Lab 17 R Script

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1) Beer vs BAL

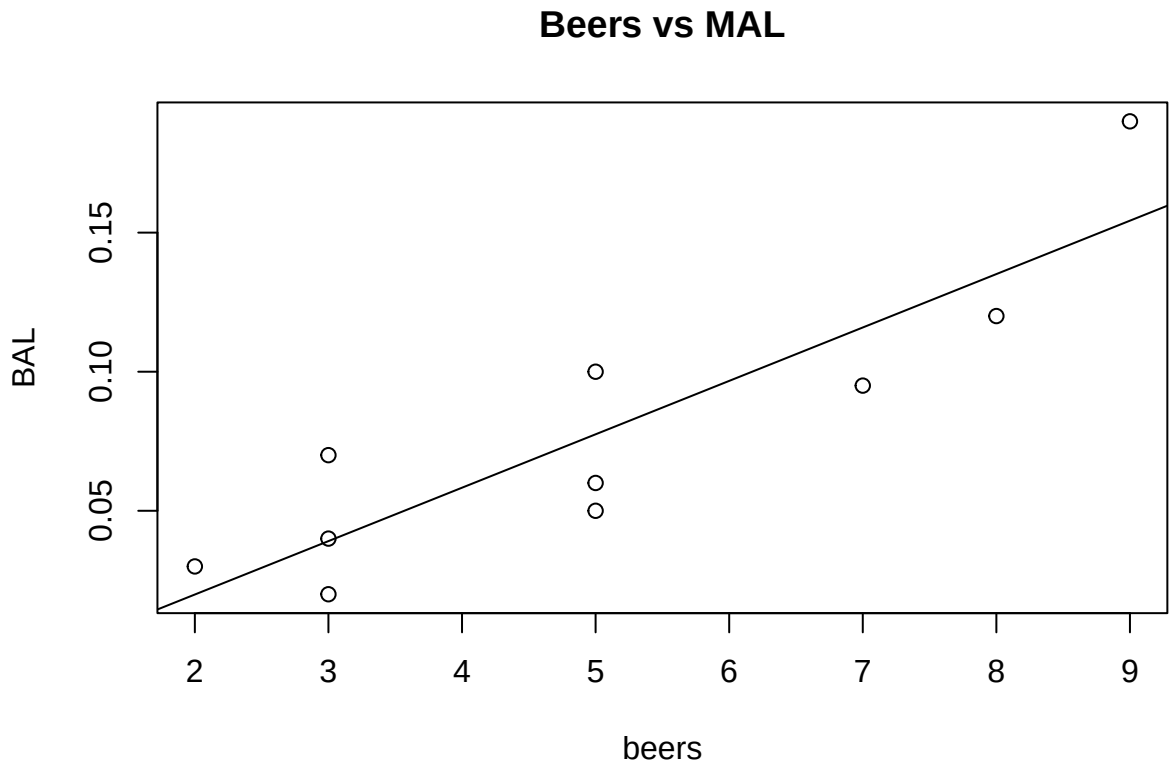
a) Make a scatterplot with a regression line

```
beers = c(5 ,    2     ,   9 ,    8,   3 ,   7 ,    3,     5,    3 ,   5)
BAL = c(0.10 , 0.03 , 0.19 , 0.12 , 0.04 , 0.095,  0.07,  0.06 , 0.02 , 0.05)

model = lm(BAL ~ beers)
model
```

```
##
## Call:
## lm(formula = BAL ~ beers)
##
## Coefficients:
## (Intercept)        beers
##     -0.0185       0.0192
```

```
# BAL = -0.0185 + 0.0192*beers
plot(beers, BAL,
     main="Beers vs MAL")
abline(model)
```



b) Calculate 95% confidence interval for the model parameters

```
confint(model)
```

```
##                   2.5 %     97.5 %
## (Intercept) -0.06284414 0.02584414
## beers        0.01110391 0.02729609
```

