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Probability

Exponential Distribution

$$P(x=a) = \begin{cases} \lambda e^{-\lambda x}, & x \geq 0 \\ 0, & x < 0 \end{cases}$$

$$\text{Mean} = \frac{1}{\lambda}, \quad \text{Variance} = \frac{1}{\lambda^2}$$

$$\int_0^a \lambda e^{-\lambda x} = 1 - e^{-\lambda a}$$

$\lambda > 0$; $e = 2.718$

Normal Distribution

Probability Density Function:

$$f(x, \mu, \sigma) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$$

not used anywhere in question solving

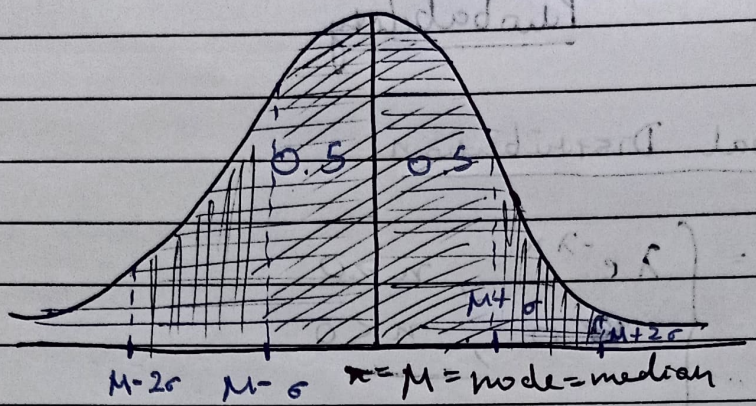
$-\infty < x < \infty$

$-\infty < \mu < \infty$

$\sigma > 0$

μ = mean ; σ = S.D

All area under this curve is 1



68.27% of whole area

95.46%

Normal Variate : μ = mean

Standard Normal Variate : $z = \frac{x - \mu}{\sigma}$; $\mu = 0$, $\sigma = 1$

Calculate the value of z using x and find for that value in table on the left side

→ z-score tells us how many S.D are we away from mean

Chebyshev's Theorem

For any type of distribution, we can find how much data lie between k S.D from mean

$$1 - \frac{1}{k^2}$$

75% lie within 1, 88.89% within 2.

Empirical Rule

In normal distribution (bell shaped):

99.7% within 3 S.D. from mean
95.46% within 2 S.D. from mean
68.2% within 1 S.D. from mean

Central Limit Theorem

If a population is following normal distribution or not but if choose multiple samples out of it, given that population is more than 30, each sample will follow normal distribution (Gaussian Distribution) for which mean = μ and variance = $\frac{\sigma^2}{n}$