Answers: Introduction to linear regression

Flora Green

Summary

Answers to questions relating to the guide on introduction to linear regression.

These are the answers to Questions: Introduction to linear regression.

Please attempt the questions before reading these answers!

Q1

1.1. α is the y-intercept of the regression line $\mathbb{E}(Y) = \alpha + \beta x$.

1.2. β is the gradient of the regression line $\mathbb{E}(Y) = \alpha + \beta x$.

Q2

2.1. A residual is the difference between the observed value y_i and the estimated value $\mathbb{E}(Y_i)$.

2.2. It minimizes the squared sum of the residuals to find the optimal regression line for a sample of data.

Q3

3.1. Here, $\hat{\alpha} = 146.6853$.

3.2. Here, $\hat{\beta} = 1.7044$.

3.3. $\mathbb{E}(Y) = \alpha + \beta x = \hat{\alpha} + \hat{\beta} x = 146.6853 + 1.7044x$

3.4. The R^2 coefficient of determination is 0.2691, which suggests that the response variable is not well modelled by a linear model of the explanatory variable.

Please note that for this question, the following R code was used. It is recommended that you use Calculator: Simple linear regression or statistical software like this to do these calculations, as these can be very tedious to do by hand.

```r
confectionery = data.frame(customers=c(43,54,65,42,68,49,
63,57,71,47,75,67),sweets=c(188,197,215,217,233,244,254,256,
274,286,291,300))
model=lm(sweets~customers,data=confectionery)
summary(model)

plot(confectionery$customers, confectionery$sweets,
     pch = 19, col = "#3f68b6",
     xlab = "Number of customers",
     ylab = "Sweets sold")

abline(model, col = "#db4315", lwd = 2)
```

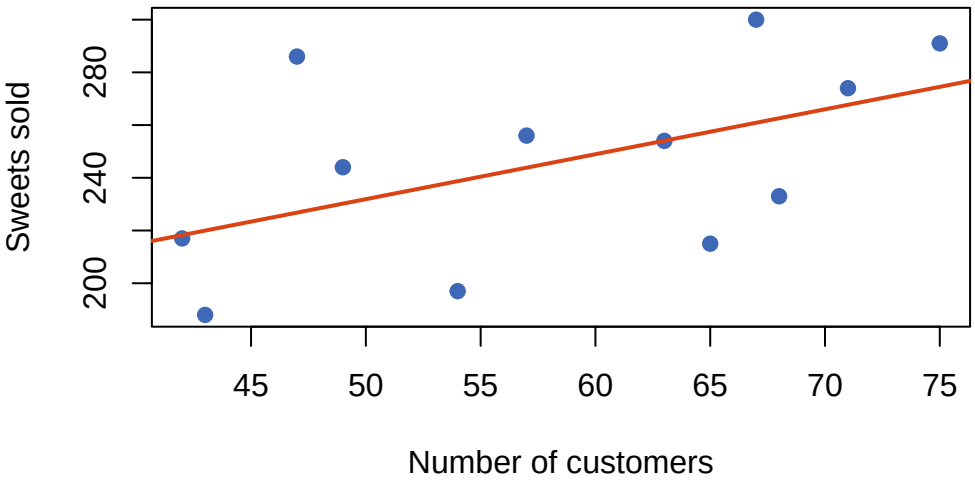
Code output:

```
Call:
lm(formula = sweets ~ customers, data = confectionery)

Residuals:
    Min      1Q  Median      3Q     Max
-42.471 -30.181   3.121  14.471  59.208

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 146.6853    52.7694   2.780   0.0195 *
customers     1.7044     0.8882   1.919   0.0839 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 33.36 on 10 degrees of freedom
Multiple R-squared:  0.2691,    Adjusted R-squared:  0.1961
F-statistic: 3.683 on 1 and 10 DF,  p-value: 0.08395
```



Version history and licensing

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