Lab 02

Johnson ODEJIDE

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## a.

### Calculation of the Confidence Inverval

se = 0.4690

df = 8

b +/- t(se)

t = 2.306004

4.0 +/- 2.306004(0.4690)

confidence interval = (4.0 - 2.306004(0.4690), 4.0 + 2.306004(0.4690))

= (2.9185, 5.0815)

X = c(1, 0, 2, 0, 3, 1, 0, 1, 2, 0)  
Y = c(16, 9, 17, 12, 22, 13, 8, 15, 19, 11)  
  
d.data <- tibble(X, Y)  
  
conf.95 <- qt(p=.025, df=8, lower.tail = FALSE)  
  
# conf.95  
  
lm.fit <- lm(Y ~ X, data = d.data)  
# lm.fit  
  
# summary(lm.fit)  
  
# qt(p=.025, df=8, lower.tail = FALSE)  
# 4.00 +/- 2.306(0.469)  
  
upper\_bound <- 4.00 + 2.306 \* 0.469  
lower\_bound <- 4.00 - 2.306 \* 0.469  
  
conf.int <- c(lower\_bound, upper\_bound)  
conf.int

## [1] 2.918486 5.081514

## b.

While the prediction interval predicts in what range a future observation will fall, the confidence interval shows in what range of values the prediction falls based on some data provided already. In summary, confidence interval predicts what is available within the limits of the data while prediction interval is able to predict the future.

## c.

new\_df <- data.frame(X = 19)  
  
predict(object = lm.fit, newdata = new\_df, interval = "prediction") %>%   
cbind(new\_df)

## fit lwr upr X  
## 1 86.2 66.40325 105.9967 19

predict(object = lm.fit, newdata = new\_df, interval = "confidence") %>%   
cbind(new\_df)

## fit lwr upr X  
## 1 86.2 66.70097 105.699 19

***Prediction Interval when X = 19***

(66.4033, 105.9967)

***Confidence Interval when X = 19***

(66.701, 105.699)