

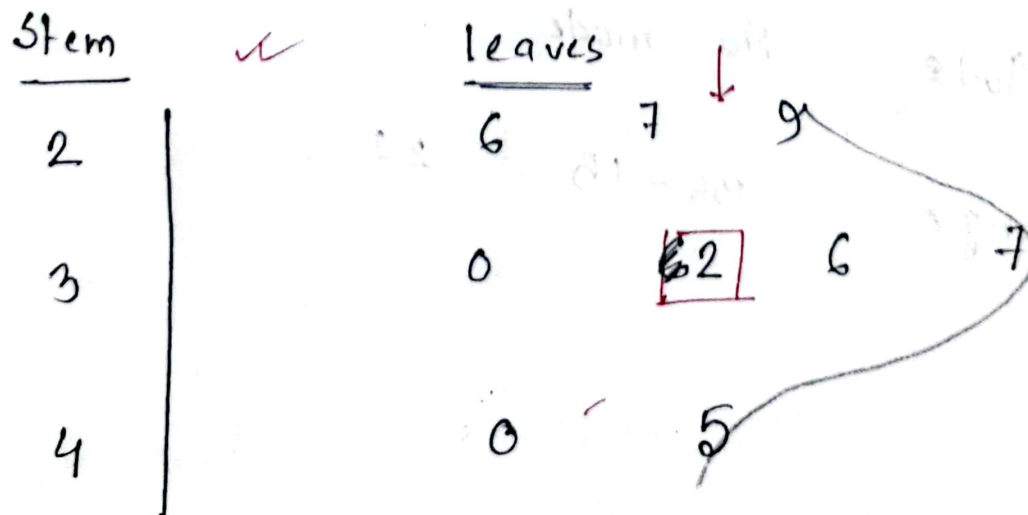
Problem: (Example-1) Draw a stem leaf diagram for

the following Data:

26 45 32 27 29 30 40 36 37

Soln: Arrange them in ascending order
(least to greatest)

26 27 29 30 32 36 37 40 45



$$S_2 = 32$$

$$S_1 = \frac{29+27}{2}$$

$$= \frac{56}{2} = 28$$

$$S_3 = 38.5$$

Problem:

(Example \rightarrow 2)

iii)

i) 15, 16, 21, 25, 27, 30, 36

ii) least value = 15

greatest value = 36

Mean = ~~20.5~~ $\frac{\sum x_i}{n} = \frac{170}{7} = 24.28$

Median = $\frac{n+1}{2}$ th term

$n = 7$

= $\frac{7+1}{2}$ th

= $\frac{8}{2}$ th = 4th term = 25

Mode = No mode

Range = $36 - 15 = 21$

iii) 21 - 27

stem 2 represents the class interval

21 to 27.

this interval includes most data:

Problem: (Example - 3)

stem	leaf
6	6
7	0 6 7 8
8	1 1 3 4 4 6 8 8 9
9	0 2 9
10	0

Soln:

a) 66, 70, 76, 77, 78

b) At least 90 (90 and > 90)

= 90, 92, 99, 100

c) most of the data are at central value. so, it's symmetrically distributed.

Example: (04)

a) For children ; $n = 15$

For Adults ; $n = 11$

→ median
→ measure spread (IQR)

For children

$$\begin{cases} Q_1 = \frac{n}{4} + h = \frac{15}{4} + h = 3.75 + h = 4\text{-th term} \\ Q_2 = \frac{n}{2} + h = \frac{15}{2} + h = 7.5 + h = 8\text{-th term} \\ Q_3 = \frac{3n}{4} + h = 11.25 + h = 12\text{-th term} \end{cases}$$

