

Section_4.6-4.7.R

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```
# 4.6-1 (a)
x = c(70,74,80,84,80,67,70,64,74,82)
y = c(87,79,88,98,96,73,83,79,91,94)
a = mean(y)
a

## [1] 86.8
(sum(x*y) - mean(y)*sum(x))

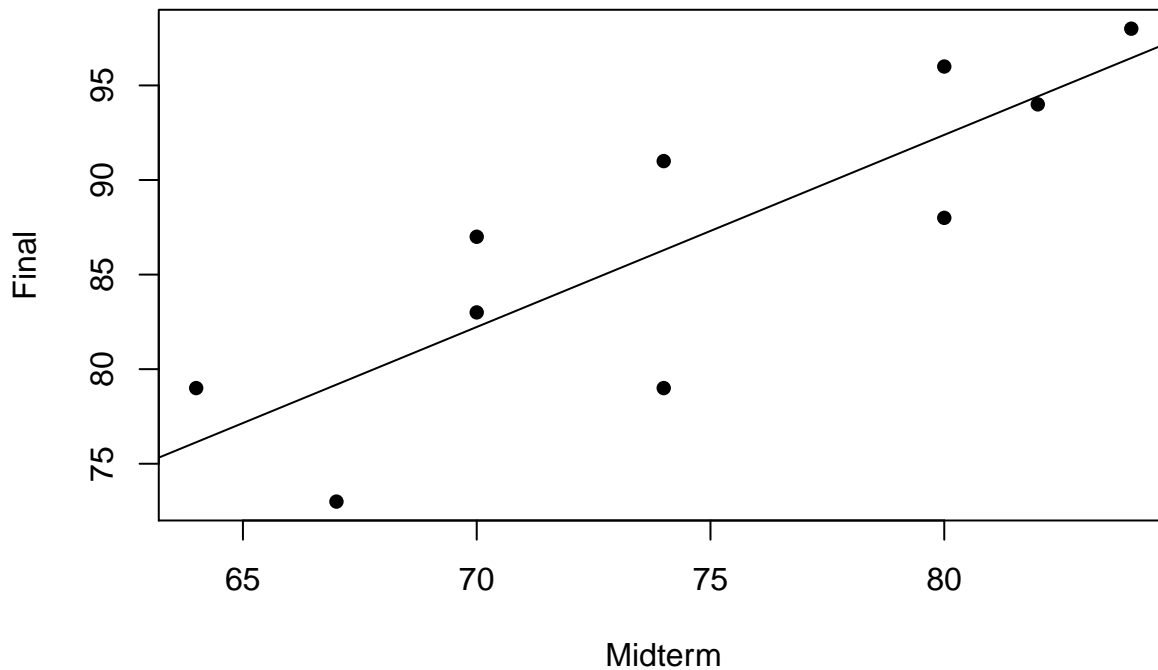
## [1] 421
(sum(x*x) - sum(x)*sum(x)/10)

## [1] 414.5
b = (sum(x*y) - mean(y)*sum(x))/(sum(x*x) - sum(x)*sum(x)/10)
b

## [1] 1.015682
mean(x)

## [1] 74.5
# 4.6-1 (b)
plot(x, y, xlab="Midterm", ylab="Final", pch = 16)
lm(y ~ x)

##
## Call:
## lm(formula = y ~ x)
##
## Coefficients:
## (Intercept)          x
##      11.132       1.016
abline(lm(y ~ x))
```



```
# 4.6-1 (c)
0.1*sum((y-a-b*(x-mean(x)))**2)

## [1] 17.99981

# 4.6-3 (a)
x = c(0,0,0,50,50,50,75,75,75,100,100,100,150,150,150,200,200,200)
y = c(1.72,1.68,1.74,2.04,2.11,2.17,2.40,2.32,2.33,2.91,3.00,2.89,4.47,4.51,4.43,6.67,6.66,6.57)
r = cov(x,y)/(sd(x)*sd(y))
r

## [1] 0.9527038

a = mean(y)
a

## [1] 3.367778

b = cov(x,y)/var(x)
b

## [1] 0.02490558

mean(x)

