if F is greater than or equal to 2.75743

Step4

F Statistic:

* F= 93.689

Step 5

Since the F statistic is greater than the f critical value, we reject the null hypothesis that there is no linear association between fish meals eaten and mercury levels

R Squared = 0.4888 which signifies that 48% of the variability in mercury levels can be attributed to the number of meals of fish consumed.

The confidence interval for 90% of the slope is between .228609 and 0.3232916

Text

Description automatically generated

R Code:

rm(list=ls()); cat("\014")

#Set directory

setwd("C:/Users/HP/Documents/555")

getwd()

#1

#Import spreadsheet

fish = read.csv("Hw\_3.csv", header = TRUE)

fish

plot(fish$Fish\_Meal , fish$Mercury, col = "blue",

xlab= "Fish Meals Eaten", ylab = "Mercury Levels",

main = "Mercury in Fish Meals")

#2

# Calculate correlation

cor(fish$Fish\_Meal, fish$Mercury)

#3

# Calculate standard deviations

sd.meals <- sd(fish$Fish\_Meal)

sd.meals

sd.mercury <- sd(fish$Mercury)

sd.mercury

m.meals <- mean(fish$Fish\_Meal)

m.meals

m.mercury <- mean(fish$Mercury)

m.mercury

# Perform Linear Regression.

m <- lm(fish$Mercury ~ fish$Fish\_Meal)

m

# Get summary of linear regression.

summary(m)

# Plot scatter plot.

plot(fish$Fish\_Meal , fish$Mercury, col = "purple",

xlab= "Fish Meals Eaten", ylab = "Mercury Levels",

main = "Mercury in Fish Meals")

# Plot regression line.

abline(m)

#4.)

summary(m)

#5.)

#Calculate Anova Table

anova.table <- anova(m)

anova.table

#Calculate F statistic

qf(p=.9, df1=1, df2=98)

#Calculate R squared

RegSS <- 309.24

Total <- 309.24 + 323.47

R\_squared <- RegSS/Total

R\_squared

#Calculate Confidence Interval

confint(m,level = 0.90)