For Adult

$$\begin{cases} Q_1 = 3\text{rd term} \\ Q_2 = 6\text{-th term} \\ Q_3 = 9\text{-th term} \end{cases}$$

children

$$\begin{aligned} Q_1 &= 21 \\ Q_2 &= \boxed{32} \\ Q_3 &= 37 \end{aligned}$$

$$\begin{aligned} \text{IQR} &= Q_3 - Q_1 = 37 - 21 \\ &= 16 \end{aligned}$$

Adult

$$\begin{aligned} Q_1 &= 27 \\ Q_2 &= \boxed{30} \\ Q_3 &= 40 \end{aligned}$$

$$\text{IQR} = 40 - 27 = 13$$

more consistent

Box-whisker plot is a graphical representation which shows five-number summary

→ minimum value

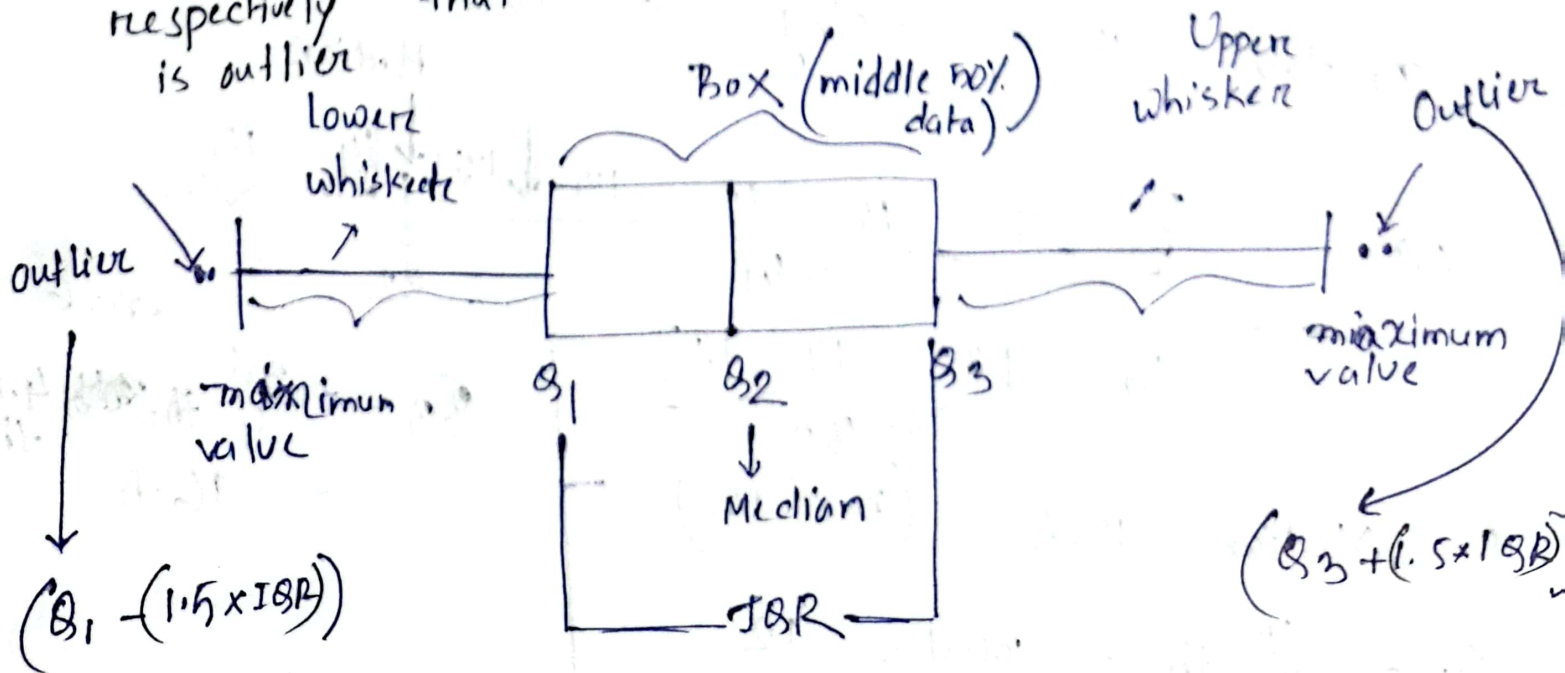
Any data of given set which is greater/lower than $Q_3 + (1.5 \times IQR)$ and $Q_1 - (1.5 \times IQR)$ respectively is outlier

