

Measure of Dispersion

Range :-

$$\boxed{\text{highest} - \text{lowest}}$$

104, 104, 98, 90, 85, 104

85, 90, 98, 104, 104, 104

Lowest

Highest

$$104 - 85 = 19 \quad \times$$

Variance / Standard Deviation



$\frac{1}{6}$

\rightarrow Signum

\rightarrow (Signum Square)

④ Take square of the diff

from mean

$$4^2, (-2)^2, (10)^2, 4^2, 4^2$$

$$= 16, 4, 100, 16, 16$$

⑤ Take the mean of these
Sum = $\frac{16+4+100+16+16}{5}$

$$\frac{152}{5} = 30.4 = \text{Variance(6)}$$

$$\text{Square root of Var} = \sqrt{30.4} = 5.5$$

① Std - 104, 98, 90, 104, 104

② Find the Avg (mean) = 100

③ How far each item is from mean.

$$(104 - 100), (98 - 100), (90 - 100), (104 - 100)$$

$$= 4, -2, -10, 4, 4$$

$$(104 - 100)$$

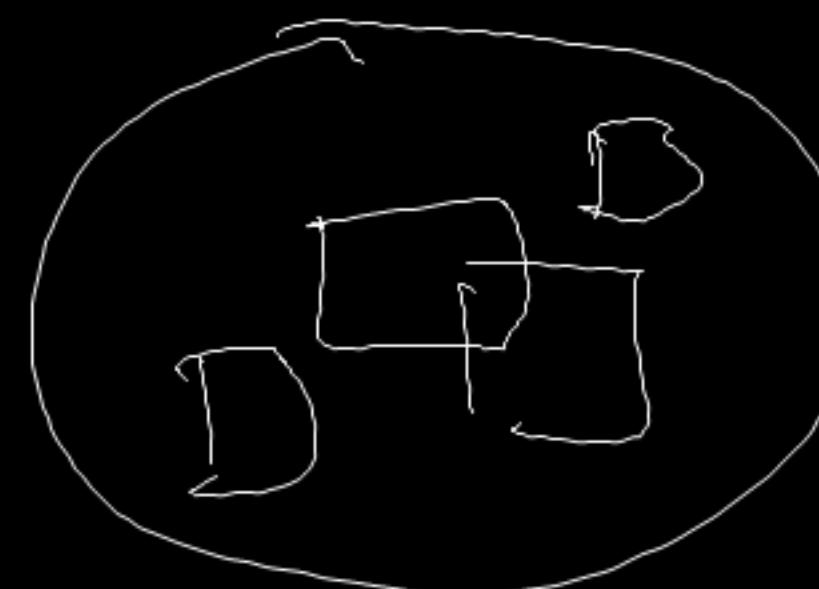


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General Formula

case I :- if Sample data given

$$S^2 = \frac{\sum (x - \bar{x})^2}{n-1}$$



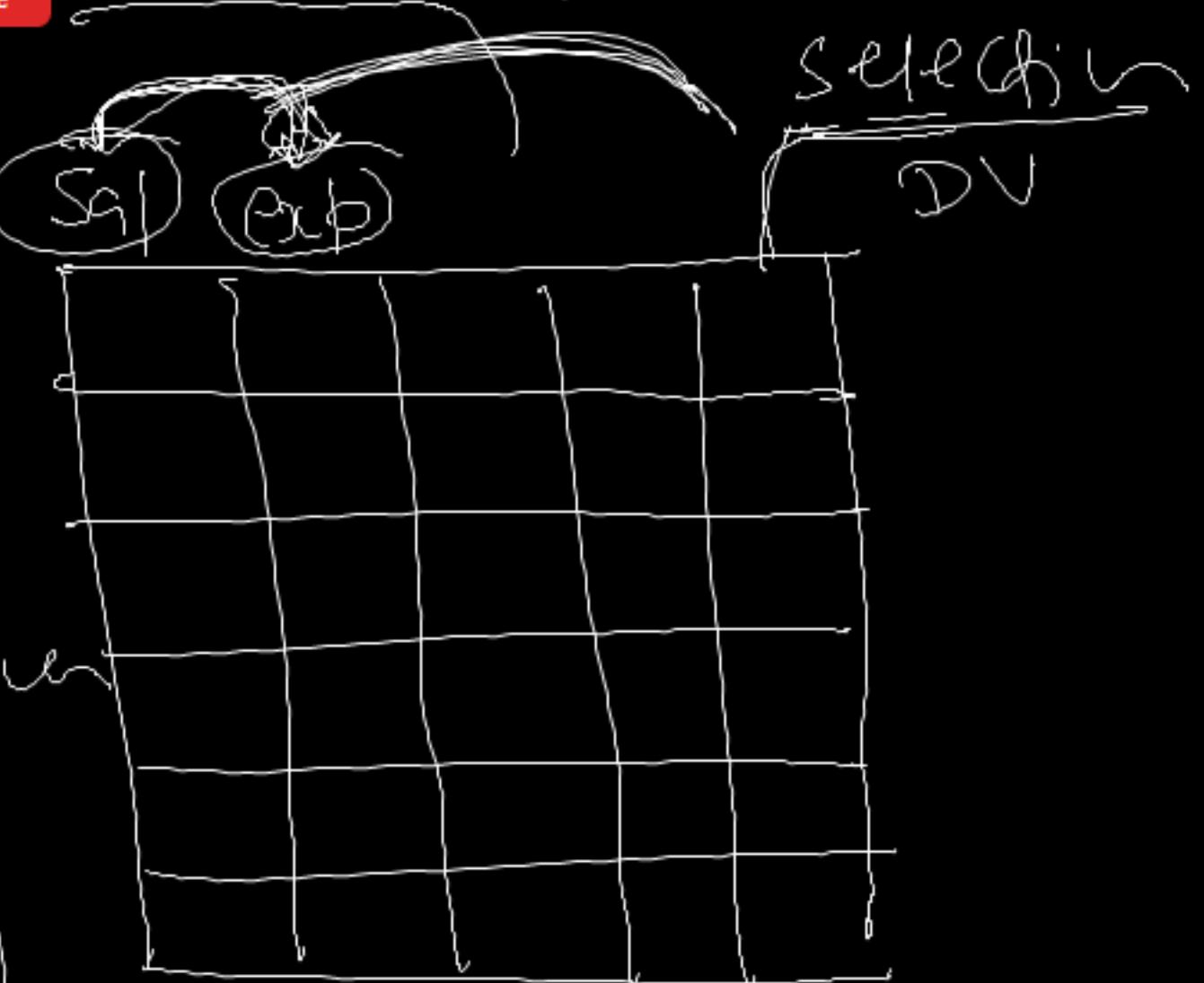
Case II :- if Population data given

$$\sigma^2 = \frac{\sum (x - \mu)^2}{N}$$

Score S

Co-efficient of variance

→ CV is the ratio of the Stdv to the mean expressed as a percentage.



wedding - castle approach

Salary x

$$CV = \left(\frac{\text{Stdv}}{\text{Mean}} \right) * 100\% = \frac{\sigma}{\mu} * 100$$

