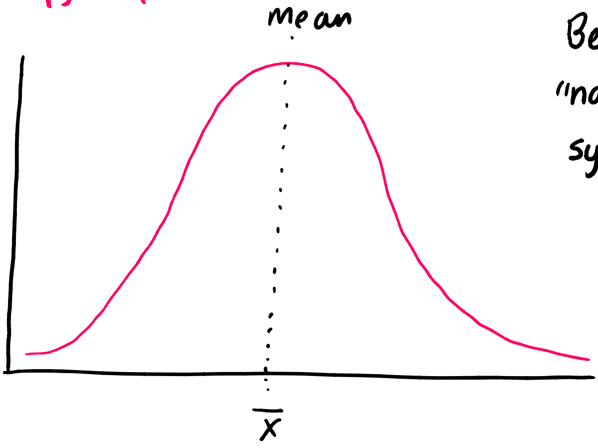
Emperical Rule

19 September 2019 13:59

68-95-99.7% Rule.



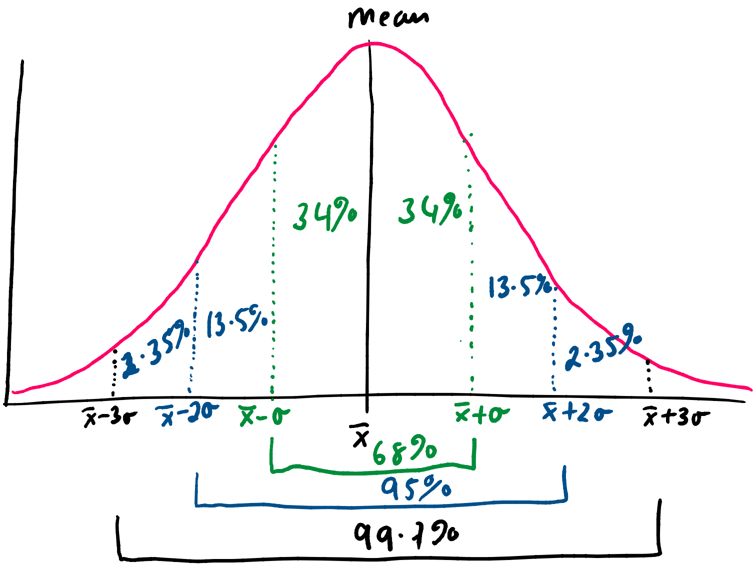
Bell curve
"normal distribution"
symmetrical curve.

σ - standard deviation

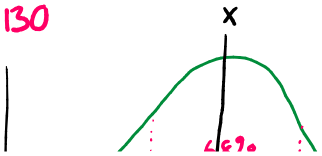
1) 68% of the population falls within 1σ of the mean formula: $\bar{x} \pm 1\sigma$

2) 95% of the population falls within 2σ of the mean formula: $\bar{x} \pm 2\sigma$

3) 99.7% of the population falls within 3σ of mean formula: $\bar{x} \pm 3\sigma$



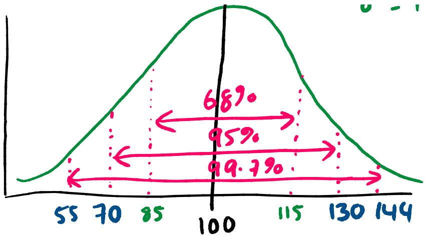
Eg 1) IQ scores are normally distributed with a mean ($\bar{x}$) of 100 and a standard deviation (σ) of 15. Use the emperical rule to show that 95% of the IQ scores in the population are between 70 and 130



$\bar{x} = 100$
$\sigma = 15$

$68\% = \bar{x} \pm 1\sigma$ 115
$100 \pm 15 = 85$

$95\% = \bar{x} \pm 2\sigma$
$100 + 2(15) = 130$, 70



$95\% = \bar{x} \pm 2\sigma$
$100 + 2(15) = 130, 70$

$99.7\% = \bar{x} \pm 3(15) = 145$
$100 + 3(15) = 55$

Q1) A bundle of stocks had a mean cost per share of €21.50 and a standard deviation of €5.25
Use the emperical rule to find the range of costs centred on the mean the stocks will cost 95% of the time.

mean $\bar{x} = €21.50$

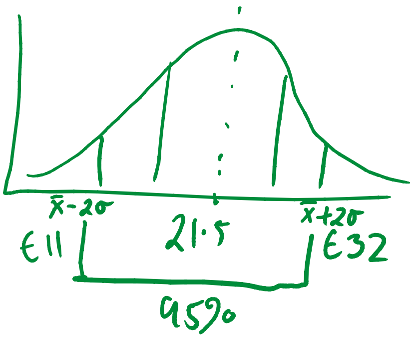
standard deviation $\sigma = 5.2$

$95\% = \bar{x} \pm 2\sigma \Rightarrow 21.50 + 2(5.25)$

€32

$21.50 - 2(5.25)$

€11



Eg2) A set of test results with a mean of 54 and a standard deviation of 5 are normally distribution.
What % of the results are between 44 and 64.

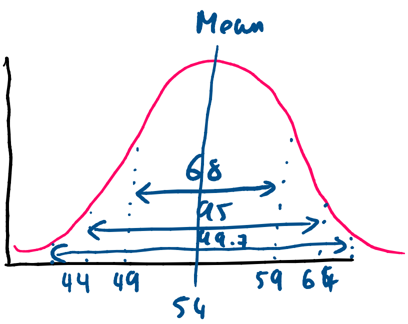
$\bar{x} = 54$

$\sigma = 5$

$68\% = \bar{x} \pm \sigma \qquad 54 \pm 5 = 59, 49$

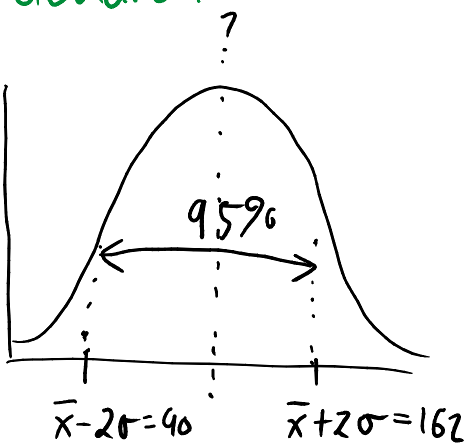
$95\% = \bar{x} \pm 2\sigma \qquad 54 \pm 2(5) = 64, 44$

$99.7\% = \bar{x} \pm 3\sigma$



44 44 54 54 64

Eg3) If 95% of the systolic blood pressure of adults distributed normally about the mean is between 90mmHg and 162mmHg. Find the mean systolic blood pressure and standard deviation



$\bar{x}$ = mean

σ = S.D

$$\bar{x} - \cancel{2\sigma} = 90$$
$$\bar{x} + \cancel{2\sigma} = 162$$

$$2\bar{x} = 252$$

$\div 2$ | $\bar{x} = 126$ | $\div 2$

mean.

$(126) - 2\sigma = 90$

-126 | $-2\sigma = -36$ | -126

$\div -2$ | $\sigma = 18$ | $\div -2$

S.D.