→ lower quartile

→ median

→ upper quartile

→ maximum value



Example: 1

$$\begin{aligned} 1) \text{ Range} &= UL - LL \\ &= 90 - 20 \\ &= 70 \end{aligned}$$

$$2) \text{ Median} = 50$$

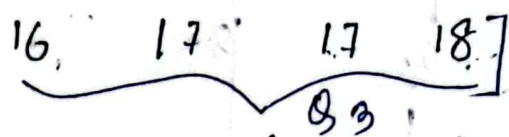
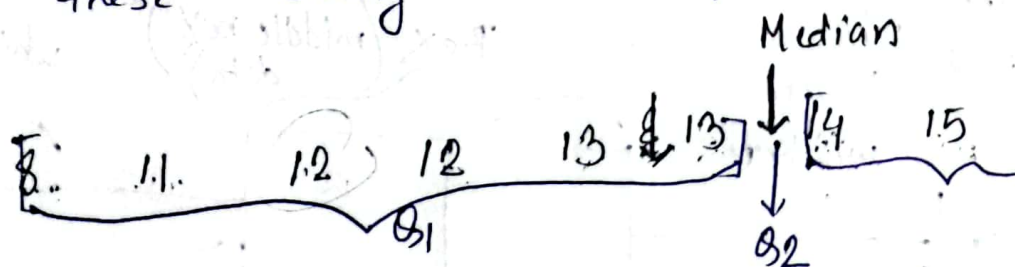
$$3) IQR = Q_3 - Q_1 = 80 - 40 = 40$$

Example: 2)

15 12 17 8 15 18
14 16 17 15 17 12

Display these using a boxplot

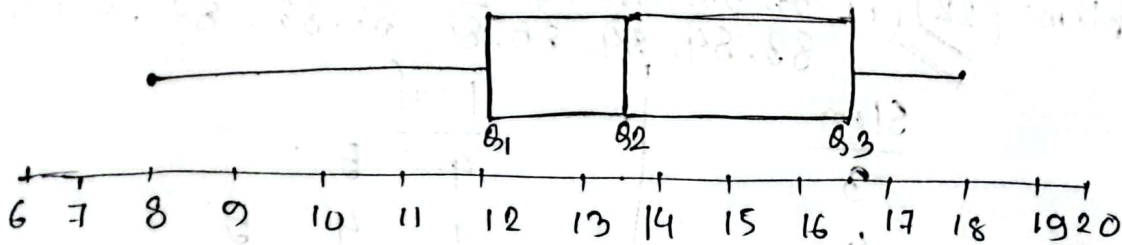
30m:



$$Q_2 = \text{Median} = 13.5 \quad (n = 12)$$

$$Q_1 = \frac{12}{4} \text{th} = 3\text{rd} = 12$$

$$\begin{aligned} Q_3 &= \frac{3n}{4} \text{th} = \frac{3 \times 6}{4} \text{th} = 4.5\text{th} \\ &= 16.5 \end{aligned}$$



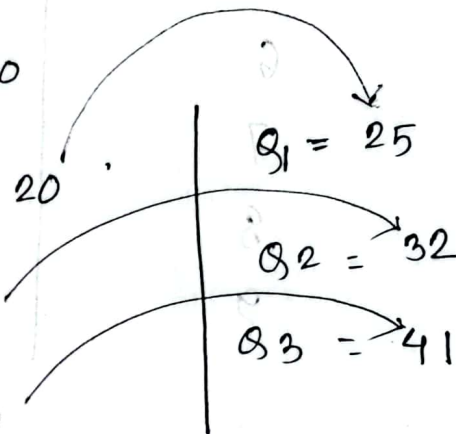
Problem: (21)

