Disc. Sec | #1 problem ② | Ans → 17 Apr 17

n integer ≥ 1

arbitrary list of numbers

$\begin{bmatrix} y_1 \\ \vdots \\ y_n \end{bmatrix}$ n of them

mean $\bar{y}$

c arbitrary constant (number) ①

we know that

$\bar{y} = \frac{1}{n} \sum_{i=1}^{n} y_i$; let's get more practice with summation notation.

(a)(i) $\sum_{i=1}^{3} 1 = 1 + 1 + 1 = 3$

(a)(ii) $\sum_{i=1}^{n} 1 = \underbrace{1 + 1 + \dots + 1}_{n} = n$

(a)(iii) $\sum_{i=1}^{5} i = 1 + 2 + 3 + 4 + 5 = 15$

(a)(iv) $\left(\sum_{i=1}^{n} y_i \right) - \left(\sum_{j=1}^{n} y_j \right) = ?$

$$\left(\sum_{i=1}^{n} y_i\right) = y_1 + y_2 + \dots + y_n$$

$$\left(\sum_{j=1}^{n} y_j\right) = y_1 + y_2 + \dots + y_n$$

$$\left(\sum_{i=1}^{n} y_i\right) - \left(\sum_{j=1}^{n} y_j\right) = 0$$

$$\sum_{i=1}^{n}(y_i + c) = (y_1 + c) + (y_2 + c) + \dots + (y_n + c)$$

$$= \underbrace{(y_1 + y_2 + \dots + y_n)} + \underbrace{(c + c + \dots + c)}_{n}$$

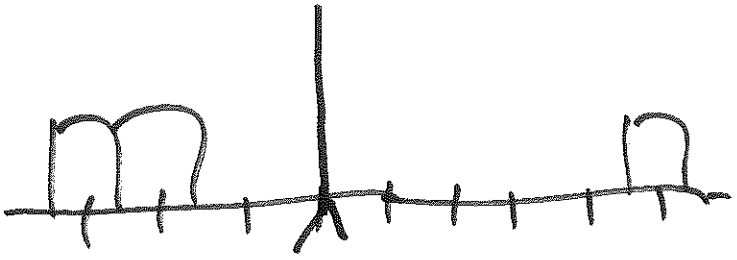
$$= \boxed{\left(\sum_{i=1}^{n} y_i\right) + nc = \sum_{i=1}^{n}(y_i + c)}$$

so $$\frac{1}{n}\left[\left(\sum_{i=1}^{n} y_i\right) + nc\right] = \frac{1}{n}\sum_{i=1}^{n}(y_i + c)$$

so $\underbrace{\left(\frac{1}{n}\sum_{i=1}^{n} y_i\right)}_{\text{old mean } \bar{y}} + c = \underbrace{\frac{1}{n}\sum_{i=1}^{n}(y_i + c)}_{\text{mean of new data set}}$

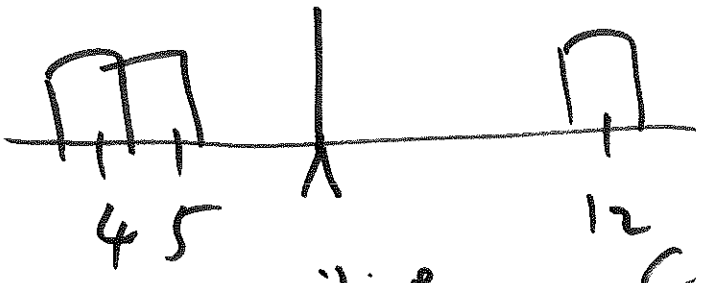
$$\begin{bmatrix} y_1 \\ \vdots \\ y_n \end{bmatrix} \xrightarrow{\text{add } c} \begin{bmatrix} y_1 + c \\ \vdots \\ y_n + c \end{bmatrix}$$

mean $\bar{y}$ → mean $\bar{y} + c$



$$\begin{bmatrix} 1 \\ 2 \\ 9 \end{bmatrix} \xrightarrow{\text{add } 3} \begin{bmatrix} 4 \\ 5 \\ 12 \end{bmatrix}$$

mean 4 → mean 7



if you add a positive constant to all your data values, the mean just changes by c & the hist. just shifts to the right by c

so adding a constant to all your ④
data values leaves the shape of the
hist. unchanged, & also leaves the
SD unchanged