c) State the estimated linear regression model

```
summary(model)
```

```
##
## Call:
## lm(formula = BAL ~ beers)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0275 -0.0187 -0.0071  0.0194  0.0357
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.018500   0.019230  -0.962 0.364200
## beers        0.019200   0.003511   5.469 0.000595 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

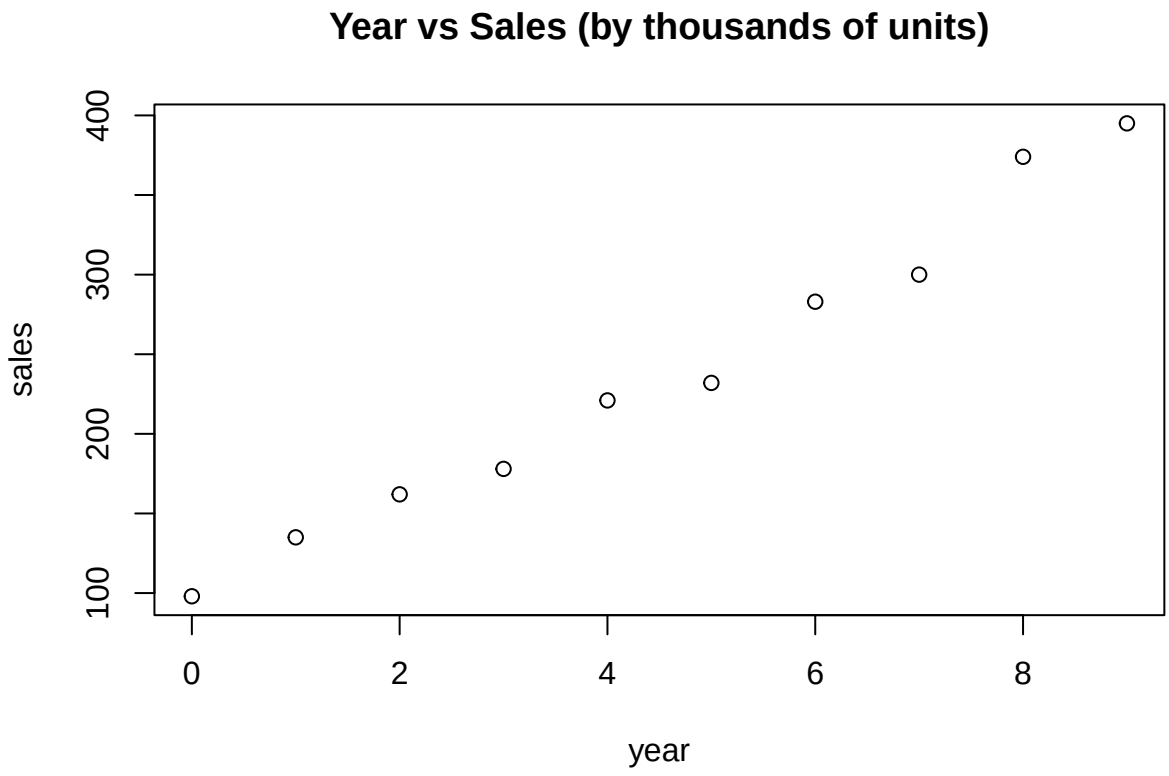
```
##
## Residual standard error: 0.02483 on 8 degrees of freedom
## Multiple R-squared:  0.789,  Adjusted R-squared:  0.7626
## F-statistic: 29.91 on 1 and 8 DF,  p-value: 0.0005953
```

```
# multiple R-squared: 0.789
```

2) Annual sales

a) Prepare a scatterplot of the data

```
year = c(0 , 1,  2 , 3,  4,  5 , 6 , 7,  8,  9)
sales = c(98 , 135 , 162 , 178 , 221 , 232 , 283 , 300 , 374,  395)
plot(year, sales, main="Year vs Sales (by thousands of units)")
```



b) no question 2.b.

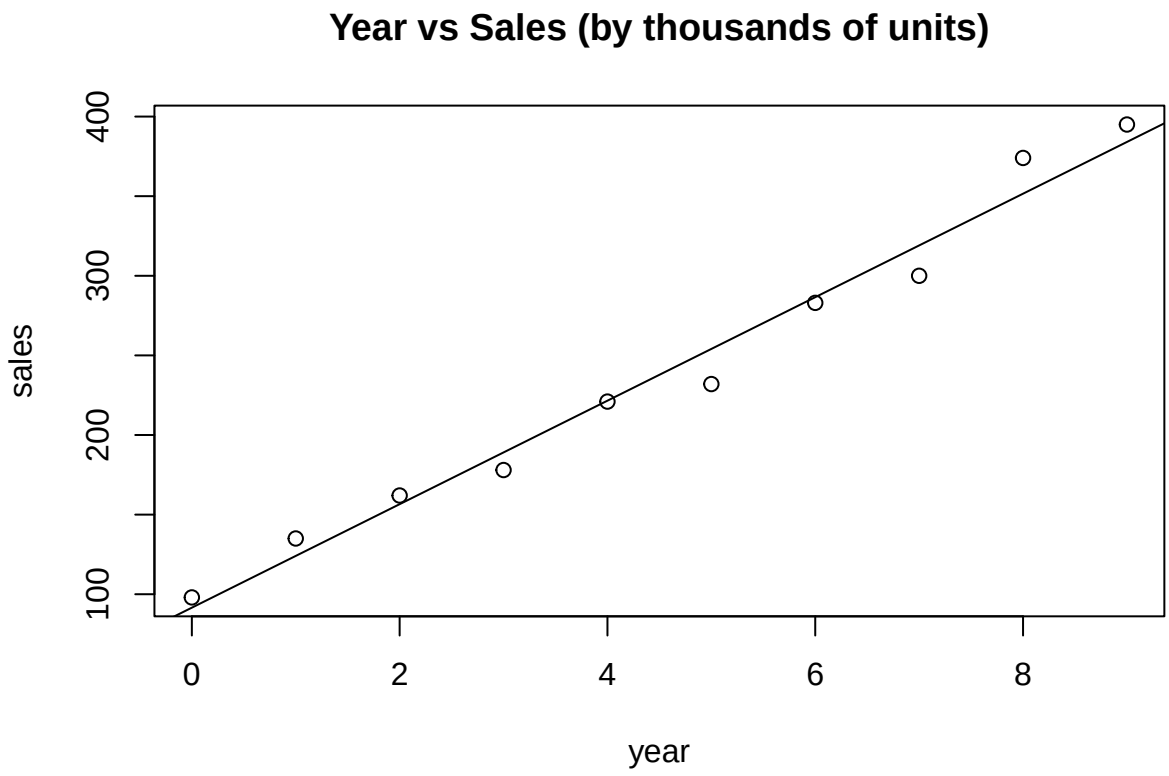
c) State the regression line and add to scatterplot

