(6) Sample 0, 3, 0, 3

$\bar{X} = \dfrac{0+3+0+3}{4}$

$= 1.5$

X	$(X-\bar{X})$	$(X-\bar{X})^2$
0	$0-1.5 = -1.5$	2.25
3	$3-1.5 = +1.5$	2.25
0	$0-1.5 = -1.5$	2.25
3	$3-1.5 = +1.5$	2.25

$\sum(X-\bar{X})^2 = SS = \boxed{9}$

(sample) $s^2 = \dfrac{SS}{n-1} = \dfrac{9}{4-1} = \dfrac{9}{3} = \boxed{3}$

$s = \sqrt{\dfrac{SS}{n-1}} = \sqrt{\dfrac{9}{3}} = \sqrt{3} = \boxed{1.73}$

or

if you use computational formula for SS

X	X^2
0	0
3	9
0	0
3	9
$\sum X = 6$	$\sum X^2 = 18$

$SS = \sum X^2 - \dfrac{(\sum X)^2}{n}$

$= 18 - \dfrac{6^2}{4}$

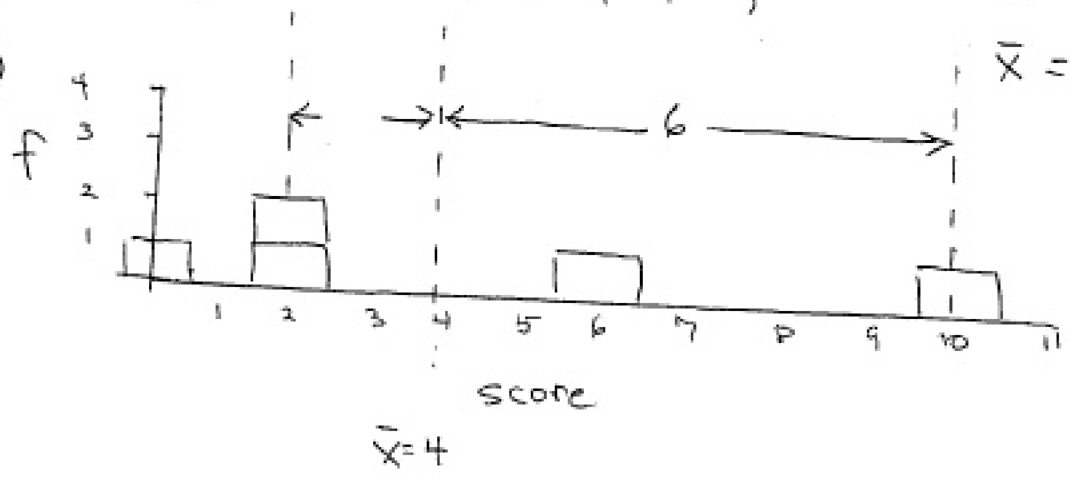
$= 18 - \dfrac{36}{4}$

$= 18 - 9 = \boxed{9}$

same as with def. formul

15. Sample: 10, 0, 6, 2, 2, $\quad n = 5$

a)



$$\bar{X} = \frac{10+0+6+2+2}{5} = 20/5 = \underline{4}$$

b) shortest distance from mean $= 2$
farthest " " " $= 6$

$\therefore$ est stnd dev $= \frac{2+6}{2} = \boxed{4}$

c)

X	$X - \bar{X}$	$(X-\bar{X})^2$
10	$10-4=+6$	36
0	$0-4=-4$	16
6	$6-4=+2$	4
2	$2-4=-2$	4
2	$2-4=-2$	4