Tabular data

exp

$$CV = \frac{\sigma}{\mu} * 100$$

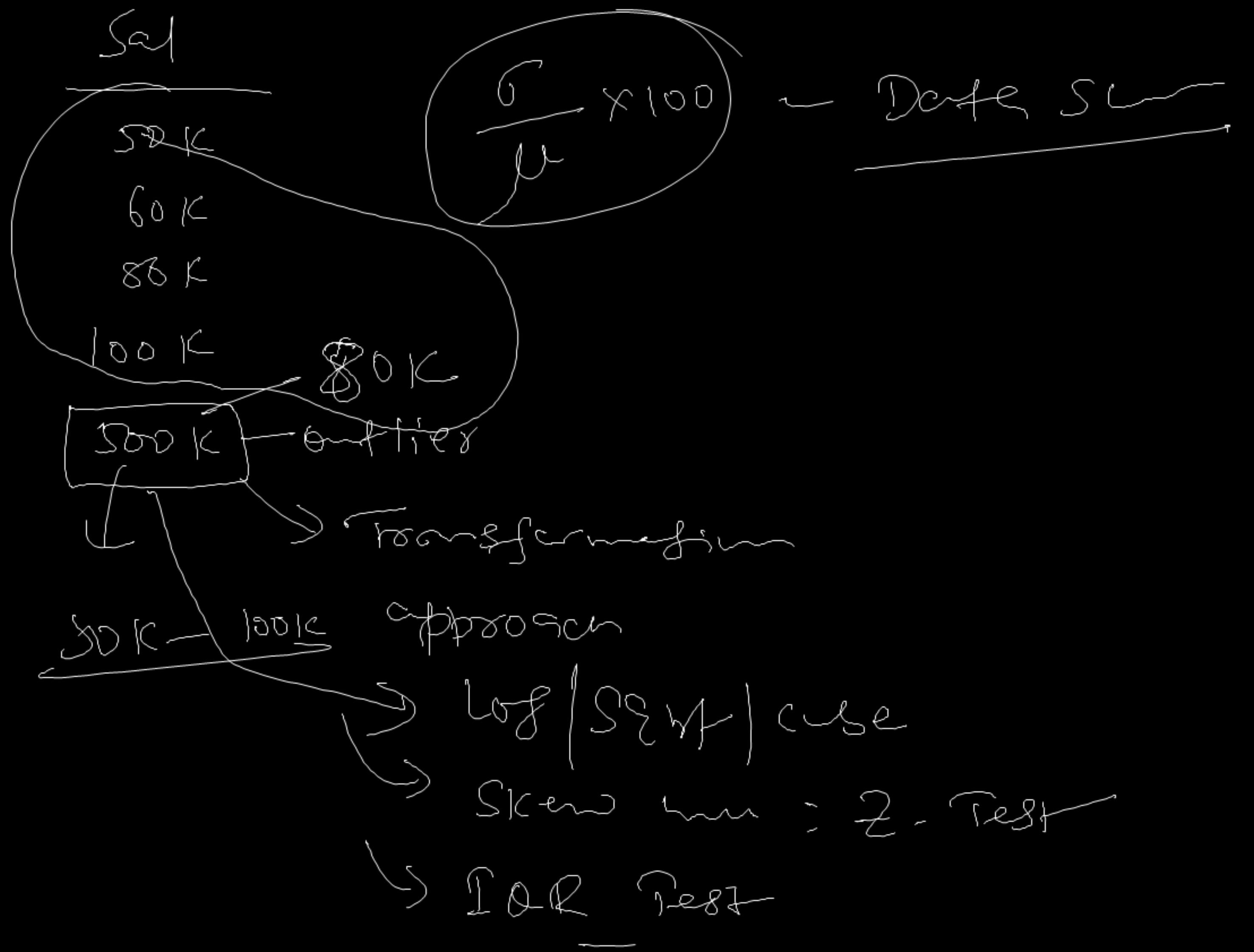
Sal = 0.3 very similar

exp = 0.28

DV

Sal = 0.8
exp = 0.01

very diss



Quartiles & Percentile

25, 50, 75, 100

→ ① Quartiles = $\frac{1}{4}$ P_{centile} = four equal parts

② Decile = Ten equal parts
10 20 30 40 → 60 70 80 90 100

→ ③ Percentile = 100 equal parts

④ Quintile = 5 equal parts
20 40 60 80 100



Things to remember while calculating these measures

- ① Data should be sorted from low to high (ascending order)
- ② You are basically finding the location of an observation
- ③ Please note, they are not actual values in the dataset

④ All other tiles can be easily derived from percentile

\checkmark
$$\text{Percentile} = \frac{P}{100} (n+1)$$

P = the percentile rank

n = total no. of observations included

Location 8.2

Total OSS = 10
 $n+1 = 10 + 1 = 11$

Data :-	78	82	84	88	91	94	93	98	99	96
	1	2	3	4	5	6	7	8	9	10
Q :-	78	82	84	88	91	93	94	96	98	99

→ Sorted now

Q:- What is 75th percentile?

$$75\text{th per} = \frac{75}{100} * 11 = \frac{3}{4} * 11 = \frac{33}{4} = \underline{\underline{8.25}} = 8 + 0.25$$