```
model = lm(sales ~ year)
model
```

```
##
## Call:
## lm(formula = sales ~ year)
##
```

```
## Coefficients:
## (Intercept)         year
##       91.56        32.50
```

```
# sales = 91.56 + 32.50*year
plot(year, sales, main="Year vs Sales (by thousands of units)")
abline(91.56, 32.5)
```



d) Use the model to predict sales in the 10th years. 90 and 95 confidence

```
predict(model, data.frame(year=10), interval="conf", level=0.95)
```

```
##        fit      lwr      upr
## 1 416.5333 392.9089 440.1578
```

```
# 95% confidence interval: (392.9089, 440.1578)
predict(model, data.frame(year=10), interval="conf", level=0.9)
```

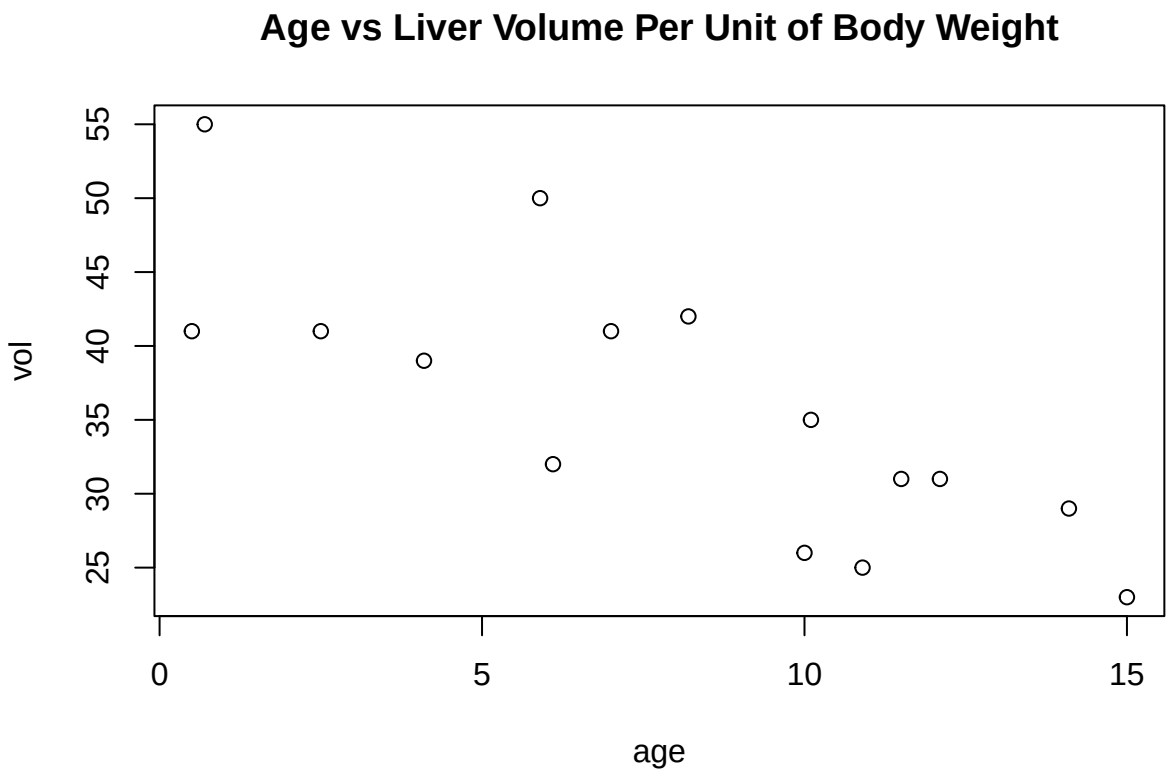
```
##        fit      lwr      upr
## 1 416.5333 397.4827 435.5839
```