$\boxed{64} = \Sigma(X-\bar{X})^2 = SS$

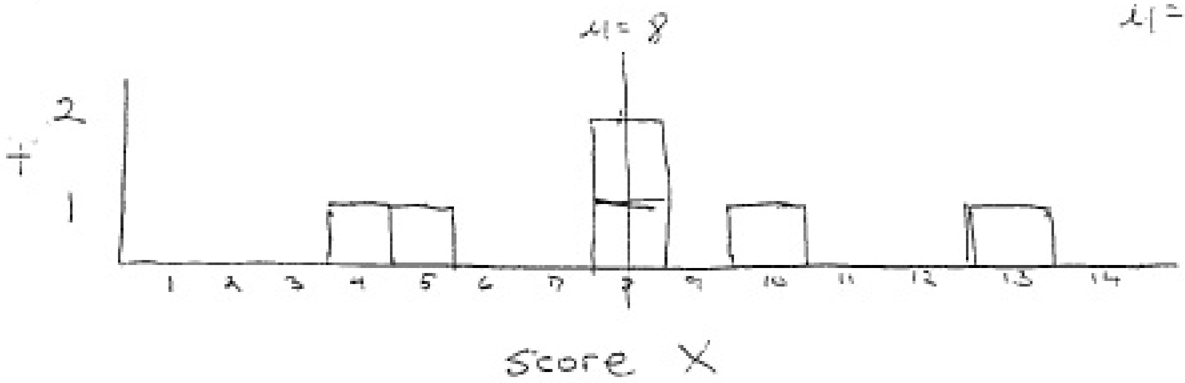
$$s^2 = \frac{\Sigma(X-\bar{X})^2}{n-1} = \frac{SS}{n-1} = \frac{64}{5-1} = \frac{64}{4} = \boxed{16}$$

$$s = \sqrt{\frac{\Sigma(X-\bar{X})^2}{n-1}} = \sqrt{\frac{SS}{n-1}} = \sqrt{16} = \boxed{4.}$$

Same as the rough estimate of the stnd. dev.

(13) Population of $N=6$ scores 8, 10, 4, 8, 5, 13

$$\mu = \frac{8+10+4+8+5+13}{6} = 8$$



est. σ closest score 2 pts away from mean

farthest score 5 pts away from mean

avg. $\frac{2+5}{2} = \frac{7}{2} \approx 3.5$

X	$X-\mu$	$(X-\mu)^2$
8	$8-8=0$	0
10	$10-8=+2$	4
4	$4-8=-4$	16
8	$8-8=0$	0
5	$5-8=-3$	9
13	$13-8=+5$	25

$$\Sigma(X-\mu)^2 = SS = \boxed{54}$$

$$\therefore \sigma^2 = \frac{SS}{N} = \frac{54}{6} = \boxed{9}$$

$$\sigma = \sqrt{\frac{SS}{N}} = \sqrt{9} = \boxed{3}$$

18 Pop. 1, 6, 9, 0, 4

a) $\mu = \dfrac{1+6+9+0+4}{5} = 4$

X	$X-\mu$	$(X-\mu)^2$
1	$1-4=-3$	9
6	$6-4=+2$	4
9	$9-4=+5$	25
0	$0-4=-4$	16
4	$4-4=0$	0

