* Chapter five *

* Types of Hypothesis Tests *

There are three Types of hypothesis test → left, right, Two-tailed

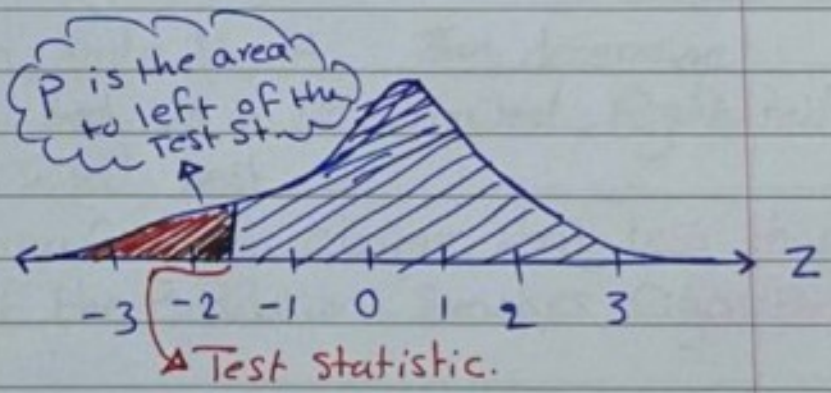
* The type of test depends on the region of the sampling distribution that favors a rejection of H_0.

* This region is indicated by the alternative hyp.

1- left-Tailed Test

if the alternative hyp. contains the less-than inequality Symbol ($<$), the hyp. test is a left-tailed test.

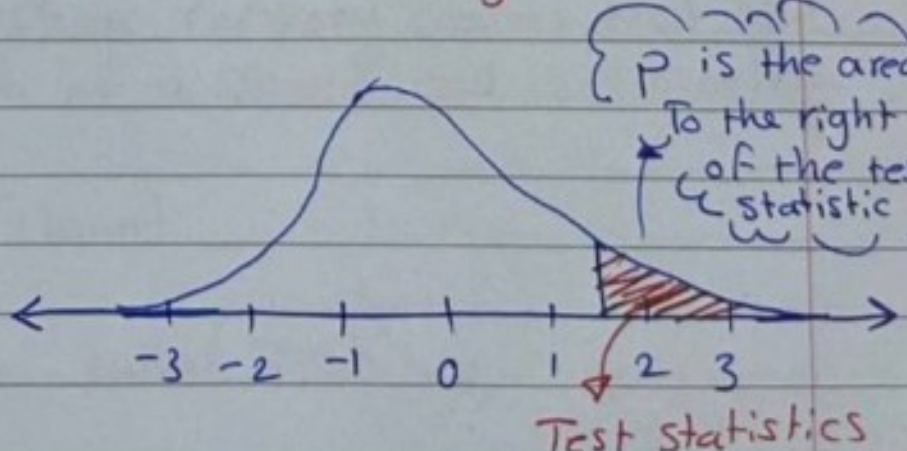
$H_0: \mu \geq K$
$H_1: \mu < K$



2- Right-Tailed Test

if the alternative hyp. contains the greater-than symbol ($>$), the Hyp. test is a right-tailed test

$H_0: \mu \leq K$
$H_1: \mu > K$



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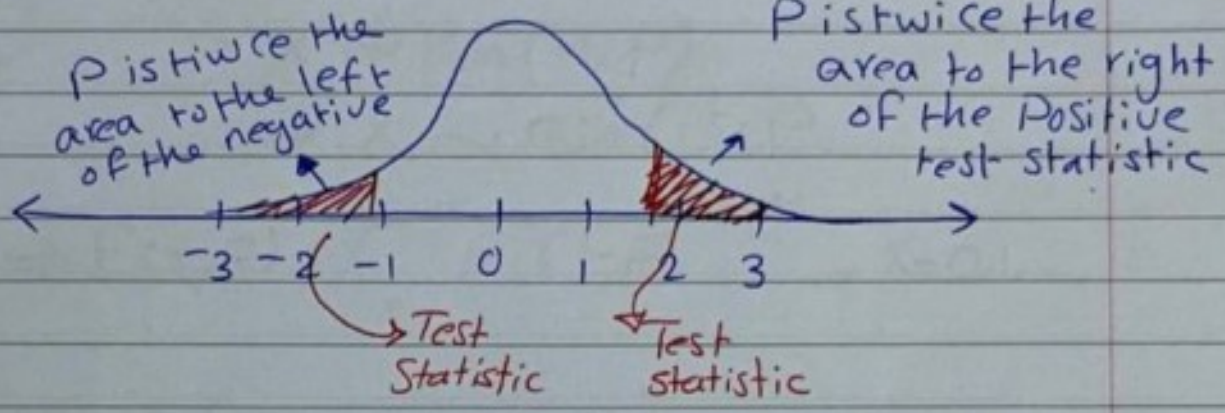
3- Two-Tailed Test:-

if the alternative hyp. contains the not-equal ($\neq$), the hyp. test is a two-tailed test, In a two-tailed test each has an area of p.

H_0; $\mu = k$

H_1; $\mu \neq k$



Ex1 For each Claim, State H_0, H_1, Then determine whether the hyp. test is a left-tailed, Right-tailed or two-Tailed test.

* Cigarette manufacturer claims that less than 0.125 of the Population Smokes Cigarette.

H_0; $p \geq 0.125$

H_1; $p < 0.125$ (claim)

↳ left-tailed test

Ex2:- A local telephone Company claims that the average length of a phone call is 8 months.

H_0: $\mu = 8$ (claim)

H_1: $\mu \neq 8$

↳ Two-tailed Test

* Chapter Five *

Ex:- let x_i be r.s of size(15) from Bin(n, p), we wish to test

$H_0: p = 0.5$ Vs. $H_1: p = 0.4$

Calculate α and β then $(1-\beta)$ when $X \leq 2$.

Sol

(1) $\because X \sim Bin(n, p)$

$\Rightarrow X \sim Bin(15, p)$

$\Rightarrow f(x,p) = \binom{15}{x} p^x (1-p)^{15-x}$, $x = 0, 1, \dots, 15$

1- $\alpha = p[\text{reject } H_0 : p = 0.5]$

$= p(X \leq 2 \mid p = 0.5)$

$= f(0) + f(1) + f(2)$

$= \binom{15}{0} (0.5)^0 (1-0.5)^{15} + \binom{15}{1} (0.5)^1 (0.5)^{14}$

$+ \binom{15}{0} (0.5)^2 (0.5)^{13}$

$\alpha = 0.004$

2- $\beta = p[\text{accept } H_0 \mid p = 0.4] = p[X > 2 \mid p = 0.4]$

$= \sum_{i=3}^{15} f(x_i) = \binom{15}{3} (0.4)^3 (0.6)^{12} + \dots$

$+ \binom{15}{15} (0.4)^{15} (0.6)^{15-15}$

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$\Rightarrow \beta = 0.87$

$\Rightarrow 1-\beta = 1-0.87 = 0.13$

(H.W) let x be a r.s From Exp(θ), to test hyp. $H_0: \theta = 2$ Vs $H_1: \theta \neq 2$

Find the level of the test when $x < 2$.