AMS 7: Discussion Section 1

9/29 See handout for questions & additional info. Census.gov has population info.

1. (a)

year	# cancer deaths
1970	331,000 ← (old)
1985	462,000 ← (new)

1. absolute comparison → new − old
   ↳ unrelated to absolute value
   $462{,}000 - 331{,}000 = 131{,}000$ → there were 131K more cancer deaths in 1985 in the U.S. than 1970. (True)

2. Relative comparison → how much larger in percentage terms

$$\frac{\text{new} - \text{old}}{\text{old}} = \frac{131{,}000}{331{,}000} \doteq \frac{1}{3} = 0.33 = 33\%$$

by calculator: 0.3957703927
↳ 3 sig figs: 0.396 = +39.6% ≐ 40%

≐ means "about equal to" There were 40% more cancer deaths in 1985 in the U.S. than in 19

Q: Can we say 40% fewer deaths?

let's try: $\frac{\text{old} - \text{new}}{\text{new}} = \frac{-131{,}000}{462{,}000} = -0.284 = 28.4\%$ Nope! There were 28% fewer cancer deaths in 1970 than in 1985 in the U.S.

• This cannot be attributed to population growth alone.
intuition: U.S. population rise in same period was smaller than 40%.

(b) variable: things you measure (your height is a variable of you)

cost/benefit trade off ie. PSA is a cheap but inaccurate way to detect prostate cancer

circumference → radius → diameter (cheapest method)

height

volume $V = \pi r^2 h$ $V = \frac{1}{3}\pi r^2 h$

geometry models: 

(c) seattle ⊛ cost of living (gas price)
omaha ⊛ quality of mass transit
atlanta ⊛ weather
⊛ crime rate
⊛ entertainment

utility - how much you value something

(d) weight - yes height - no $\frac{\text{weight}}{\text{height}}$ - yes, but can have more errors

(e) $\frac{20 \text{ beats}}{15 \text{ sec}} \Big| \frac{60 \text{ sec}}{1 \text{ min}} = 80$ b/m

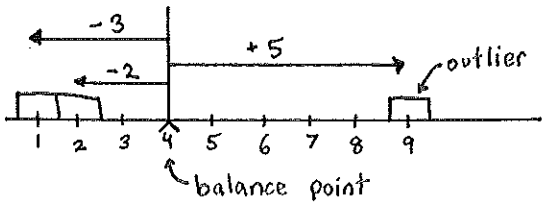
$\frac{39 \text{ beats}}{30 \text{ sec}} \Big| \frac{60 \text{ sec}}{1 \text{ min}} = 78$ b/m

$\frac{80 \text{ beats}}{65 \text{ sec}} \Big| \frac{60 \text{ sec}}{1 \text{ min}} = 73.85$!

Section 1: 2c

$\begin{bmatrix}1\\2\\9\end{bmatrix}$ $n=3$ $\xrightarrow[\bar{y}=4]{\text{subtract}}$ $\begin{bmatrix}-3\\-2\\+5\end{bmatrix}$ $n=3$

mean $\bar{y}=4$ mean 0



$\begin{bmatrix}y_1\\y_2\\\vdots\\y_n\end{bmatrix}$ $\xrightarrow[\bar{y}]{\text{subtract}}$ $\begin{bmatrix}y_1-\bar{y}\\y_2-\bar{y}\\\vdots\\y_n-\bar{y}\end{bmatrix}$

old mean $\bar{y}$ new mean 0?

$$\text{new mean: } \frac{(y_1-\bar{y})+(y_2-\bar{y})+\ldots+(y_n-\bar{y})}{n} = \frac{1}{n}\sum_{i=1}^{n}(y_i-\bar{y})$$

$$= \frac{1}{n}\left[(y_1-\bar{y})+(y_2-\bar{y})+\ldots+(y_n-\bar{y})\right] = \frac{1}{n}\left[\underbrace{y_1+y_2+\ldots+y_n}_{n\bar{y}}+\underbrace{(-\bar{y}-\bar{y}\ldots-\bar{y})}_{-n\bar{y}}\right] = 0\checkmark$$

$$\text{mean } \bar{y} = \frac{1}{n}(y_1+y_2+\ldots+y_n)$$

$$\text{so } n\bar{y} = (y_1+y_2+\ldots+y_n)$$

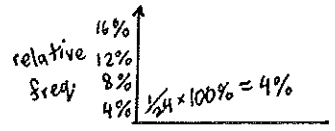
Discussion Section # 2:

