Date:- 14/01/19.

[B] Variability:-

Range = max. - min.

Varience :- (How far you deviate from mean)

$$\sigma^2 = \frac{\sum_{i=1}^{n} (x_i - \mu)^2}{n}$$

(Square to eliminate -ve values)

of a population

σ^2 = population varience

For sample varience,

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

-1 to make it a better estimate as we are finding varience of sample not population

$$\frac{1}{n-1}\left[\sum_{i=1}^{n} x_i^2 - \frac{\left(\sum_{i=1}^{n} x_i\right)^2}{n}\right]$$

Standard deviation = σ (square root of variance).

Ex-2

A) Range = max - min
= 65 - 40
= 25

$$s^2 = \frac{1}{5-1}\left[\sum_{i=1}^{5} x_i^2 - \frac{\left(\sum_{i=1}^{5} x_i\right)^2}{5}\right]$$

$$= \frac{1}{4}\left[(40^2+50^2+50^2+55^2+65^2) - \frac{(260)^2}{5}\right]$$

$$\frac{1}{4}\left[13850 - \frac{(260)^2}{5}\right]$$

$= 82.5$

$s = \sqrt{82.5}$
$= 9.08$

if each value +10
→ $\bar{x}$ is also +10.
→ variance and standard deviation stays the same.

if each value $\times 10$

→ $\bar{x}$ is also $\times 10$

→ varience is $\times 10^2$

→ standard deviation $\times \sqrt{10^2} = \times 10$

∴ if each value $\times c$

→ $\bar{x}$ is also $\times c$

→ varience is $\times c^2$

→ s.d is $\times \sqrt{c^2}$.

~~The Take~~ Significance of the Standard deviation:-

$\bar{x}, \sigma$

upper limit

$(\bar{x}-\sigma, \bar{x}+\sigma)$ ≡ at least $1-\frac{1}{k^2}$.

Lower limit

Lets say $\bar{x}$ is 60, $k=2$, $\sigma=10$

$(\bar{x}-k\sigma, \bar{x}+k\sigma)$ → Is a factor we multiply for data coverage.

$[60-2(10), 60+2(10)]$

$=(40, 80)$

$= 1-\frac{1}{2^2} = 0.75$

$= 75\%$ of the data ranges between 40 & 80.

Ex-3.

$\bar{x} = 35 \quad \sigma = 5$

a) $35 - k(5), 35 + k(5)$

$35 - 5k = 25$

$35 - 25 = 5k$

$= \frac{10}{5} = 2.$

$35 + 5k = 45$

$5k = 10$

$k = 2$

$1 - \frac{1}{2^2} = 0.75$

$= 75\%$ (at least)

$1 - 0.75$

b) $35 - 5k = 20$

$15 = 5k$

35
20
15

$k = 3$

$1 - \frac{1}{9} = \frac{4}{6} = \cancel{0.66}.$

$1 -$
c

$1 - 0.66$
$= \cancel{0.33}4$

~~50 + 5k =~~

$35 + 5k = 50$

$k = 3 \quad = \cancel{0}.66$

= at <u>most</u> 11.11%

Ex - 4 (Emperical Rule)

a) $\bar{x} = 42$ $\quad n = 5000$

$\sigma = 15$.

$\cancel{42 - 15k = 27}$
$\cancel{15k = 015}$
$\cancel{k = 1}$

k → is the 'z score' aka → how many standard de-viations it is away from mean.