$54 = \Sigma(X-\mu)^2$

b.) $\Sigma(X-\mu) = 0$

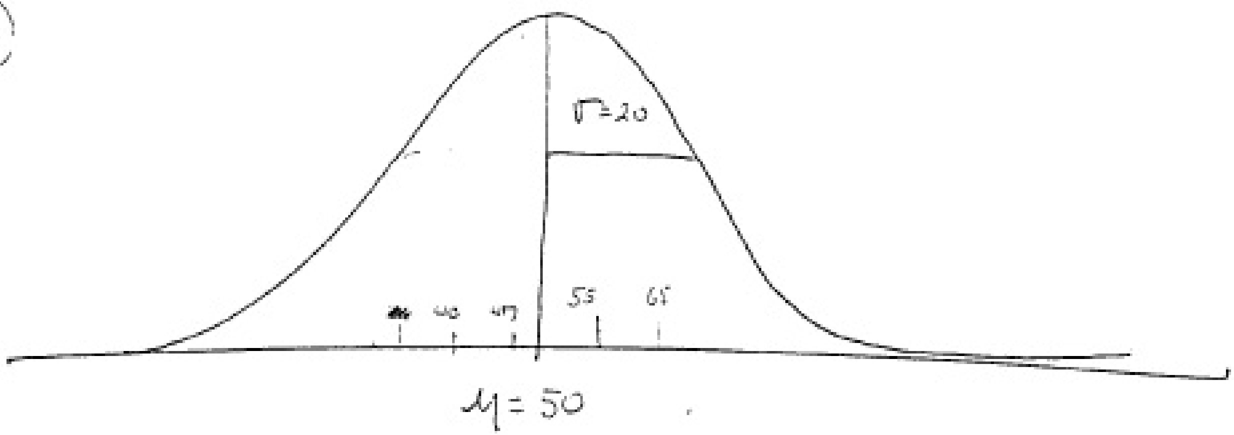
c) 54

d.) SS doesn't matter

- you get the same value for SS

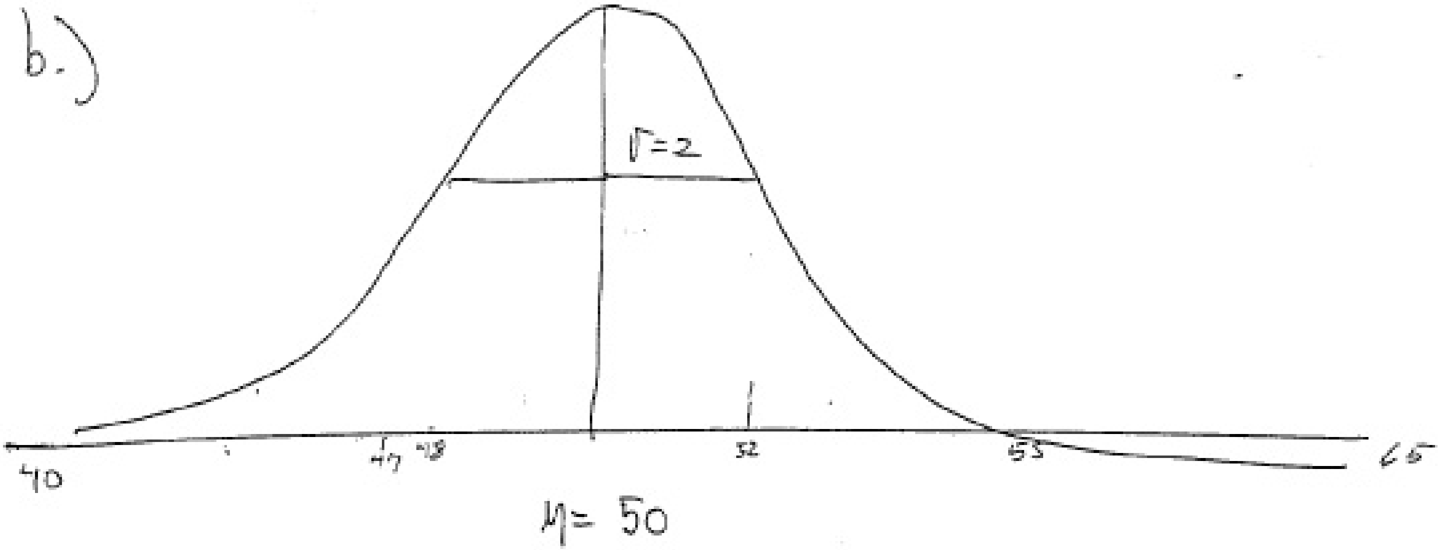
$SS = \Sigma(X-\mu)^2$ or $\Sigma(X-\bar{X})^2$

20.



a) all scores near center of distribution (within 1 standard deviation of mean)

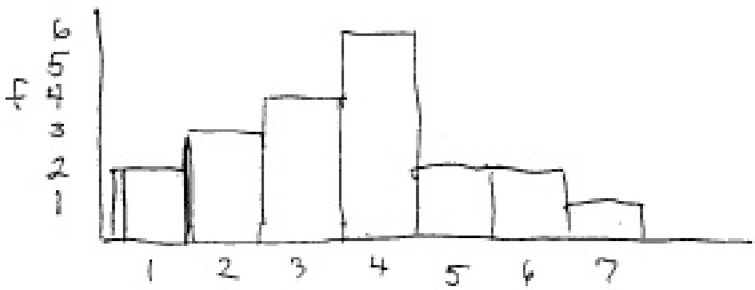
b.)