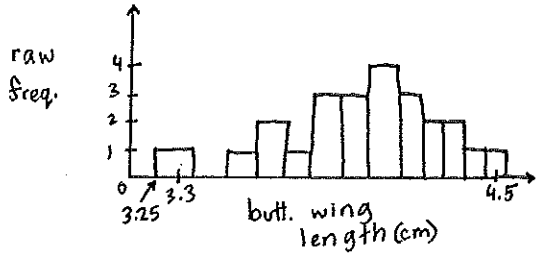
① freq. / values

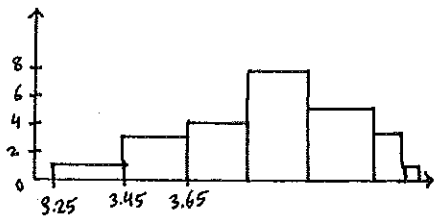
new grouping	value	(raw) freq. = count
1	3.3	1
	3.4	0
3	3.5	1
	3.6	2
4	3.7	1
	3.8	3
7	3.9	3
	4.0	4
5	4.1	3
	4.2	2
3	4.3	2
	4.4	1
1	4.5	1

sum = $n = 24$

Stem & leaf plot by Tukey

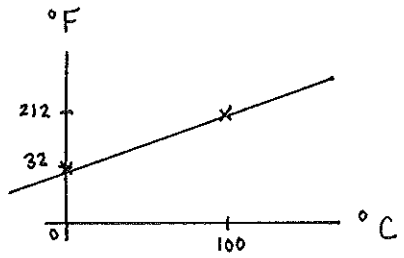






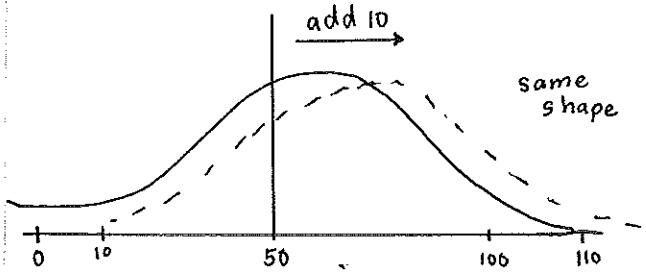
2.

°C	°F
0	32
100	212



$°F = \frac{9}{5}°C + 32$

$y = mx + b$



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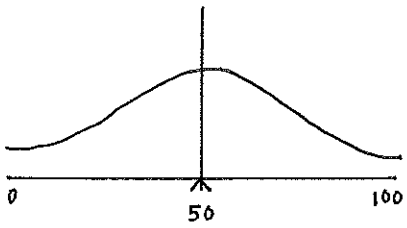


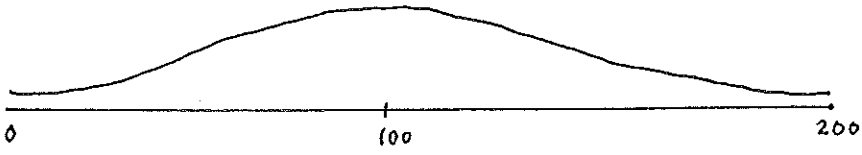
symmetric

multiply by 2

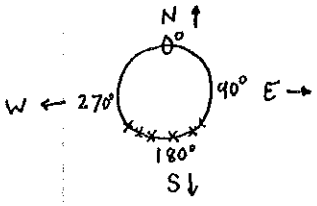
center changed - got multiplied by 2

Spread got multiplied by 2

Same shape



compas degrees are...



[170, 205, 187, ⋮]

quant.

continuous

no "twice as south"

interval scale