Stat310 HW9 solutions (40'):

(10')

6.11–14 (a) $\widehat{\alpha} = \dfrac{395}{15} = 26.333,$

$$\widehat{\beta} = \frac{9292 - (346)(395)/15}{8338 - (346)^2/15} = \frac{180.667}{356.933} = 0.506,$$

$$\widehat{y} = 26.333 + \frac{180.667}{356.933}(x - \frac{346}{15})$$

$$= 0.506x + 14.657;$$

(b)

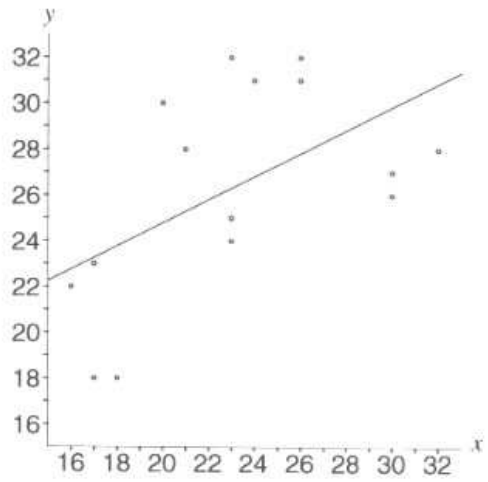


Figure 6.11–14: ACT natural science (y) versus ACT social science (x) scores

(10')

6.12–10 (a) and (b)

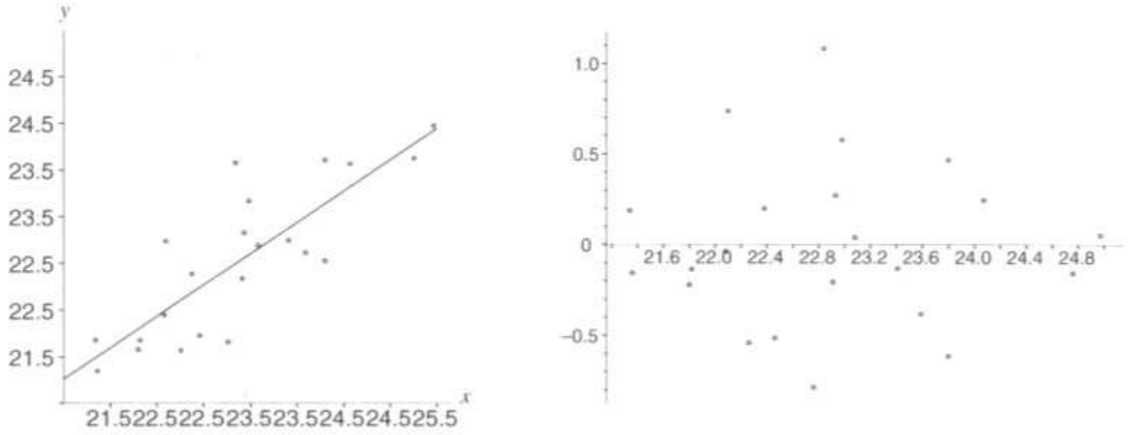


Figure 6.12–10: Swimmer's meet time (y) versus best year time (x) and residual plot

$\hat{\alpha} = 7.18358$, $\hat{\beta} = 0.6705089$, $\hat{y}_i = \hat{\beta}x_i + \hat{\alpha}$