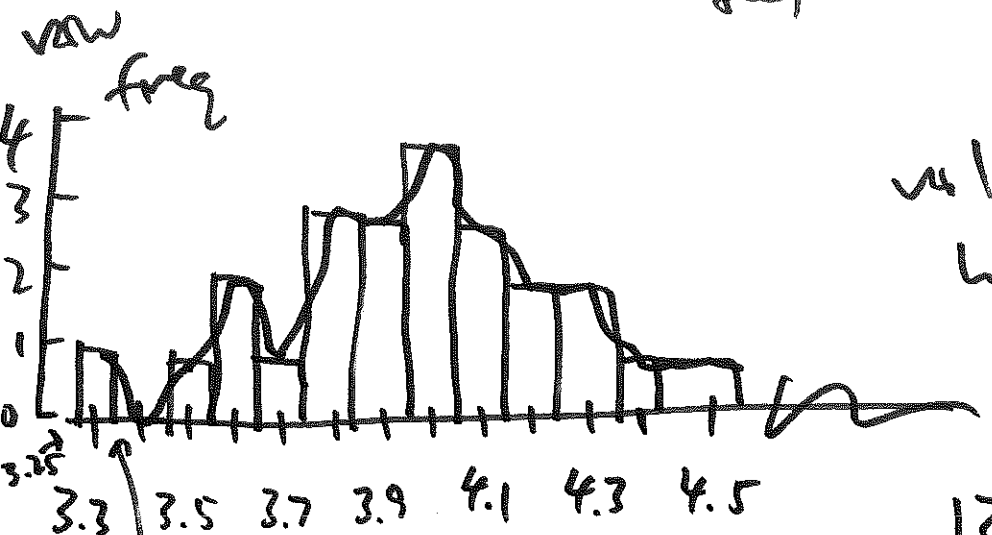
DS 2 | problem 1

R-29

sorted data set → [3.3, ⋮, 4.5]

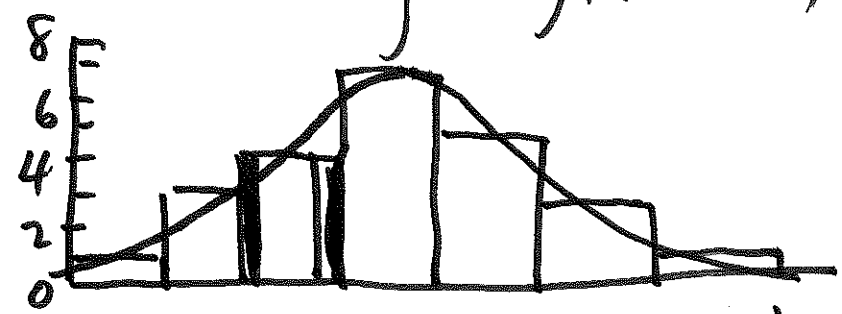
value	freq.	raw freq.
3.3	1	1
3.4	0	
3.5	1	3
3.6	2	
3.7	1	4
3.8	3	
3.9	3	7
4.0	4	
4.1	3	5
4.2	2	
4.3	2	3
4.4	1	
4.5	1	1
4.6	0	

sum $n = 24$

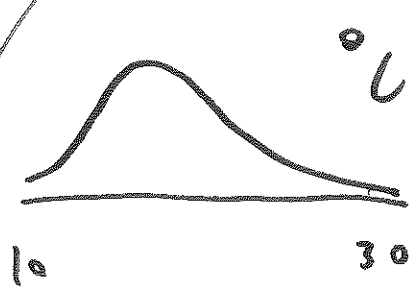


valid hist? yes

13 bars for 24 obs.