$75\text{th Percentile} = 96.50$

↓
96 + 0.25 * 2

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Tanmay Kulkarni +1 other raised hands View x

4 3 1 7 6 9 11 13 16

Answe^rs Range Scenarios Value

Locat ⁿ	1	2	3	4	5	6	7	8	9
1	3	4	6	7	5	9	11	13	16

$$\text{Total obs} = 9, \text{ m} = 9, \text{ mH} = 9+1 = 10$$

$$\text{SD per} = \frac{\text{SD}}{100} * 10 = 5 = 7$$

$$\underline{Q_2} = ? = \underline{50 \text{ Per}}$$

V.V. Sankar

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1 2 3 4 5 6 7 8 9

-100 2 4 7 10 12 14 20 200

already arranged

Q1 = ?

S-number Summary

Q3 = ?

Q2 = ?

IQR = ?

min = ?

max = ?

Range = ?

(-)ve outliers = ?

(+)ve outliers = ?

Range = $N - 1$

Box-Plot

Range = max - min

Q1 = 25th Percentile

Q2 = 50th Percentile

Q3 = 75th Percentile

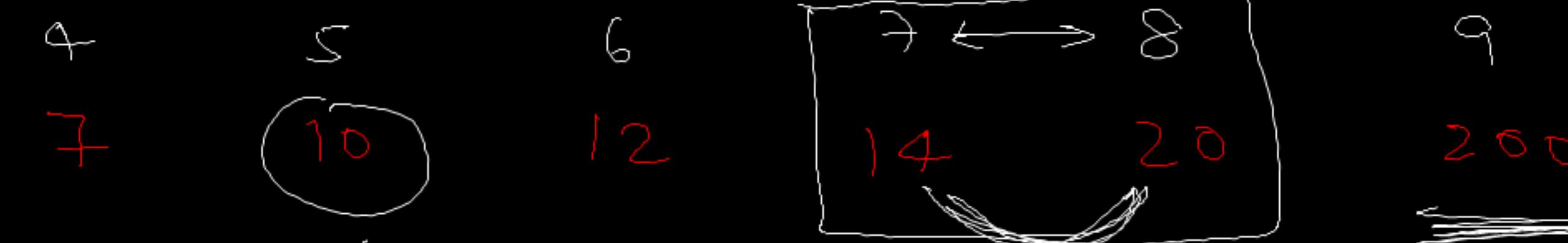
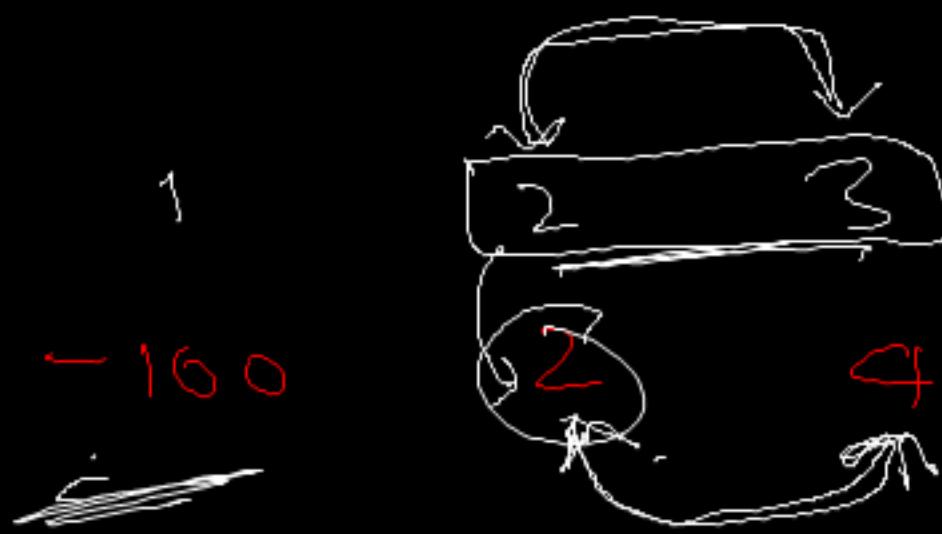
Range = $Q_3 + 1.5 \times IQR$