```
# 90% confidence interval: (397.4827, 435.5839)
```

3) Age by Liver Volume per Unit of Body Weight

a) Prepare a scatter plot of the data

```
age = c(0.5, 0.7, 2.5, 4.1, 5.9, 6.1, 7, 8.2, 10, 10.1, 10.9, 11.5, 12.1, 14.1, 15)
vol = c(41, 55, 41, 39, 50, 32, 41, 42, 26, 35, 25, 31, 31, 29, 23)
plot(age, vol, main="Age vs Liver Volume Per Unit of Body Weight")
```



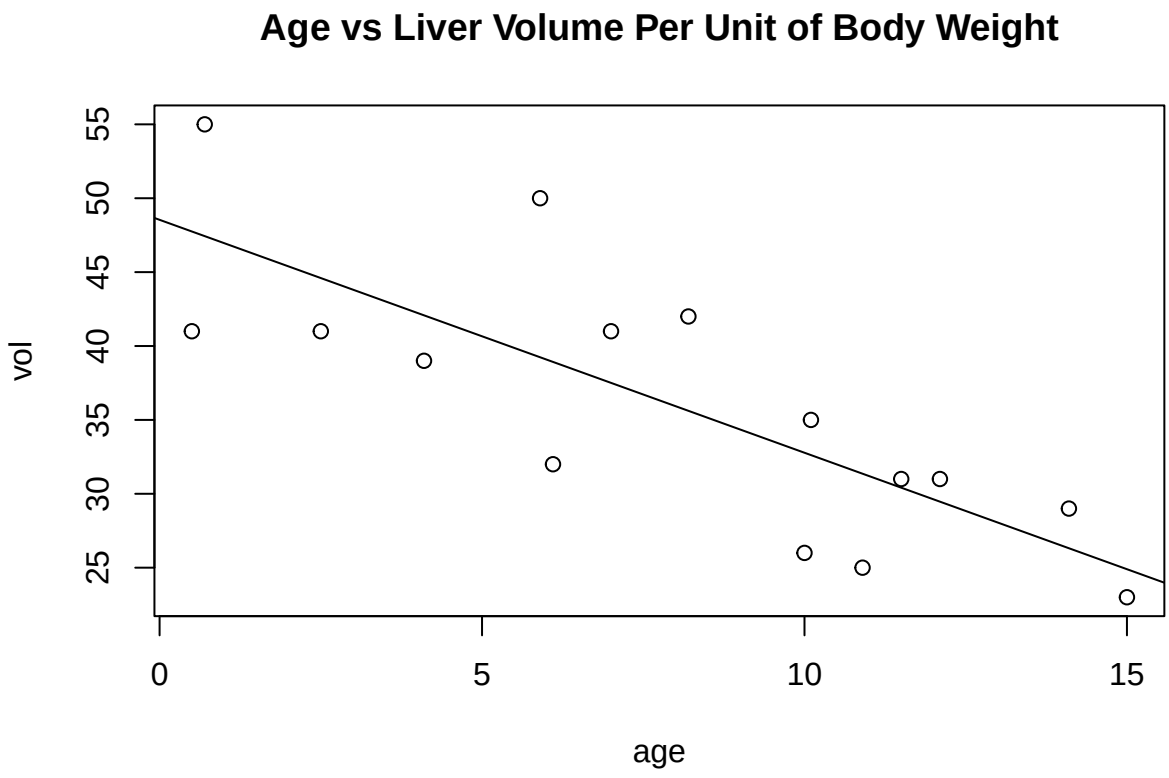
b) no question for 3.b.

c)

```
model = lm(vol ~ age)
model
```

```
##
## Call:
## lm(formula = vol ~ age)
##
## Coefficients:
## (Intercept)          age
##      48.540       -1.576
```

```
# vol = 48.540 - 1.576*age
plot(age, vol, main="Age vs Liver Volume Per Unit of Body Weight")
abline(model)
```



d) Use the model to predict the liver volume of an 8 year old child

```
predict(model, data.frame(age=8))
```

```
##        1
## 35.93006
```

e) Construct a 90% confidence interval for this prediction

```
predict(model, data.frame(age=8), interval="conf", level=0.9)
```

```
##        fit      lwr      upr
## 1 35.93006 33.24692 38.61321
```

```
# 90% confidence interval: (33.24692, 38.61321)
```

f) Construct a 90% prediction interval for this prediction

```
predict(model, data.frame(age=8), interval="pred",  level=0.9)
```

```
##        fit     lwr      upr
## 1 35.93006 25.1994 46.66072
```

```
# 90% prediction interval: (25.1994, 46.66072)
```