With σ = 2 only <u>one</u> of the scores (x = 47) is located near the center of the distribution. All the other values are extreme values

21. Population 3, 4, 4, 1, 7, 3, 2, 6, 4, 2
1, 6, 3, 4, 5, 2, 5, 4, 3, 4

a) Freq. Dist. histogram



b. range = 7.5 − .5 = $\boxed{7.0}$

c. interquartile range : find 75% percentile or Q3
25% percentile or Q1

Count boxes or ↘ 20 total 5 out of 20 = 25% ∴ 2.5
15 out of 20 = 75% ∴ 4.5

	x	f	cF	c%	
	7	1	20	20/20 = 1.00 = 100%	
	6	2	19	19/20 = .95 = 95%	
	5	2	17	17/20 = .85 = 85%	75%
4.5	4	6	15	15/20 = .75 = 75%	
3.5	3	4	9	9/20 = .45 = 45%	
2.5	2	3	5	5/20 = .25 = 25%	
1.5	1	2	2	2/20 = .10 = 10%	

∴ 4.5 − 2.5 = $\boxed{2}$

d) $\frac{4.5 - 2.5}{2} = \boxed{1.0}$

22 population of $N = 4$ Scores: 2, 0, 8, 2

a) $\mu = \frac{2+8+0+2}{4} = \frac{12}{4} = 3$

X	$X - \mu$	$(X-\mu)^2$
2	$2 - 3 = -1$	1
0	$0 - 3 = -3$	9
8	$8 - 3 = +5$	25
2	$2 - 3 = -1$	1

$\sum (x-\mu)^2 = \boxed{36} = SS$

$\sigma^2 = \frac{SS}{N} = \frac{36}{4} = \boxed{9}$

$\sigma = \sqrt{\frac{SS}{N}} = \sqrt{9} = \boxed{3}$

b.) 2, 0, 8, 2 $\longrightarrow$ 5, 3, 11, 5

$\mu = \frac{5+3+11+5}{4} = \frac{24}{4} = 6$

X	$X - \mu$	$(X-\mu)^2$
5	$5 - 6 = -1$	1
3	$3 - 6 = -3$	9
11	$11 - 6 = +5$	25
5	$5 - 6 = -1$	1

$\sum (x-\mu)^2 = SS = \boxed{36}$

$\therefore \sigma^2 = \frac{SS}{N} = \frac{36}{4} = \boxed{9}$

$\sigma = \sqrt{\frac{SS}{N}} = \sqrt{9} = \boxed{3}$

(c) 2, 0, 8, 2 $\xrightarrow[\text{by } 2]{\text{mult.}}$ 4, 0, 16, 4

$\mu = \frac{4+0+16+4}{4}$

$= \frac{24}{4} = 6$

X	$X - \mu$	$(X-\mu)^2$
4	$4-6 = -2$	4
0	$0-6 = -6$	36
16	$16-6 = +10$	100
4	$4-6 = -2$	4

$\Sigma(X-\mu)^2 = SS = \boxed{144}$

$\sigma^2 = \frac{SS}{N} = \frac{144}{4} = \boxed{36}$

$\sigma = \sqrt{\frac{SS}{N}} = \sqrt{36} = \boxed{6}$

(d) Adding a constant does <u>not</u> change the deviation scores and does <u>not</u> change the standard deviation

(e) When each score is multiplied by a constant, the deviations and the standard deviation ~~is~~ are <u>also</u> multiplied by the constant.