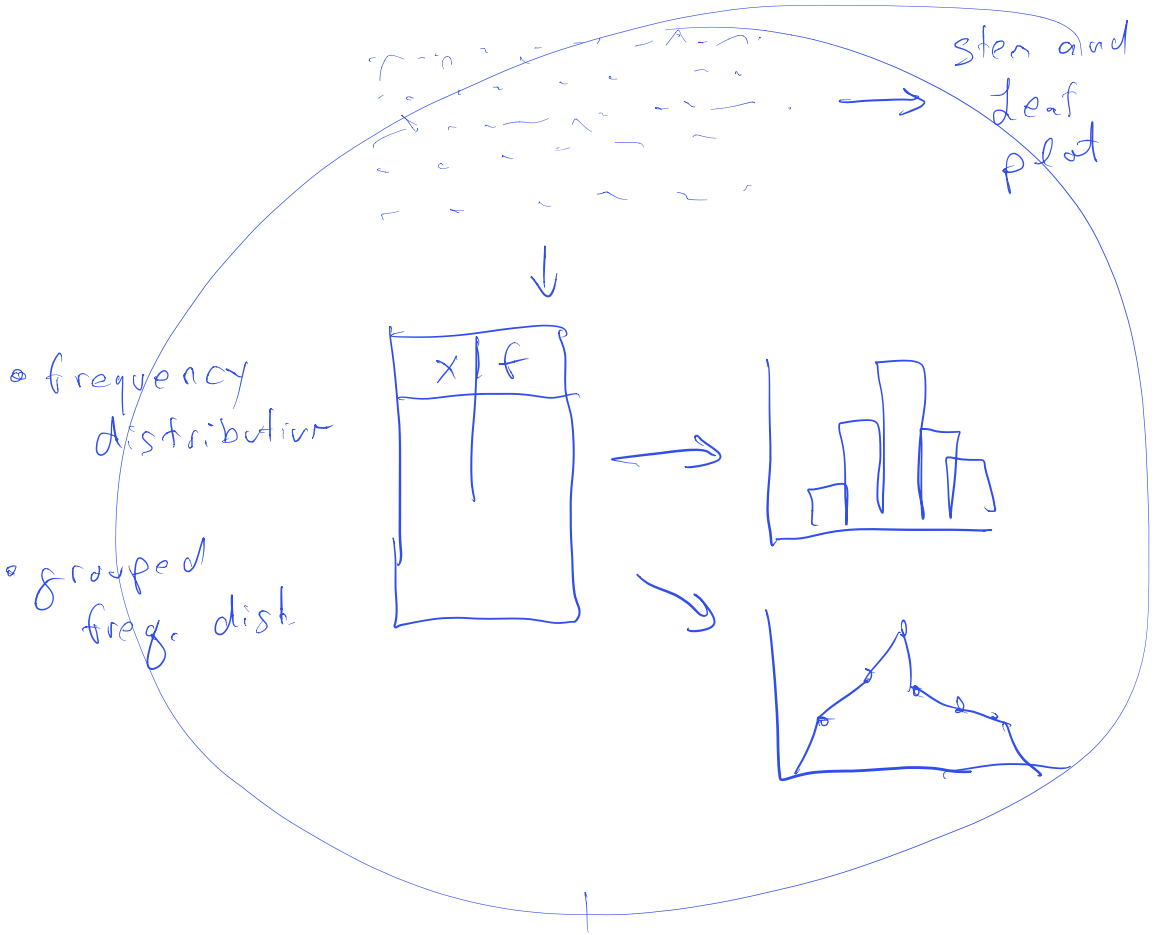
12.3 - Measures of Dispersion

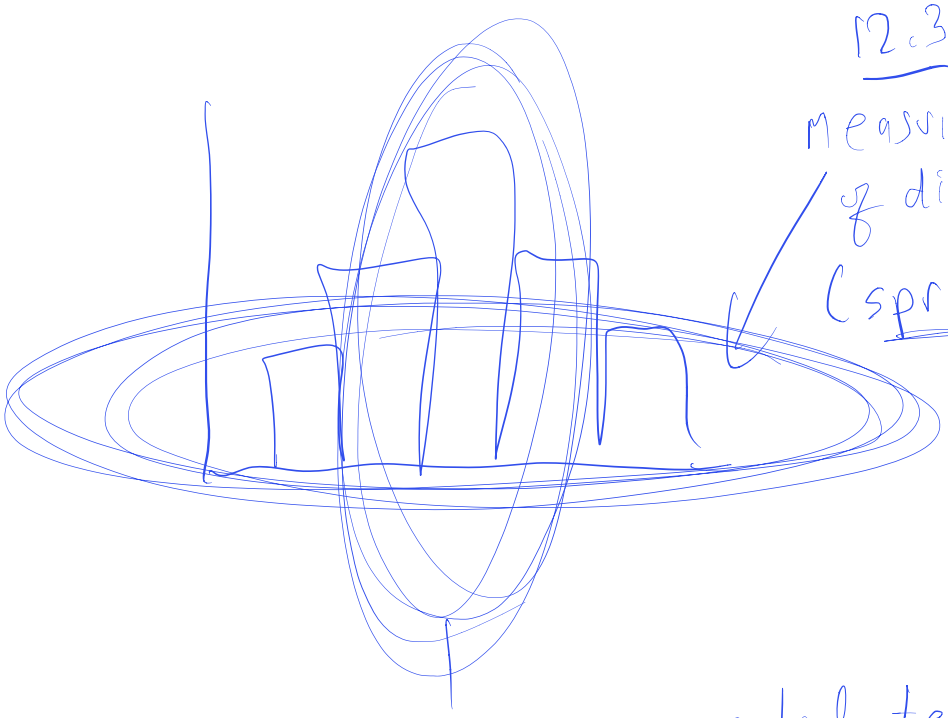
- measures of dispersion - are used to describe the spread of data items.



12.2

12.3

measures of dispersion (spread)