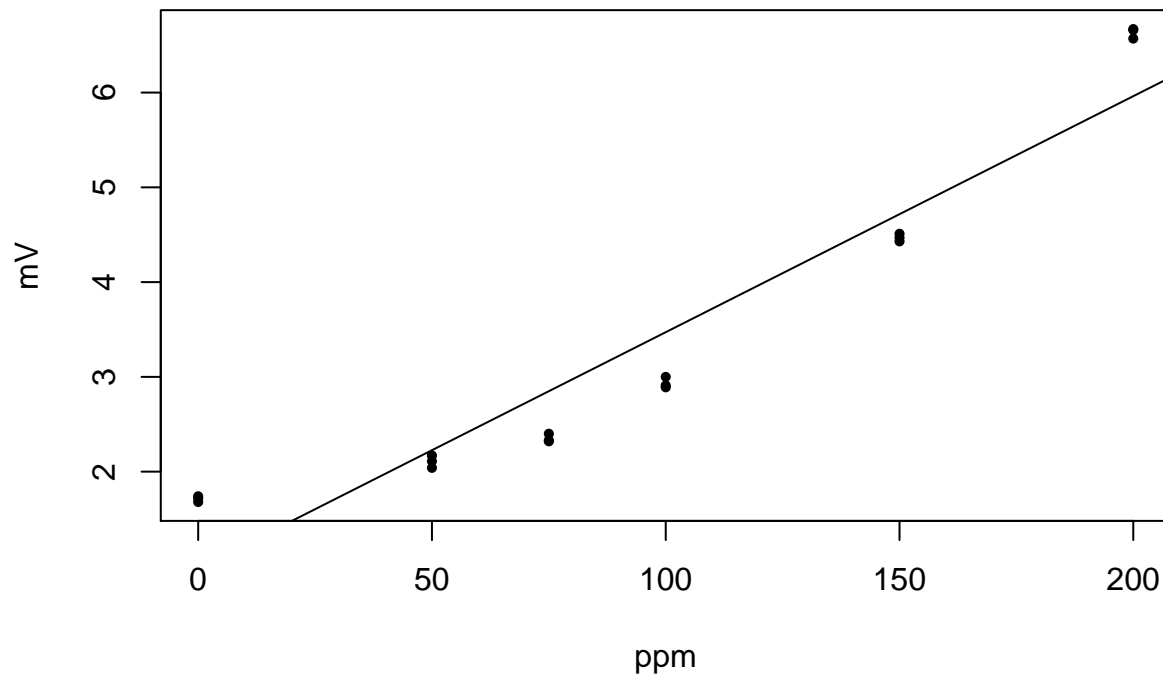
## [1] 95.83333

# 4.6-3 (b)
plot(x, y, xlab="ppm", ylab="mV", cex=0.7, pch = 16)
lm(y ~ x)

##
## Call:
## lm(formula = y ~ x)
##
## Coefficients:
## (Intercept)          x
```

```
##      0.98099      0.02491
```

```
abline(lm(y ~ x))
```



```
# 4.6-3 (c)
```

```
yi = a + b*(x-mean(x))
```

```
y-yi
```

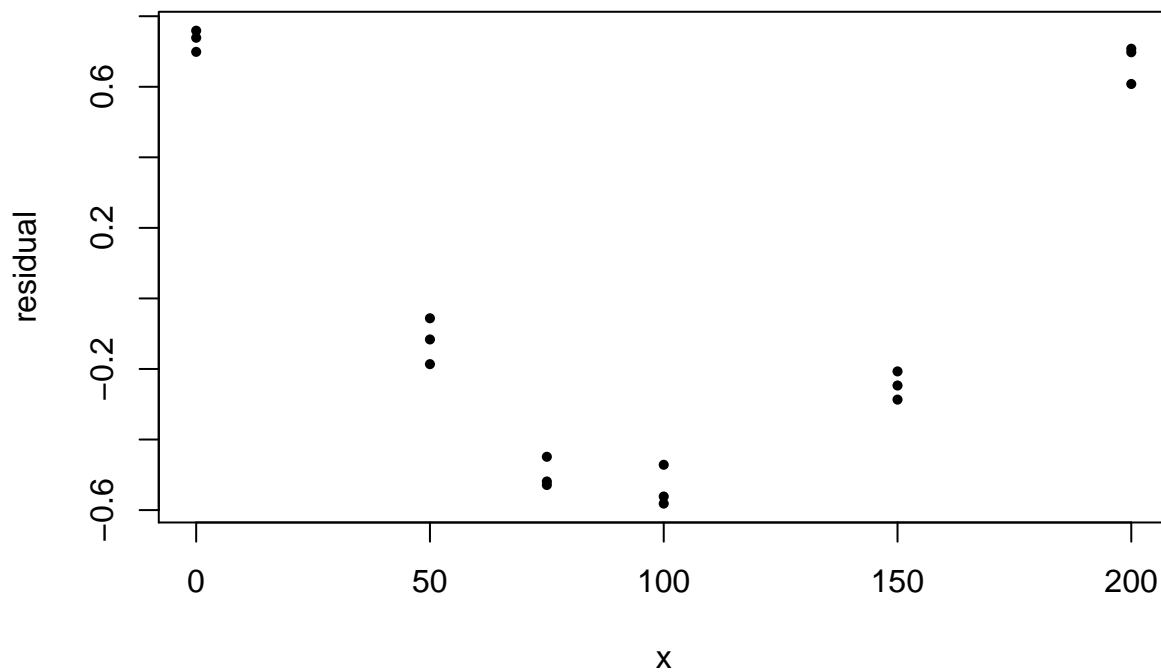
```
## [1] 0.73900680 0.69900680 0.75900680 -0.18627211 -0.11627211
```