Range = $Q_1 - 1.5 \times IQR$

Range = $Q_3 + 1.5 \times IQR$

Range = $Q_1 - 1.5 \times IQR$

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$$Q_1 = \frac{P}{100} * (n+1) = \frac{25}{100} * 10 = \frac{\sum}{2} = 2.5 = 2 + 0.5$$

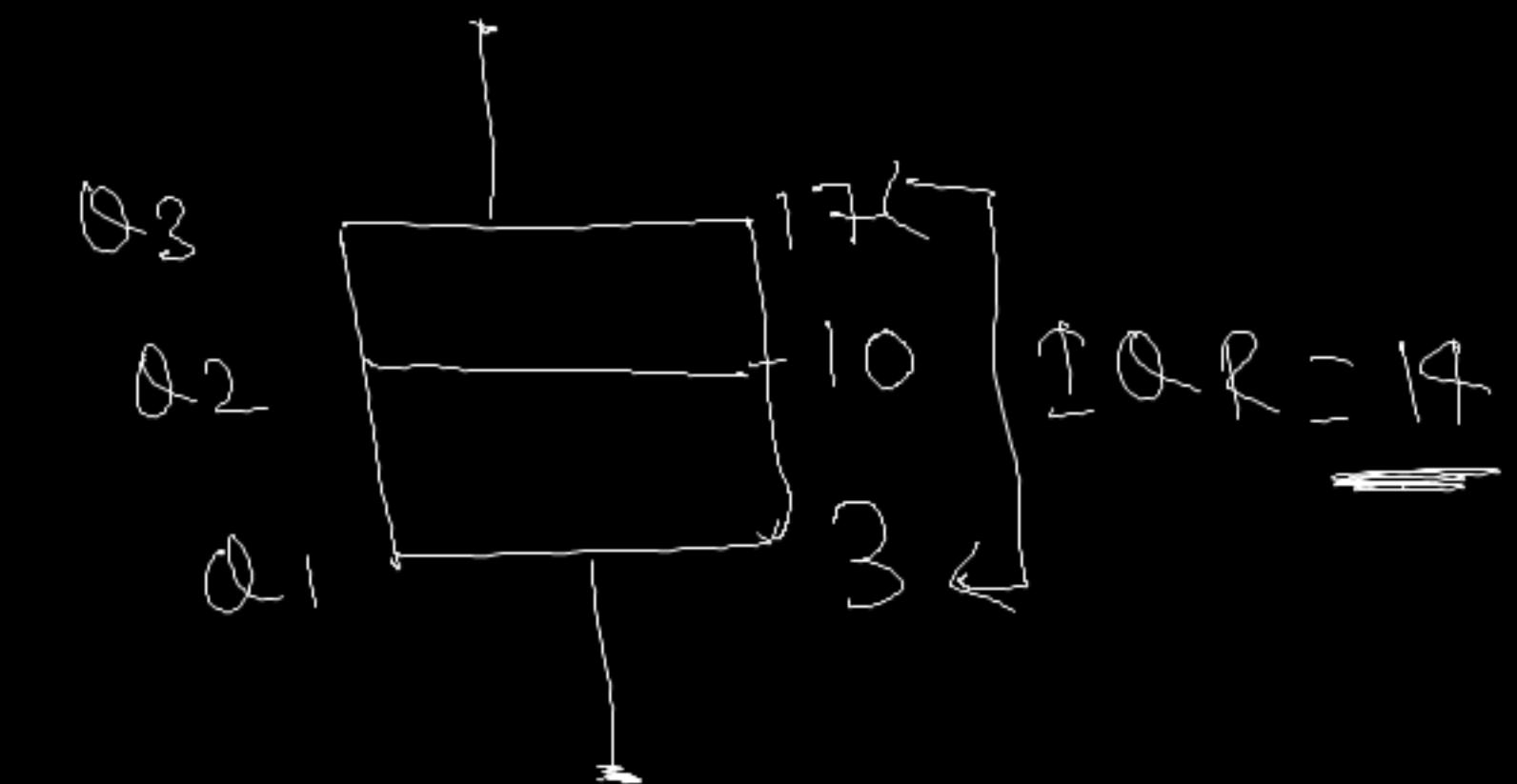
$$Q_1 = 3 \quad \checkmark$$

$$Q_2 = \frac{50}{100} * 10 = 5 = 10$$

$$Q_3 = \frac{3}{4} \frac{7.5}{100} * 10 = \frac{30}{4} = 7.5 = 7 + 0.50 \\ = 14 + 0.5 * 6 \\ = 14 + 3.0$$