measures of central tendency

- mean
- median
- mode
- midrange

- 2 measures of dispersion
  - range
  - standard deviation

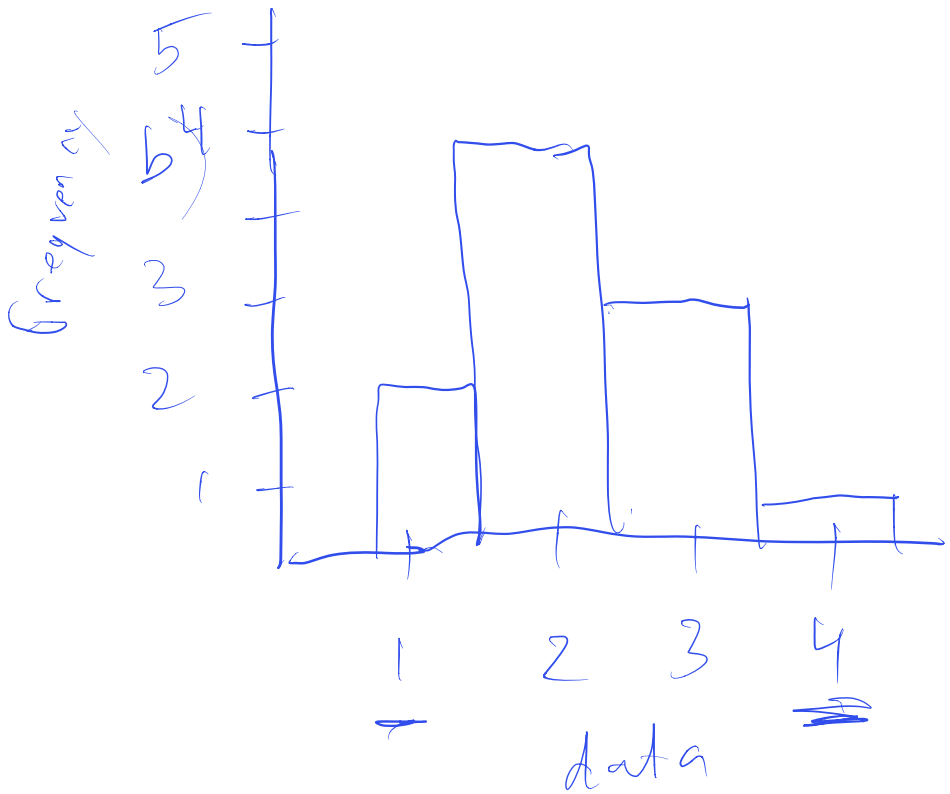
① RANGE - subtracting the highest and lowest data value