```
## [6] -0.05627211 -0.44891156 -0.52891156 -0.51891156 -0.56155102
```

```
## [11] -0.47155102 -0.58155102 -0.24682993 -0.20682993 -0.28682993
```

```
## [16] 0.70789116 0.69789116 0.60789116
```

```
plot(x,y-yi,ylab="residual",cex=0.7, pch = 16)
```



```
# 4.6-7 (a)
x = c(32,23,23,23,26,30,17,20,17,18,26,16,21,24,30)
y = c(28,25,24,32,31,27,23,30,18,18,32,22,28,31,26)
a = mean(y)
a
```

```
## [1] 26.33333
```

```
b = cov(x,y)/var(x)
b
```

```
## [1] 0.5061636
```

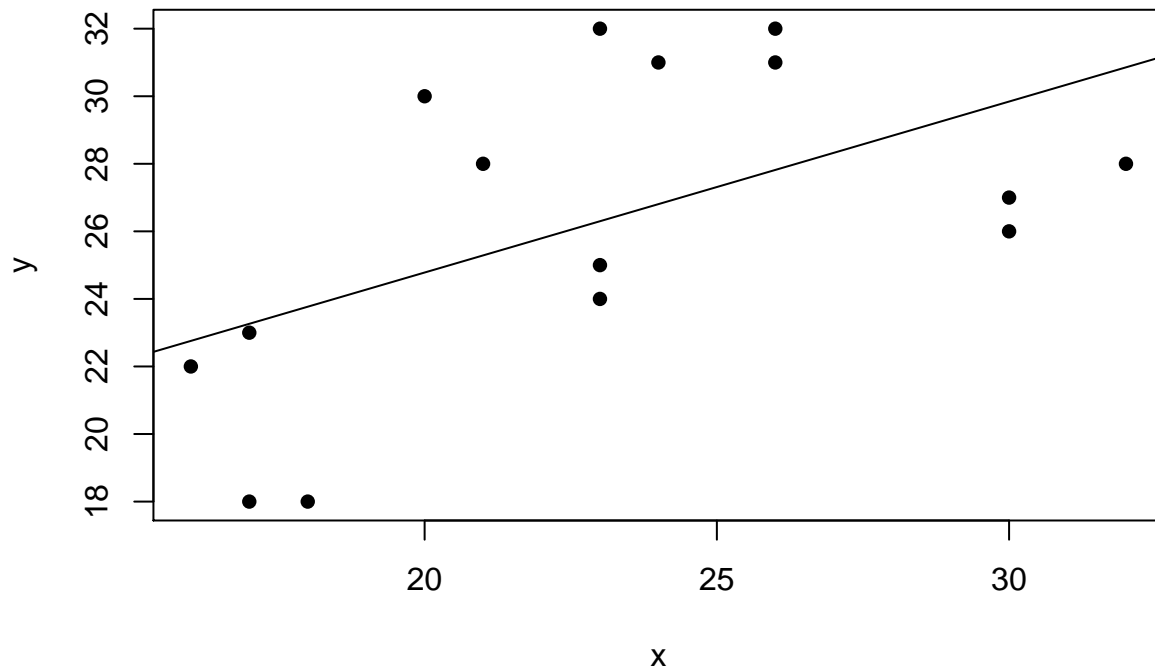
```
mean(x)
```