$$n = 80$$

$$\text{(Position)} Q_1 = \frac{n}{4} = \frac{80}{4} = 20$$

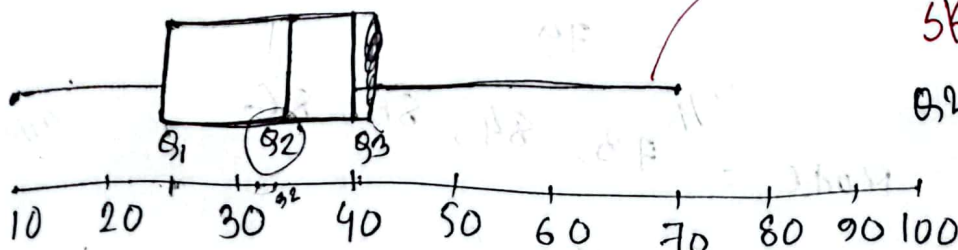
$$\text{(Position)} Q_2 = \frac{80}{2} = 40$$

$$\text{(Position)} Q_3 = \frac{3 \times 80}{4} = 60$$



Maximum value = 70

Minimum value = 10



$[Q_2 - Q_1] > [Q_3 - Q_2]$
Left Skewness
 Q_2 is closer to the larger values

Example: (3) For Sydney, (More consistent)

$$Q_1 = 11 ; \boxed{Q_2 = 13} \text{ Median} ; Q_3 = 14$$

$$IQR = Q_3 - Q_1 = 14 - 11 = 3$$

$$\text{Range} = 15 - 9 = 6$$

Melbourne,

$$Q_1 = 10 ; \boxed{Q_2 = 14} \text{ Median} ; Q_3 = 16$$

$$IQR = 16 - 10 = 6$$

$$\text{Range} = 19 - 7 = 12$$

$\frac{12}{10}$

Problem: (22) (i) 34, 35, 41, 44, 45, 50, 52, 62, 73, 73, 83, 84, 84, 85, 85, 86, 86, 87, 89, 91.

Stem	Leaf
3	4 5
4	1 4 <u>5</u>
5	<u>0</u> 2
6	2
7	3 3 <u>9</u>
8	3 4 4 5 5 6 6
9	1

$$n = 21$$

$$\begin{aligned} \text{(ii) Median} &= \frac{21+1}{2} \text{th} \\ &= \frac{22}{2} \text{th} \\ &= 11 \text{th} \end{aligned}$$

$$\text{Mode} = 73, 84, 85, 86$$

$$\text{(iii) } Q_1 = \text{median of lower half} = 47.5$$

$$Q_3 = 85.5$$

$$\therefore \text{IQR} = Q_3 - Q_1 = 85.5 - 47.5 = 38$$

(iv) Negative skewness.

Maximum value are at left tails.

[Ans.]

Problem: (24) (i) For Group A,

$$Q_1 = 30$$

$$Q_3 = 55$$

$$IQR = Q_3 - Q_1 = 55 - 30 = 25$$

Group B, $Q_3 = 59$; $Q_1 = 31$

$$IQR = Q_3 - Q_1 = 59 - 31 = 28$$

As IQR of group B is larger than IQR of group A, so, spreading of group B is higher. so, Group B has less consistency.

(ii) Comment:

For Group A,

$$Q_2 - Q_1 > Q_3 - Q_2$$

That is negative skewed distribution.

→ Median is far away from upper quartile.

