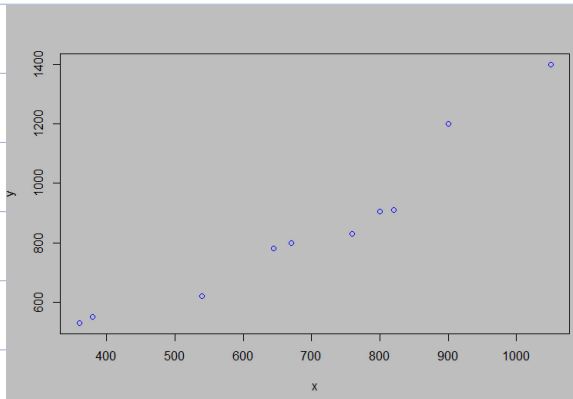


CH-10 Q-2

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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. $y = 27.54 + 1.19x$

```
> 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.

$$d. SSE = 63845.58 \quad \left(\begin{array}{l} \text{using function} \\ \text{sum}((y - 1.191 * x - 27.543)^2) \text{ in R} \end{array} \right)$$

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

$$e. r = 0.95 \quad \left(\begin{array}{l} \text{using function} \\ (10 * \text{sum}(x * y) - \text{sum}(x) * \text{sum}(y)) / \\ (\text{sqrt}(10 * \text{sum}(x^2) - (\text{sum}(x))^2)) * \\ \text{sqrt}(10 * \text{sum}(y^2) - (\text{sum}(y))^2)) \\ \text{in R.} \end{array} \right)$$

(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. $H_0: \beta_1 = 1$
 $H_a: \beta_1 \neq 1$

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

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

does not fall in the region of rejection

$\Rightarrow H_0$ can't be rejected.
 \Rightarrow slope may be 1.