```
## [1] 23.06667
```

```
# 4.6-7 (b)
plot(x, y, pch = 16)
lm(y ~ x)
```

```
##
## Call:
## lm(formula = y ~ x)
##
## Coefficients:
## (Intercept)          x
##      14.6578      0.5062
```

```
abline(lm(y ~ x))
```



```
# 4.6-7 (c)
```

```
a
```

```
## [1] 26.33333
```

```
b
```

```
## [1] 0.5061636
```

```
var = sum((y-a-b*(x-mean(x)))**2)/15
var
```

```
## [1] 14.12576
```

```
a - qt(0.975, 13, lower.tail = TRUE, log.p = FALSE)*sqrt(var/13)
```

```
## [1] 24.08137
```

```
a + qt(0.975, 13, lower.tail = TRUE, log.p = FALSE)*sqrt(var/13)
```

```
## [1] 28.5853
```

```
b - qt(0.975, 13, lower.tail = TRUE, log.p = FALSE)*sqrt((15*var)/(13*sum((x-mean(x))**2)))
```

```
## [1] 0.04451215
```

```
b + qt(0.975, 13, lower.tail = TRUE, log.p = FALSE)*sqrt((15*var)/(13*sum((x-mean(x))**2)))
```

```
## [1] 0.9678151
```

```
15*var/qchisq(0.975, 13, ncp = 0, lower.tail = TRUE, log.p = FALSE)
```

```
## [1] 8.56605
```

```
15*var/qchisq(0.025, 13, ncp = 0, lower.tail = TRUE, log.p = FALSE)
```

```
## [1] 42.30325
```

```
# 4.6-8
```

```
qt(0.9875, 8, lower.tail = TRUE, log.p = FALSE)
```

```
## [1] 2.751524
x = c(70,74,80,84,80,67,70,64,74,82)
1.015682/sqrt(10*17.99981/(8*sum((x-mean(x))**2)))

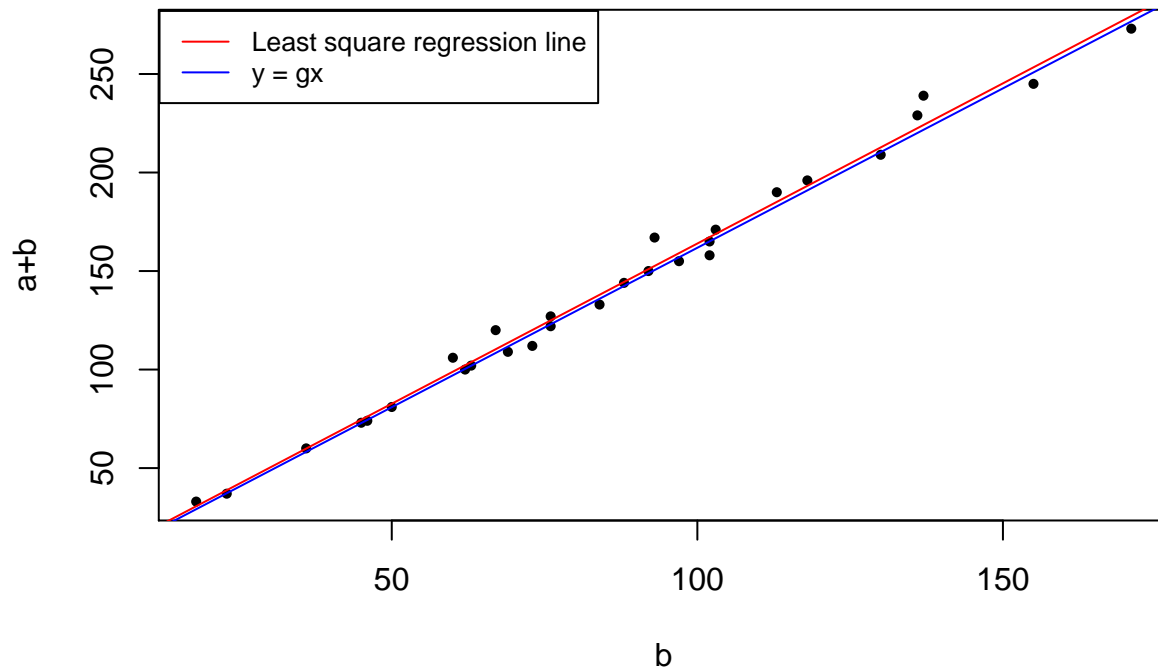
## [1] 4.359444
# 4.6-12 (a)
x = c(38,56,24,40,15,53,102,58,49,68,90,31,102,28,79,28,
      56,77,46,39,14,51,39,58,93,63,74,46,78)
y = c(62,102,36,69,18,67,171,97,84,103,155,50,137,45,130,
      46,88,113,60,63,23,76,73,92,136,102,93,76,118)
plot(y,x+y, xlab="b", ylab="a+b", cex= 0.7, pch=16)
# 4.6-12 (b)
a = mean(x+y)
a

