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P-VALUE:

* P-value is a probability value (between 0 and 1)
* P-value is also known as probability value at which null hypothesis is rejected.
* P-values are generally expressed as decimals.
* Usually p-values of 0.05 is used, which means 50% of the data is random.
* Smaller the p-value more significant is the experiment.
* If $p <= \alpha$ (level of significance) then reject the null hypothesis.
* If $p > \alpha$, then fail to reject the null hypothesis (or) accept null hypothesis.

Example:- Single population mean (z Test using p-value).
Vendor claims that average weight of box is 1.84kg. Customer randomly choose 64 parts and find sample weight as 1.88kg. Suppose population standard deviation is 0.3kg. Use $\alpha = 0.05$, and test for hypothesis that true mean is of shipment is 1.84kg. Calculate using p-value.

Solution:-
$H_0 : \mu = 1.84$, $H_a : \mu \neq 1.84$, $\alpha = 0.05$

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$N = 64$, $\bar{X} = 1.88$, $\sigma = 0.3$.

$$Z_{cal} = \frac{\bar{X} - \mu}{\sigma/\sqrt{N}}$$

$$= \frac{1.88 - 1.84}{0.3/\sqrt{64}}$$

$$Z_{cal} = 1.07$$

Calculate p-value :

p = 1 - z value of 1.07. (Refer z table).

= 1 - 0.8577.

p = 0.1423.

Compare p and α value :- (Multiply p × 2 since it is two tailed).

0.2846 > 0.05

It fails to reject the null hypothesis or it accepts the null hypothesis.

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Example 2:

(1) The average weight of all residents in town XYZ is 168 lbs. A nutritionist believes the true mean to be different. She measured the weight of 36 individuals and found mean to be 169.5 lbs with a standard deviation of 3.9. (a) State the null and alternate hypothesis (b) At a 95% confidence level, is there enough evidence to discard the null hypothesis? (Use the p-value method).

Solution:

$H_0 : \mu = 168$

$H_a : \mu \neq 168$

$n = 36, \bar{X} = 169.5, s = 3.9$.

$C = 0.95, \alpha = 1 - C = 0.05$.

$$Z_c = \frac{\bar{X} - \mu}{\sigma/\sqrt{N}}.$$

$$= \frac{169.5 - 168}{3.9/\sqrt{36}} = 1.5/0.65$$

$$\boxed{Z_c = 2.31}.$$

Refer z^+ table to calculate pvalue.

$P = 1 - z$ value of 2.31.

$P = 1 - 0.9896 = 0.0104$.

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Compare p and α value :

Multiply p with 2 since it is two tailed

$0.0208 < 0.05$.

Reject the null hypothesis.