

Ex 2.5

Q3 In order: 6, 7, 8, 9, 9, 9, 11, 12, 15, 16, 19

(i) Range = $19 - 6 = 13$

(ii) Lower quartile = $\frac{1}{4}(11+1) = 3^{\text{rd}} \text{ No.}$
 $= 8$

(iii) Upper quartile = $\frac{3}{4}(11+1) = 9^{\text{th}} \text{ No.}$
 $= 15$

(iv) Interquartile range = $15 - 8 = 7$.

Q4 In order: 12, 13, 14, 14, 14, 14, 14, 15, 15, 16, 16, 17.

(i) Range = $17 - 12 = 5$ marks.

(ii) Mean = $\frac{12 + 13 + 5(14) + 2(15) + 2(16) + 17}{12} = \frac{174}{12} = 14.5$

(iii) On average boys did better
the girls' marks were more spread out

Q8

2, 3, 4, 5, 6.

$$\bar{x} = \frac{20}{5} = 4$$

| x | $x - \bar{x}$ | $(x - \bar{x})^2$ |
|-----|---------------|-------------------|
| 2 | -2 | 4 |
| 3 | -1 | 1 |
| 4 | 0 | 0 |
| 5 | 1 | 1 |
| 6 | 2 | 4 |
| | | 10 |

$$\sigma = \sqrt{\frac{10}{5}} = \sqrt{2} = 1.414$$

12, 13, 14, 15, 16,

$$\bar{x} = \frac{70}{5} = 14$$

| x | $x - \bar{x}$ | $(x - \bar{x})^2$ |
|-----|---------------|-------------------|
| 12 | -2 | 4 |
| 13 | -1 | 1 |
| 14 | 0 | 0 |
| 15 | 1 | 1 |
| 16 | 2 | 4 |
| | | 10 |

$$\sigma = \sqrt{\frac{10}{5}} = \sqrt{2} = 1.414$$

- (i) There is a difference of +10 in the second set of numbers.
- (ii) σ is the same for both sets.
- (iii) When all numbers are increased by the same amount, σ does not change.

Q10 (i) Route 1: $\bar{x} = \frac{84}{6} = 14$

Route 2: $\bar{x} = \frac{84}{6} = 14$

(ii) Route 1: $\sigma = 2$ (Calculator)

Route 2: $\sigma = 2.31$ (Calculator)

Recommend route 1, as times are less dispersed.

Q14

$$\bar{x} = \frac{(2 \times 2) + (6 \times 3) + (10 \times 9) + (14 \times 7) + (18 \times 3)}{2 + 3 + 9 + 7 + 3}$$
$$= \frac{264}{24} = 11$$

| x | $x - \bar{x}$ | $(x - \bar{x})^2$ | f | $f(x - \bar{x})^2$ |
|-----|---------------|-------------------|-----------|--------------------|
| 2 | -9 | 81 | 2 | 162 |
| 6 | -5 | 25 | 3 | 75 |
| 10 | -1 | 1 | 9 | 9 |
| 14 | 3 | 9 | 7 | 63 |
| 18 | 7 | 49 | 3 | 147 |
| | | | <u>24</u> | <u>456</u> |

$$\sigma = \sqrt{\frac{456}{24}} = \sqrt{19} = 4.358 = 4.36$$

Q.15 18, 26, 22, 34, 25.

(i) $\bar{x} = \frac{125}{5} = 25$ letters

(ii) $\sigma = 5.2915 = 5.3$.

(iii) $\bar{x} + \sigma = 25 + 5.3 = 30.1$

$\bar{x} - \sigma = 25 - 5.3 = 19.7$

(iv) \Rightarrow Days that between 19.7 and 30.1 letters delivered.
3 days [26, 22, 25].

Q.16
(i) $\bar{x} = \frac{1+9+a+3a-2}{4} = \frac{4a+8}{4} = a+2$.

(ii) $\sigma = \sqrt{20}$.

| σ | x | $x - \bar{x}$ | $(x - \bar{x})^2$ |
|----------|--------|---------------|------------------------------|
| | 1 | $-a-1$ | $(-a-1)^2 = a^2 + 2a + 1$ |
| | 9 | $7-a$ | $(7-a)^2 = 49 - 14a + a^2$ |
| | a | -2 | $(-2)^2 = 4$ |
| | $3a-2$ | $2a-4$ | $(2a-4)^2 = 4a^2 - 16a + 16$ |
| | | | $6a^2 - 28a + 70$. |

$$\sigma = \sqrt{\frac{6a^2 - 28a + 70}{4}} = \sqrt{20}$$

$$6a^2 - 28a + 70 = 20(4)$$

$$6a^2 - 28a + 70 = 80$$

$$6a^2 - 28a - 10 = 0$$

$$3a^2 - 14a - 5 = 0$$

$$(3a+1)(a-5) = 0$$

$$a = -\frac{1}{3} \quad a = 5$$

$$\left. \begin{array}{l} a \in \mathbb{Z} \\ \Rightarrow a = 5. \end{array} \right\}$$

Q20 are in order.

$$(i) P_{70} = \frac{70}{100} \times 36 = 25.2 \Rightarrow 26^{\text{th}} N^{\circ}$$

$$P_{70} = \text{€}55$$

$$(ii) P_{40} = \frac{40}{100} \times 36 = 14.4 \Rightarrow 15^{\text{th}} N^{\circ}$$

$$P_{40} = \text{€}32$$

(iii) 14 shirts. ($P_{40} = 14.4$)

$$(iv) P_{80} = \frac{80}{100} \times 36 = 28.8 \Rightarrow 29^{\text{th}} N^{\circ}$$

$$P_{80} = \text{€}59$$

7 are more expensive.

(v) €40. from data 19 shirts are lower

$$\Rightarrow \frac{19}{36} \times 100 = 52.77 = 53^{\text{rd}} \text{ percentile.}$$

53rd to 56th Percentile.