## [1] 140.6897
b = cov(y,x+y)/var(y)
b

## [1] 1.625984
mean(y)

## [1] 85.68966
lm((x+y) ~ y)

##
## Call:
## lm(formula = (x + y) ~ y)
##
## Coefficients:
## (Intercept)          y
##      1.360         1.626
abline(lm((x+y) ~ y), col="red")
# 4.6-12 (c)
g = (1+sqrt(5))/2
abline(0, g, col="blue")
legend(12, 282, legend=c("Least square regression line", "y = gx"),
      col=c("red", "blue"), lty=1:1, cex=0.8)
```



```
# 4.6-12 (d)
mean((x+y)/y)
```

```
## [1] 1.647096
```

```
g
```

```
## [1] 1.618034
```

```
# 4.7-1 (a)
```

```
# x = 68
```

```
86.8+1.015682*(68-74.5)
```

```
## [1] 80.19807
```

```
x = c(70,74,80,84,80,67,70,64,74,82)
```

```
qt(0.975, 8)*sqrt(10*17.99981/8)*sqrt(0.1+(((68-74.5)**2)/sum((x-74.5)**2)))
```

```
## [1] 4.915294
```

```
80.19807-4.915294
```

```
## [1] 75.28278
```

```
80.19807+4.915294
```

```
## [1] 85.11336
```

```
# x = 75
```

```
86.8+1.015682*(75-74.5)
```

```
## [1] 87.30784
```

```
qt(0.975, 8)*sqrt(10*17.99981/8)*sqrt(0.1+(((75-74.5)**2)/sum((x-74.5)**2)))
```

```
## [1] 3.469403
```

```
87.30784-3.459006
```

```
## [1] 83.84883
```

```
87.30784+3.459006
```

```
## [1] 90.76685
```

```
#  $x = 82$ 
```

```
86.8+1.015682*(82-74.5)
```

```
## [1] 94.41761
```

```
qt(0.975, 8)*sqrt(10*17.99981/8)*sqrt(0.1+(((82-74.5)**2)/sum((x-74.5)**2)))
```

```
## [1] 5.310483
```

```
94.41761-3.462993
```

```
## [1] 90.95462
```

```
94.41761+3.462993
```

```
## [1] 97.8806
```

```
#  $4.7-1$  (b)
```

```
#  $x = 68$ 
```

```
86.8+1.015682*(68-74.5)
```

```
## [1] 80.19807
```

```
qt(0.975, 8)*sqrt(10*17.99981/8)*sqrt(1.1+(((68-74.5)**2)/sum((x-74.5)**2)))
```

```
## [1] 11.99192
```

```
80.19807-11.99192
```

```
## [1] 68.20615
```

```
80.19807+11.99192
```

```
## [1] 92.18999
```

```
#  $x = 75$ 
```

```
86.8+1.015682*(75-74.5)
```

```
## [1] 87.30784
```

```
qt(0.975, 8)*sqrt(10*17.99981/8)*sqrt(1.1+(((75-74.5)**2)/sum((x-74.5)**2)))
```

```
## [1] 11.47531
```

```
87.30784-11.47531
```

```
## [1] 75.83253
```

```
87.30784+11.47531
```

```
## [1] 98.78315
```

```
#  $x = 82$ 
```

```
86.8+1.015682*(82-74.5)
```

```
## [1] 94.41761
```

```
qt(0.975, 8)*sqrt(10*17.99981/8)*sqrt(1.1+(((82-74.5)**2)/sum((x-74.5)**2)))
```

```
## [1] 12.15924
```

```
94.41761-12.15924
```



```
## [1] 82.25837
94.41761+12.15924
## [1] 106.5768
```