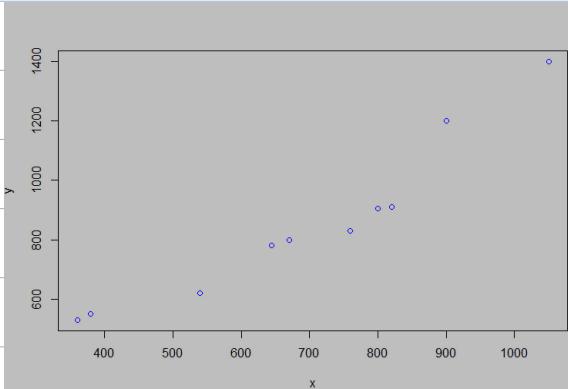


CH-10 Q-2

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bmat 1801

a)



From the scatterplot we can see the points plotted roughly form a line.

Also, we observe that there is a positive relationship between the variables — as the money spent on advertisement increases, the increase in sales also rises.

b. $y = 27.54 + 1.19 x$

```
> x <- c(380,645,360,900,540,670,820,1050,760,800  
> y <- c(550,780,530,1200,620,800,910,1400,830,90  
> lm(y~x)  
  
Call:  
lm(formula = y ~ x)  
  
Coefficients:  
(Intercept)           x  
      27.543        1.191  
  
> par(bg="gray")  
> plot(x,y,col="blue")
```

c (since unit of increase in sales not mentioned)

since slope is positive, there is a direct relationship between money spent on advertisement and increase in sales.

Slope = 1.19 \Rightarrow For every dollar spent on Television advertisement, there is 1.19 unit increase in increase in sales.

y-intercept = 27.54 \Rightarrow If 0 money is spent in advertising, there is 27.54 unit increase in sales.

d. $SSE = 63845.58$ (using function
 $\text{sum}((y - 1.191*x - 27.543)^2)$ in R)

$$s^2 = \frac{SSE}{n-2} = \frac{63845.58}{8} = 7980.6975$$

e. $r = 0.95$ (using function
 $(10 * \text{sum}(x*y) - \text{sum}(x) * \text{sum}(y)) / (\sqrt{10 * \text{sum}(x^2) - (\text{sum}(x))^2} * \sqrt{10 * \text{sum}(y^2) - (\text{sum}(y))^2})$ in R)

This value indicates strong positive correlation between x and y

f. Coefficient of determination = $r^2 \approx 0.91$
 Around 91% of increase in sales can be explained by money spent on advertising

$$g. H_0: \beta_1 = 1$$

$$H_a: \beta_1 \neq 1$$

$$t = \frac{\hat{\beta}_1 - 1}{s_{\hat{\beta}_1}} , s_{\hat{\beta}_1} = \frac{s}{\sqrt{SS_{XY}}} = \frac{\sqrt{7980.7}}{\sqrt{437462.5}} \approx 0.1352$$

$$\Rightarrow t = 1.416 \Rightarrow p = 0.1945 \quad (\text{for } df = 8)$$

does not fall in the region of rejection

$\Rightarrow H_0$ can't be rejected.

\Rightarrow Slope may be 1.