range = highest − lowest

Ex/ FIND RANGE

a) 4, 2, 11, 7

range = 11 − 2
= 9



Range: 4 - 1

= 3

(2) standard deviation

- standard deviation = a measure that's dependent on all of the data items

- In order to find standard deviation, it's necessary to find by how much each data value deviates from the mean.

1st - FIND mean, $\overline{X}$

2nd - subtract the mean from each data item,

$X - \overline{X}$

Ex/ FIND the deviations from the mean for the following data items

→ 69, 68, 65, 64, 64

1st - FIND $\bar{X}$

$$\bar{X} = \frac{69+68+65+64+64}{6}$$

$$\bar{X} = \frac{330}{6}$$

$$\bar{X} = 66$$

2nd - FIND Deviation

X	69	68	65	64	64
$X-\bar{X}$	3	2	-1	-2	-2

$X-\bar{X}$: 69-66, 68-66, 65-66, 64-66, 64-66

Deviation

3rd - check work

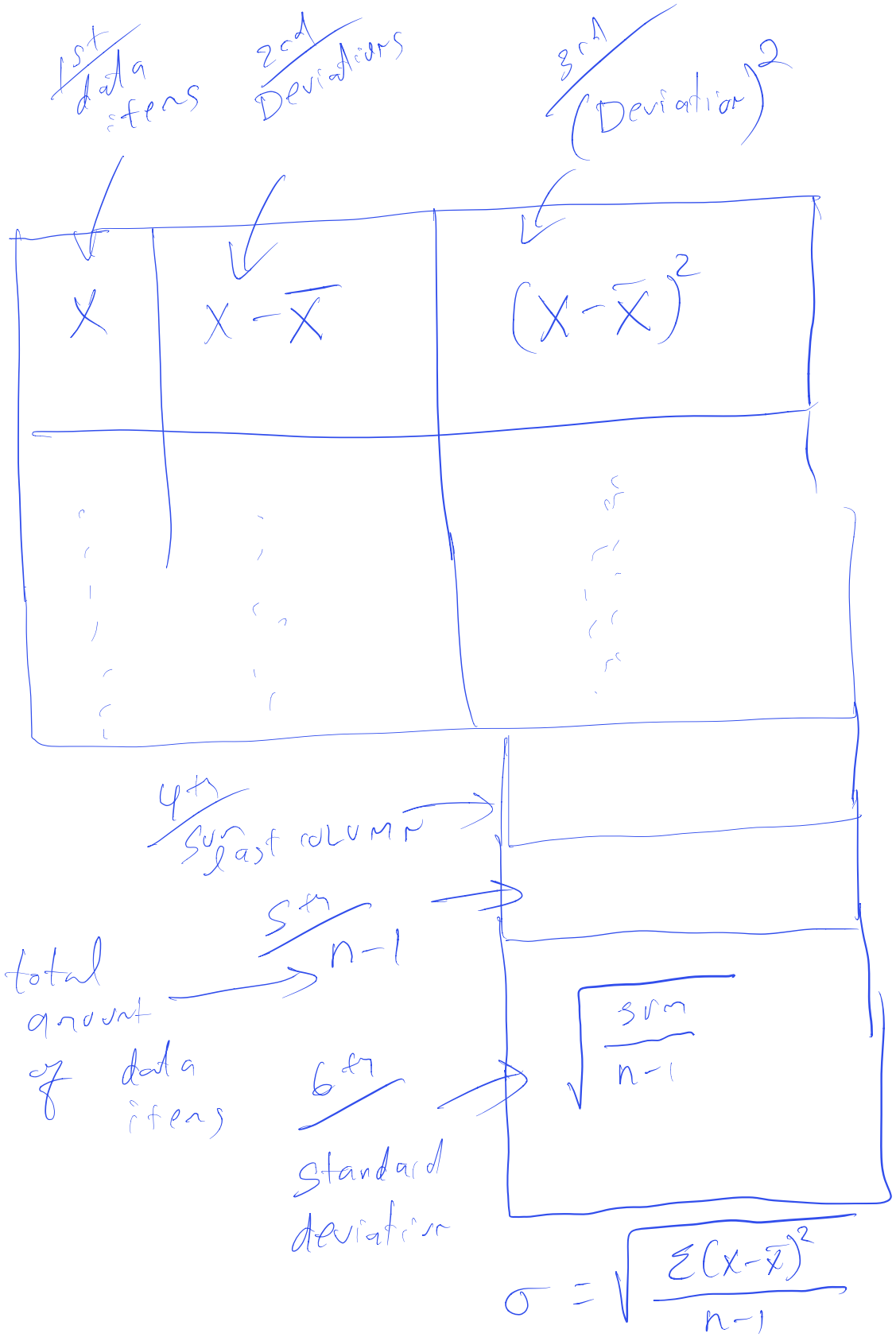
- deviations must sum to EQUAL 0.

