# Version (B) - MODEL ANSWER

## Answer the following THREE questions:                    (Total Marks: 15)

### Question 1:                                                    marks: 6

A study on the pedaling technique of endurance cyclists reported the following data on single-led power at a high workload:
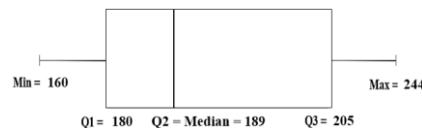
| 244 | 191 | 160 | 187 | 180 | 176 | 174 | 205 | 211 | 183 | 211 | 180 | 194 | 200 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|

a) **(3 mark)** Calculate the mean, median, the first quartile, the third quartile and the IQR.

- Mean $= \frac{\sum X}{N} = \frac{2969}{14} = \underline{\textbf{192.57}}$
- Median $= Q2 = \frac{187+191}{2} = \frac{378}{2} = \underline{\textbf{189}}$
- $Q1 = \underline{\textbf{180}}$
- $Q3 = \underline{\textbf{205}}$

IQR $= Q3 - Q1 = 205 - 180 = \underline{\textbf{25}}$

b) **(2 mark)** Construct a box plot for this data.



Min = 160    Q1 = 180    Q2 = Median = 189    Q3 = 205    Max = 244

c) **(1 mark)** What is the shape of the distribution?
**Since (Q2-Q1 < Q3-Q2) → Positive or Right Skewing**

### Question 2:                                                    marks: 5

**Education and crime rate ratings for selected US cities are given below:**

Education rating is an index for public/teacher ratio, academic options in higher education: the higher the rating the better and other factors and crime is the crime rate per 100 people.

| City | New York | Detroit | Los Angeles | Boston | Chicago | Washington, DC |
|------|----------|---------|-------------|--------|---------|----------------|
| Education (X) | 30 | 31 | 32 | 35 | 35 | 36 |
| Crime (Y) | 25 | 16 | 20 | 12 | 10 | 13 |

$(\bar{x} = 33.1667, S_X = 2.4833, \bar{Y} = 16, S_Y = 5.6214)$

a) **(3 mark)** Compute and interpret the correlation coefficient between X and Y.

| Education (X) | 30 | 31 | 32 | 35 | 35 | 36 | |
|---------------|------|------|------|------|------|------|---|
| Zx | -1.2752 | -0.873 | -0.4698 | 0.7383 | 0.7383 | 1.1409 | |
| Crime (Y) | 25 | 16 | 20 | 12 | 10 | 13 | |
| Zy | 1.601 | 0 | 0.7116 | -0.712 | -1.0673 | -0.5337 | |
| Zx*Zy | -2.0416 | 0 | -0.3343 | -0.525 | -0.788 | -0.6089 | $\sum Zx*Zy$ |
| | | | | | | | -4.2982 |

$r = \frac{\sum Zx*Zy}{n-1} = \frac{-4.2982}{5} = \underline{\textbf{-0.8596}}$ It is a **STRONG NEGATIVE or INVERSE** Relation

b) **(2 mark)** Estimate the crime rate for an education rating of 34.

$\hat{y} = bo + b1\,X$          $b_1 = r\frac{Sy}{Sx} = -0.8596 \frac{5.6214}{2.4833} = \underline{\textbf{-1.9459}}$

$b_o = \bar{y} - b_1\bar{x} = 16 - (-1.9459)(33.1667) = \underline{\textbf{80.539}}$

$\hat{y} = bo + b1\,X = \underline{\hat{y} = 80.539 - 1.9459\,X}$

At X = 34          $\underline{\hat{y} = 80.539 - 1.9459\,(34) = 14.3784}$

| **Question 3:** | **marks: 4** |
| --- | --- |

Suppose the highway fuel consumption of cars sold in a city follows a normal distribution with a mean of 8.7 L/100km and a standard deviation of 2.5 L/100km.

**μ = 8.7, σ = 2.5**

a) **(2 mark)** What percentage of cars will consume more than 10.375 L/100km?

$P(X > 10.375) = 1- P(X < 10.375) = 1- P(Z < \frac{10.375 - 8.7}{2.5}) = 1- P(Z < 0.67) = 1-0.7486 = \underline{\textbf{0.2514}}$

b) **(2 mark)** Determine the fuel consumption rate above which 90% of the cars will fall.

$\textbf{Z} = \frac{X - \mu}{\sigma} \rightarrow -1.28 = \frac{X - 8.7}{2.5}$

$X - 8.7 = -1.28\ (2.5) \rightarrow \underline{\textbf{X = 5.5 L/100KM}}$

*With My Best Regards,*
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