$(27, 57)$

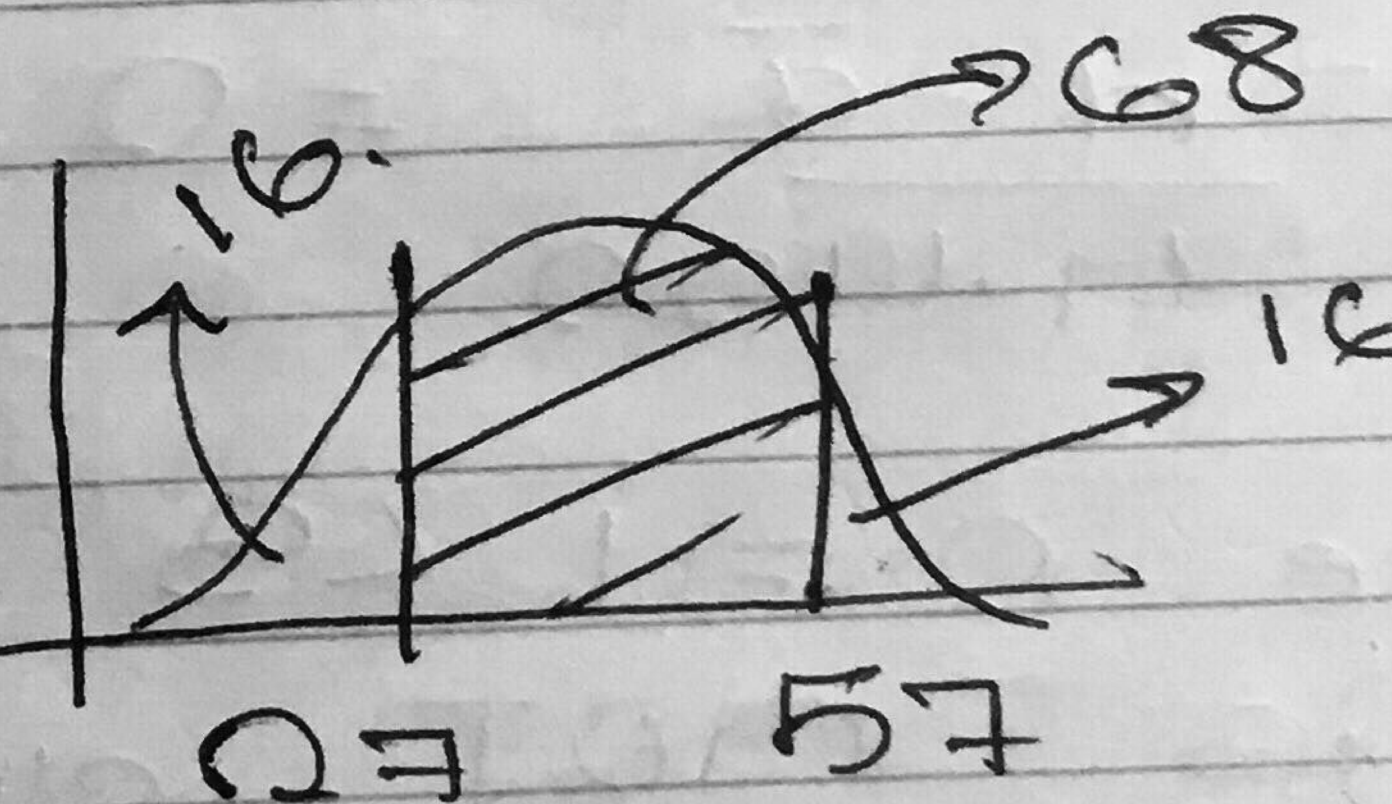
$k = \dfrac{42 - 27}{15}$

$= 1$

distribution is symmetric, so use emperical rule:
∴ Approximately = 68%

b) $\dfrac{1 - 0.68}{2}$

$= 0.16$ (at most)



$k = 1 = 68\%$

$k = 2 = 95\%$

$k = 3 = 99.7\%$

Ex-5

$R = 43$

$s = \frac{R}{4} = \frac{max - min}{4}$

$= \frac{31.9 - 10.2}{4}$

$= 5.425$ (approximately)

Ex-6. (How to find outliers)

$\bar{x} = \frac{30}{10} = 3$

$s = \sqrt{\frac{1}{9}(266 - 90)} = 4.422$

$z = \frac{x - \bar{x}}{4.422} = 2.71$

Since $2.71 < 3$ the value 15 is NOT an outlier.


25
25
25
25
min
median
max
25th %
Q1
50th %
Q2
75th %
Q3