$$Q_3 = 17$$

$$IQR (\text{Inter Quartile Range}) = Q_3 - Q_1 = 17 - 3 = 14$$



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$$(-)\text{ve outlier} = Q_1 - 1.5 \times IQR$$

$$= 3 - 1.5 \times 14 = 3 - 21.0$$

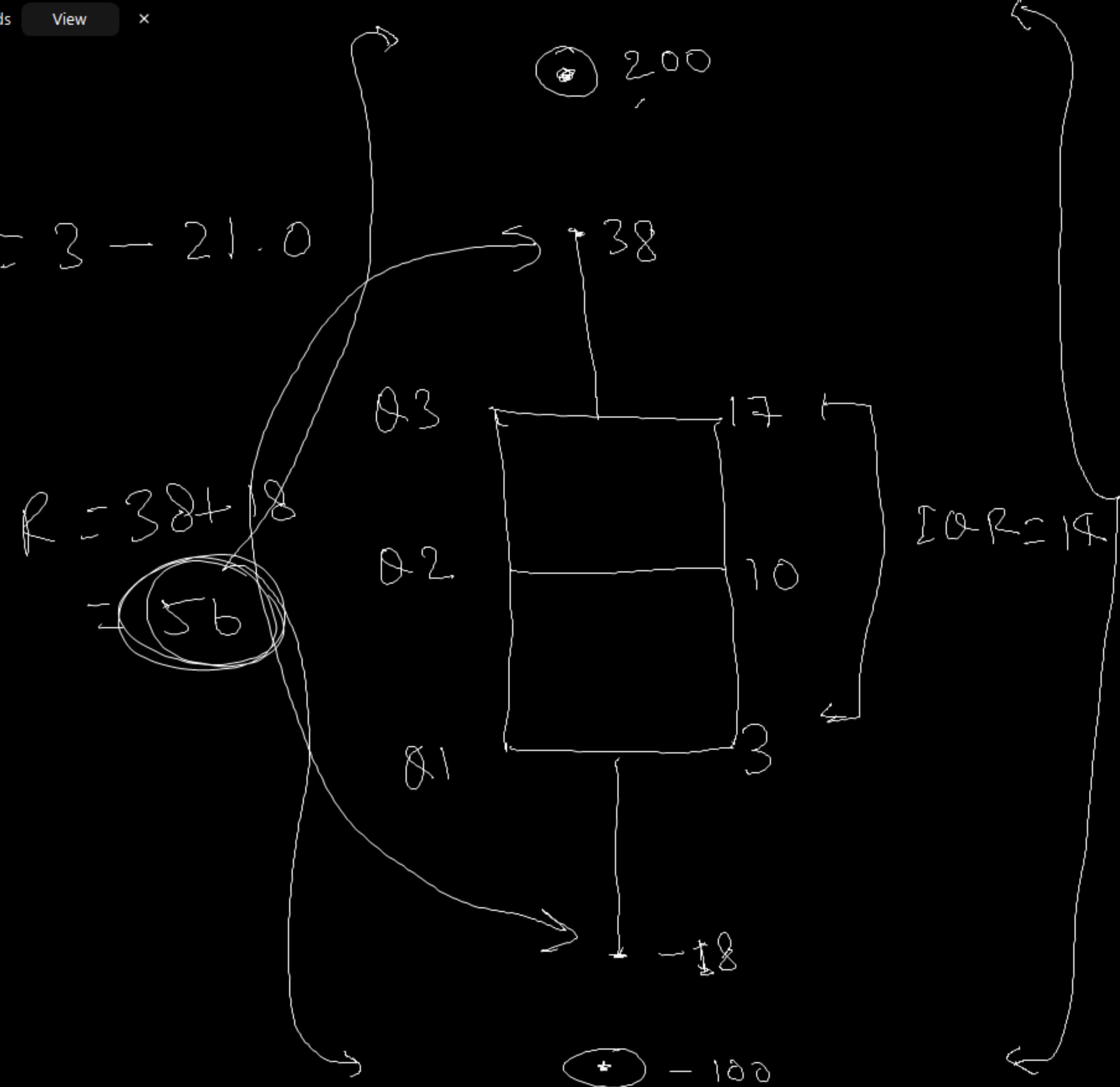
$$(-)\text{ve outlier} = -18$$

$$(+)\text{ve outlier} = Q_3 + 1.5 \times IQR$$

$$= 17 + 1.5 \times 14$$

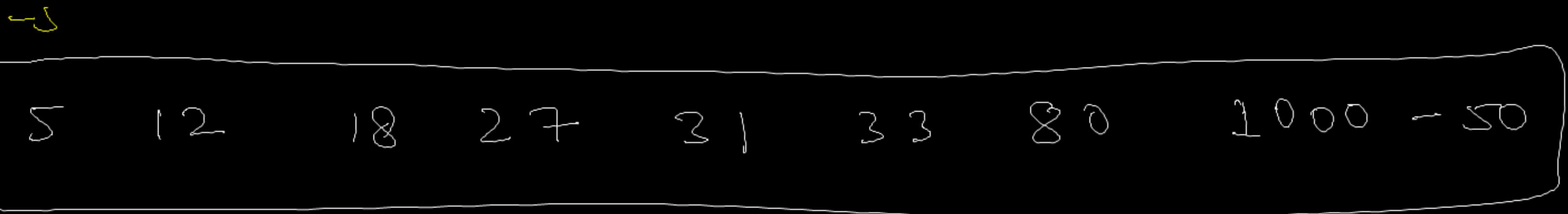
$$= 17 + 21$$

$$(+)\text{ve outlier} = 38$$



np.where(date > 38, 38, date)

200 → 38



a. 38

Q1 = ?

Min = ?

(-)ve outlier = ?

Q3 = ?

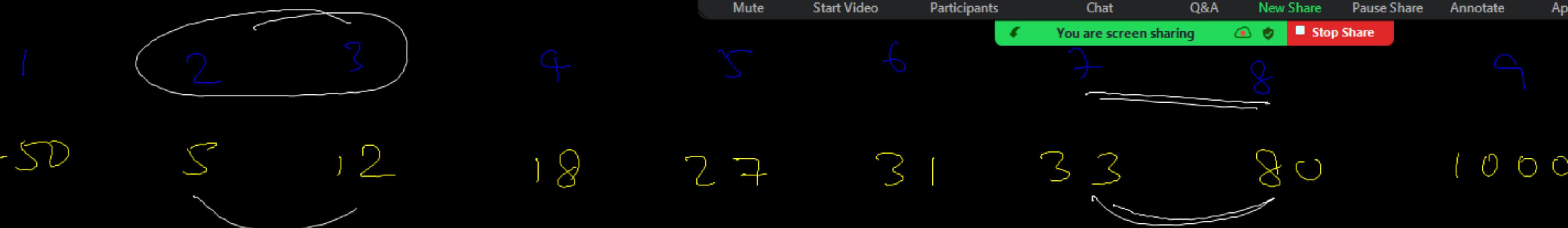
Max = ?

(+)ve outlier = ?

Var = ?

Range = ?

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$$Q_1 = \frac{25}{100} \times 10 = \frac{1}{4} \times 10 = 2.5 = 5 + 0.5 \times 7 = 5 + 3.5$$

$$m+1 = 9+1 = 10$$

$$\boxed{Q_1 = 8.50} \quad \checkmark$$

$$Q_3 = \frac{75}{100} \times 10 = \frac{3}{4} \times 10 = \frac{30}{4} = 7.5 = 33 + 0.5 \times 47 = 33 + 23.5$$

$$\boxed{Q_3 = 56.5}$$

$$(-)ve = 8.5 - 1.5 \times 48$$

$$IQR = Q_3 - Q_1 = 56.5 - 8.50 = \underline{48}$$

$$(+ve = 56.5 + 1.5 \times 48$$

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