Hypothesis Testing

Null Hypothesis: H_0 Trying to disprove

Alternative Hypothesis: H_a What you think is happening

Testing airbags. Researchers believe they do not open properly.

H_0: Airbags are opening properly.

H_a: Airbags do not open properly.

Developers believe new paint dries more quickly.

H_0: New paint dries at same rate or slower than standard paint.

H_a: New paint dries more quickly.

October 30, 2025

Hypothesis Test

1) Define parameters. (what numerical info is needed.)
2) Set up H_0 & H_a. (set up using #'s with $\geq, <, \neq$)
3) Set the criteria for the test.
   a) What kind of distribution – normal
   b) Set level of confidence. H_a: 95%
      $p<0.05$ $p<0.01$

$$z^* = \frac{\bar{x} - \mu}{\sigma_{\bar{x}}}$$

4) List sample evidence.
   $n, \bar{x}, \sigma$ or $s, \sigma_{\bar{x}}, z^*$ (test statistic)
5) Find probability. ($p=$)
   $p = 0.357$

6) If $p < \#$, then Reject the H_0.
   If $p > \#$, then Fail to Reject the H_0.

Millvale H.S. – National Test

95% confidence

National Test $\mu = 50$ $\sigma = 10$

900 students $\bar{x} = 51.1$ $s = 10$

Did Millvale students really do better?

1) Parameter: Millvale HS test scores

2) H_0: $\mu = 50$ $(\leq)$

H_a: $\mu > 50$

3) Criteria: normal, $p < 0.05$

4) Evidence: $n = 900$ $\bar{x} = 51.1$ $s = 10$

$$\sigma_{\bar{x}} = \frac{s}{\sqrt{n}} = \frac{10}{\sqrt{900}} = 0.333$$

$$z^* = \frac{\bar{x} - \mu}{\sigma_{\bar{x}}} = \frac{51.1 - 50}{0.333}$$

$z = 3.3$

5) $p = 0.0005$

6) Reject to H_0; MHS students performed higher than the national average.

99% Confidence

Kelley Employment Agency $\mu = 82$ $\sigma = 8$

Brown Agency $n = 36$ $\bar{x} = 79$ $s = 8$

Does Brown test produce same results as Kelley Test?

1) Param: Brown test scores

2) H_0: $\mu = 82$

H_a: $\mu \neq 82$

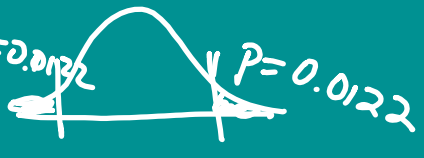
3) Criteria; Normal; $p < 0.01$

4) $n = 36$ $\bar{x} = 79$ $s = 8$

$\sigma_{\bar{x}} = \frac{8}{\sqrt{36}} = 1.333$

$z^* = \frac{79 - 82}{1.333}$

$z^* = -2.25$

5) 

$p = 0.0244$

6) Failed to Reject H_0

Brown test is not same as Kelley Test