2.5 Part 1

2.5 Measures of Variation

Range: highest value - lowest value

⌘ Not that useful b/c it only uses to values

STANDARD DEVIATION VERY IMPORTANT

Represents the average distance from any point in the data set to the mean.

- If the standard deviation is small, all the values of data are close to the mean.
- The more outliers, the bigger the standard deviation.
- When would the standard deviation be 0?

Standard Deviation Formula

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

The units for *s* are the same as they are for the data values such as inches, feet, pounds…

Variance –

standard deviation squared

S : sample st. dev

σ : pop. st. dev.

Notation
- s^2 Sample variance
- σ^2 Population variance

Round-off Rule
(In case you missed it the first time.)

Carry one more decimal place than is present in the original set of data.

Round only the final answer, not values in the middle of a calculation.

Find the range, variance, and standard deviation for each data set.

4, 7, 9, 3, 7

$\bar{x} = 6$

x	$x-\bar{x}$	$(x-\bar{x})^2$
4	4−6	4
7	7−6	1
9	9−6	9
3	3−6	9
7	7−6	1

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

$$s = \sqrt{\frac{4+1+9+9+1}{5-1}}$$

$$s = \sqrt{\frac{24}{4}} = \sqrt{6} \approx 2.4$$

$$s^2 = 6$$

Find the standard deviation. 5 5 7 8 8

$\bar{x} = 6.6$

x	$x-\bar{x}$	$(x-\bar{x})^2$
5	5−6.6	2.56
5	5−6.6	2.56
7	7−6.6	.16
8	8−6.6	1.96
8	8−6.6	1.96

$$s = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n-1}}$$

$$= \sqrt{\frac{2.56+2.56+.16+1.96+1.96}{5-1}}$$

$$= 1.5$$

Find the standard deviation. 5 5 7 8 8

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

$\bar{x} = 6.6$

x	$x-\bar{x}$	$(x-\bar{x})^2$
5	$5-6.6=-1.6$	2.56
5	$5-6.6=-1.6$	2.56
7	$7-6.6=.4$	.16
8	$8-6.6=1.4$	1.96
8	$8-6.6=1.4$	1.96

$$S = \sqrt{\frac{2.56+2.56+.16+1.96+1.96}{5-1}}$$

$S = 1.5$

14, 10, 8, 0

Find the standard deviation of the frequency distribution

Number of AP classes (x)	frequency (f)	$x \cdot f$	$(x-\bar{x})^2$	$(x-\bar{x})^2 \cdot f$
0	8	0	2.89	23.12
1	2	2	.49	.98
2	7	14	.09	.63
3	5	15	1.69	8.45
4	3	12	5.29	15.87

$$\bar{x} = \frac{0+2+14+15+12}{25}$$

$$\bar{x} = 1.7$$

$$s = \sqrt{\frac{\Sigma (x-\bar{x})^2 \cdot f}{n-1}} = \sqrt{\frac{23.12+.98+.63+8.45+15.87}{24}}$$

$$= 1.4$$

Find the mean and the standard deviation of the frequency distribution.

Salaries	f	X	X·f
24 - 32	7	28	196
33 - 41	11	37	407
42 - 50	5	46	230
51 - 59	6	55	330
60 - 68	6	64	384

$$\bar{X} = \frac{\Sigma(x \cdot f)}{\Sigma f} = \frac{196+407+230+330+384}{35}$$

$$= 44.2$$

Find the mean and the standard deviation of the frequency distribution.

Salaries	f
24 - 32	7
33 - 41	11
42 - 50	5
51 - 59	6
60 - 68	6

x	$x \cdot f$	$(x-\bar{x})^2$	$(x-\bar{x})^2 \cdot f$
28	196	262.44	1837.08
37	407	51.84	570.24
46	230	3.24	16.2
55	330	116.64	699.84
64	384	392.04	2352.24

$\bar{x} = 44.2$

$n = 35$

$$S = \sqrt{\frac{1837.08 + 570.24 + 162 + 699.84 + 2352.24}{35-1}}$$

$S = 12.7$