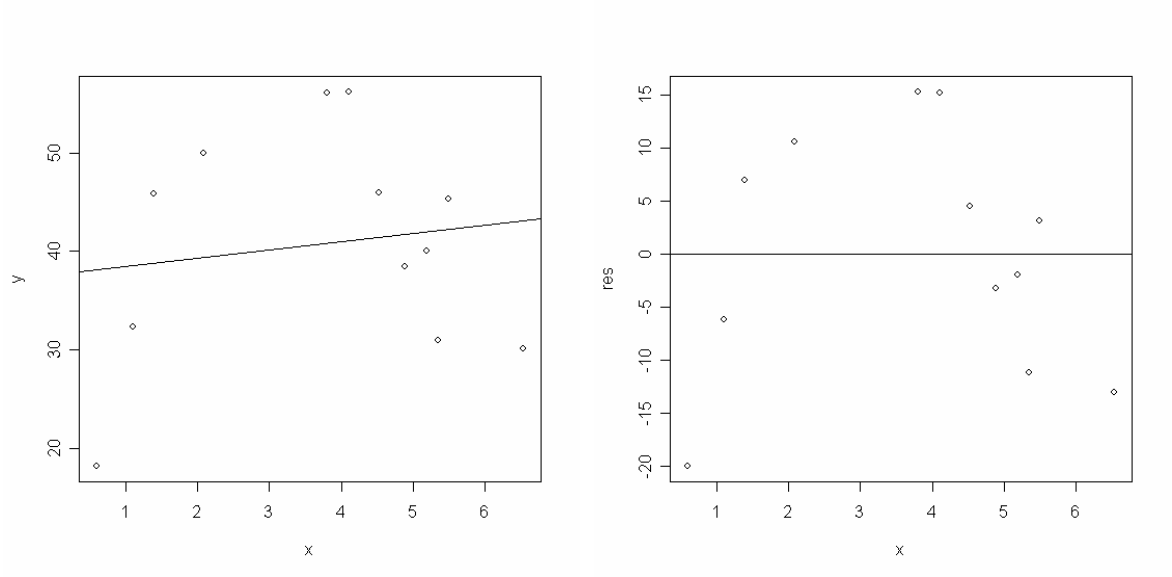
Yes, seem to be appropriate.

(20')

(a) $\rho = \dfrac{\frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\hat{\sigma}_x \hat{\sigma}_y} = 0.1430206$

(b) $\hat{\alpha} = 37.68335$, $\hat{\beta} = 0.8275959$, $\hat{y}_i = \hat{\beta} x_i + \hat{\alpha}$

(c) (d)



R code:

```
# 6.11-14
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)
m=lm(y~x)
c=m$coeff
plot(x,y)
abline(c[1],c[2])
# underlying calculation
b1=sum((x-mean(x))*(y-mean(y)))/sum((x-mean(x))^2)
b0=mean(y)-b1*mean(x)

# 6.12-10
x=c(24.97,24.07,22.10,22.38,21.34,22.26,24.76,22.98,23.08,22.91,22.76,2
1.36,23.80,22.93,23.59,22.08,21.82,22.84,23.41,23.80,22.46,21.80)
y=c(23.98,23.57,22.74,22.39,21.68,21.57,23.63,23.17,22.70,22.34,21.66,2
1.35,23.61,22.83,22.62,21.95,21.68,23.58,22.75,22.53,21.73,21.58)
m=lm(y~x)
c=m$coeff
plot(x,y)
abline(c[1],c[2])
res=y-predict(m)
plot(x,res)
abline(0,0)

# 6.12-13
x=c(4.11,5.18,4.52,5.49,4.89,1.11,5.35,2.09,0.60,6.53,1.40,3.80)
y=c(56.2,40.0,45.9,45.3,38.5,32.4,31.0,50.0,18.2,30.1,45.8,56.1)
cor(x,y)
# underlying calculation
sum((x-mean(x))*(y-mean(y)))/(length(x)-1)/sd(x)/sd(y)

m=lm(y~x)
c=m$coeff
# compare coefficients with cor*sd(y)/sd(x) and mean(y)-
cor*sd(y)/sd(x)*mean(x)
cor(x,y)*sd(y)/sd(x)
mean(y)-cor(x,y)*sd(y)/sd(x)*mean(x)

plot(x,y)
abline(c[1],c[2])
res=y-predict(m)
plot(x,res)
abline(0,0)
```