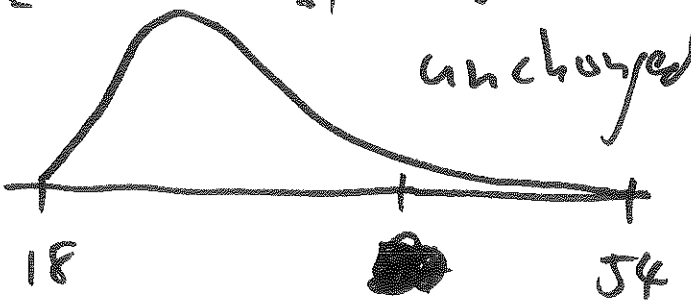


(2) $°F = 1.8(°C) + 32$



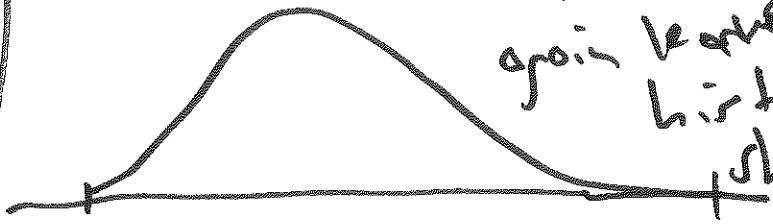
mult. by 1.8

leaves shape of hist. unchanged



linear transformation from °C to °F

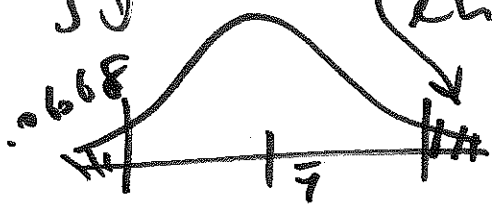
add 32: again leaves hist. shape unchanged



(3) $n = 159$

$0.16 = s$

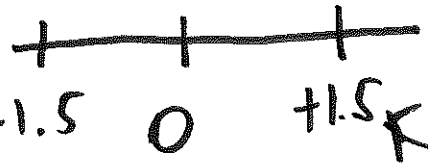
about 7% = % of frogs with $y > 1.77$



enzyme activity

raw units (y)

mean

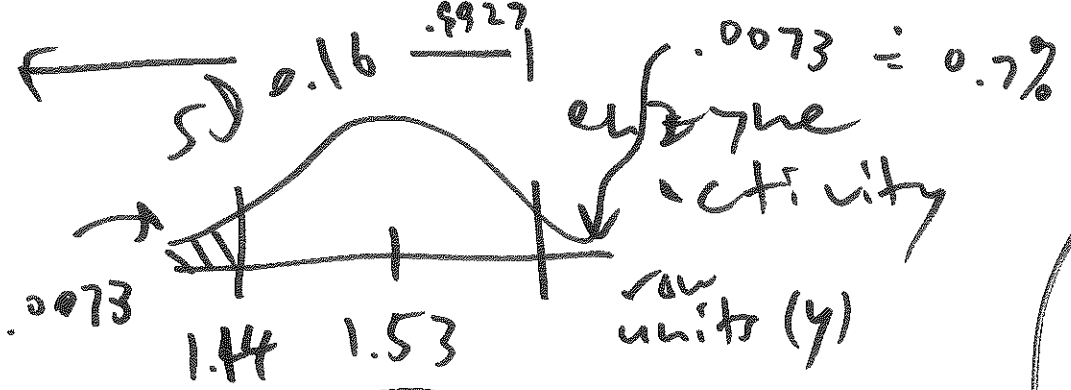


standard units (z)

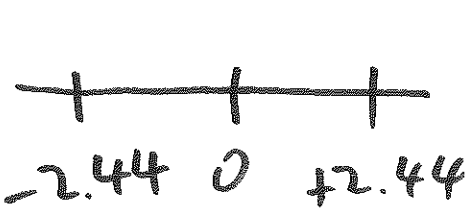
how many SDs away from the mean is 1.77?

$$\frac{y - \bar{y}}{s} = \frac{\text{\# - mean}}{\text{SD}} = \frac{1.77 - 1.53}{0.16}$$

$$= \frac{+0.24}{0.16} = +1.50$$



$$\frac{1.14 - 1.53}{0.16}$$



$$= \frac{-0.39}{0.16}$$

$$= -2.44$$

frogs with $y \leq 1.14 = (.0073)(159)$

$\approx 1.16 \approx 1$ frog