5. In a study to determine the distribution of *Cepaea nemoralis* snails at the Hanley Wildlife Preserve in upstate New York, 100 sampling quadrats were surveyed, with the results in the table below. Calculate the mean, median, and variance of the number of snails per quadrat in this study. (*Note:* The corrected sum of squares is 345.)

No. of snails (X_i)	f_i	$f_i X_i$	$f_i X_i^2$
0	69	0	0
1	18	18	18
2	7	14	28
3	2	6	18
4	1	4	16
5	1	5	25
8	1	8	64
15	1	15	225
	100	70	394

$$\bar{X} = \frac{\sum f_i X_i}{n} = \frac{70}{100} = .7 \text{ snails / quadrat}$$

$$\tilde{X} = 0 \text{ snails}$$

$$s^2 = \frac{\sum f_i X_i^2 - \frac{(\sum f_i X_i)^2}{n}}{n-1} = \frac{394 - \frac{(70)^2}{100}}{100-1} = \frac{345}{99} \left(\text{snails/quadrat}\right)^2$$

11. (*a*) Invent a sample of size 5 for which the mean is 20 and the median is 15.
(*b*) Invent a sample of size 2 for which the mean is 20 and the variance is 50.

______ ______

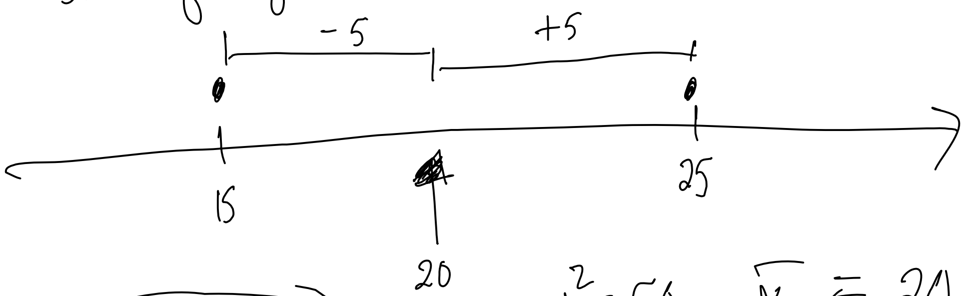
Variance = "average" squared distance to the mean

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

$n = 2$

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

$$= \underbrace{\sum (x_i-\bar{x})^2}_{\text{sum of squared distances to mean}}$$



$s^2 = 50$, $\bar{x} = 20$

$x_1 = 15$, $x_2 = 25$

3. The red-tailed tropic bird, *Phaethon rubricauda*, is an extremely rare sea bird that nests on several islands of the Queensland coast of Australia. As part of a conservation effort to manage these endangered birds, every nesting pair was measured and weighed. Below are the body weights of these birds (in kg).

census

Female	2.45	2.57	2.81	2.37	2.01	2.50	2.32
Male	2.86	2.65	2.75	2.60	2.30	2.49	2.84

(*a*) Determine the following descriptive characteristics for the weights of the females: mean, variance, and standard deviation. Is this a sample or population? Again, pay attention to number of decimal places and appropriate units.

(*b*) Determine the mean, variance, and standard deviation for the male weights.

(*c*) Comment on the differences or similarities between the two data sets.

μ $\qquad \sigma^2$ $\qquad \sigma$

$$\sigma^2 = \frac{1}{N}\left[\sum x^2 - \frac{(\sum x)^2}{N}\right]$$

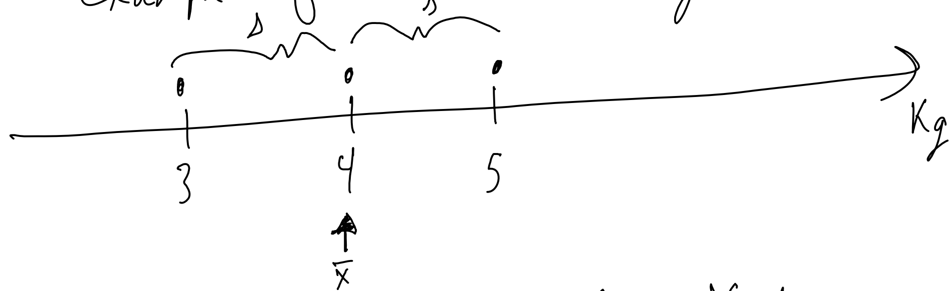
§1.7 Coding or Transforming Data

Ex. $n=3$

convert to lbs

3 kg	$\bar{x} = 4$ kg	mult. by	6.6 lbs	$\bar{X}_{new} = 8.8$ lbs
4 kg		$2.2 \frac{\text{lbs}}{\text{kg}}$	8.8 lbs	
5 kg	$s = 1$ kg		11.0 lbs	$S_{new} = 2.2$ lbs

example of multiplicative coding



if the transform is $X_{new} = C * X_{old}$

(c is some #) then $\bar{X}_{new} = C * \bar{X}_{old}$

$s_{new} = C * s_{old}$

Ex. (Additive Coding)

now we need to subtract 1kg from each measurement because our scale is wrong (add -1)

3 kg		$\xrightarrow{x_i - 1}$	2 kg	
4 kg	$\bar{X}_{old} = 4$ kg		3 kg	$\bar{X}_{new} = 3$ kg
5 kg	$s_{old} = 1$ kg		4 kg	$s_{new} = 1$ kg

$X_i + C \rightarrow$ same

$(C \text{ any } \#)$

$\bar{X}_{new} = \bar{X}_{old} + C$

$s_{new} = s_{old}$

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2 Kinds of Data

Quantitative

numbers — math makes sense

e.g. counts, measurements

kg, cm, # of bacteria, \$, percentages

Qualitative

(categorical)

labels (sometimes #'s are used, but they are arbitrary)

e.g. hair color, year in school

2 Kinds of quantitative data

Discrete

individual possible values

Continuous

range of possible values

on the # line

(often from counting)

on the # line

w/ infinitely values possible

weight of a hog

0 lbs to 500 lbs

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§1.8