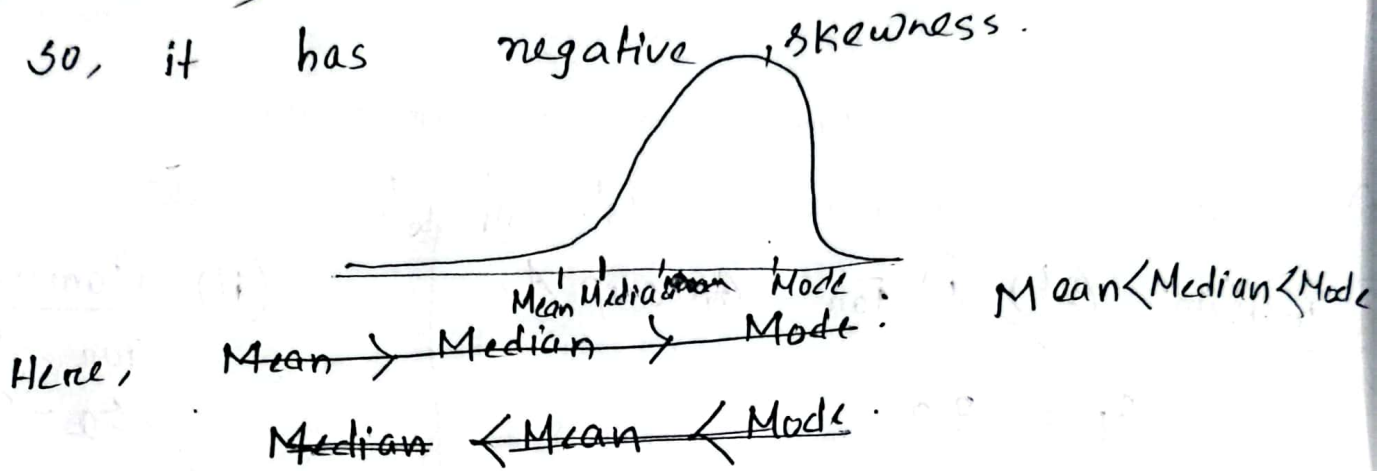
For Group B,

$$Q_2 - Q_1 < Q_3 - Q_2$$

positive skewness

Problem: (26) Here, right whisker is longer than left whisker. So, positive skewness exists.

Problem: 26) Here, $Q_3 - Q_2 < Q_2 - Q_1$
So, it has negative skewness.



Problem: (25) Kurtosis Analysis:

Girls $TBR = Q_3 - Q_1$
 $= 69 - 66$
 $= 3$

$$\frac{R}{2} = \frac{UL - LL}{2} = \frac{70 - 64}{2} = 3$$

As, $TBR = R/2$
So, it is mesokurtic.

Boys $TBR = Q_3 - Q_1 = 70 - 65 = 5$

$$\frac{R}{2} = \frac{UL - LL}{2} = \frac{73 - 61}{2} = 6$$

left tails.

Hence, $JBR < R/2$

So, it is Leptokurtic.

Comment:

For both data set,
 $Q_2 - Q_1 < Q_3 - Q_2$
 so, both have
 +ve skewness.

so, $Mean > Median > Mode$

skewness analysis

For girls, Left whisker is longer than R.W.
 so, it has negative skewness.
 $mean < median < mode$

For Boys, same as girls.

Problem: [Outlier Problem]

(15 18 20 22 25 29 32)
 + (34 38 41 43 46 54 76)

$n = 14$

Soln: $Q_2 = Median = 33$

$\frac{n}{2} - 1h, \frac{n}{2} + 1h$
 $= 7h, 8th$

$Q_1 = \frac{7+1}{2}th = 4th = 22$

$Q_3 = \frac{7+1}{2}th = 4th = 43$

Max = 76 ; Min = 15

$JBR = Q_3 - Q_1$
 $= 43 - 22$
 $= 21$

Outlier (Higher)

$$= Q_3 + (1.5 \times IQR)$$

$$= 43 + (1.5 \times 21)$$

$$= 74.5$$

Outlier (Lower)

$$= Q_1 - (1.5 \times IQR)$$

$$= 22 - (1.5 \times 21)$$

$$= -9.5$$

Any data > 74.5
will be higher outlier

and Any data < -9.5
will be lower outlier.

So, 76 is outlier.