$$3 + 2 + -1 + -2 + -2$$

$$= 0 \checkmark$$

How to find standard deviation

- notations
  - s (sample)
  - σ (greek letter sigma)


1st data items
2nd Deviations
3rd (Deviation)²
X
X − X̄
(X − X̄)²
4th Sum last column
5th n − 1
total amount of data items
6th Standard deviation
√(sum / n − 1)
σ = √(Σ(x − x̄)² / n − 1)

Ex FIND the standard deviation

a) 69, 68, 65, 64, 64

$$\bar{x} = \frac{69+68+65+64+64}{5}$$

$$\bar{x} = \frac{330}{5} = 66$$

x	$x - \bar{x}$		$(x-\bar{x})^2$	
69	69-66	3	3^2	9
68	68-66	2	2^2	4
65	65-66	-1	$(-1)^2$	1
64	64-66	-2	$(-2)^2$	4
64	64-66	-2	$(-2)^2$	4
		0 ✓		22

22

4

$n-1$

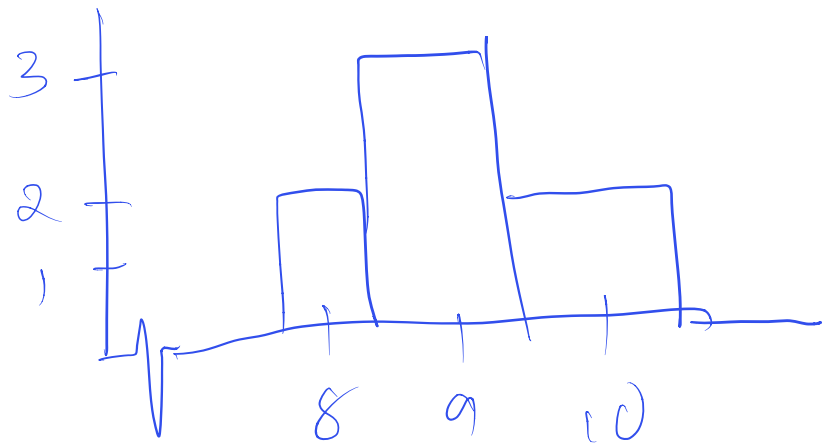
$5-1$

$4\overline{)22}$

$\sigma = \sqrt{5.5}$

$\sigma = 2.35$

b)



8, 8, 9, 9, 9, 10, 10

$$\bar{x} = \frac{8+8+9+9+9+10+10}{7}$$

$$\bar{x} = \frac{63}{7} = 9$$

x	$x-\bar{x}$	$(x-\bar{x})^2$
8	$8-9=-1$	$(-1)^2=1$
8	$8-9=-1$	$(-1)^2=1$
9	$9-9=0$	$0^2=0$
9	$9-9=0$	$0^2=0$
9	$9-9=0$	$0^2=0$
10	$10-9=1$	$1^2=1$
10	$10-9=1$	$1^2=1$

4 sum

6 $n-1$ $7-1$

$\sigma = \sqrt{4/6}$

$\sigma = .82$ (hundredths)