Hypothesis Testing

H_0 Null Hypothesis: Try to disprove

H_a Alternative Hypothesis: What you think happened

Testing airbags. Researchers believe they do not open properly.

H_0: Airbags open properly.

H_a: Airbags are defective.

Developers believe new paint dries more quickly.

H_0: New paint dries at same speed or slower. $\geq \#$

H_a: New paint dries faster. $< \#$

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Hypothesis Test

1) Define parameters. (What numerical info is needed.)
2) Set up H_0 & H_a. (Use $<, >, =$)
3) Set the criteria for the test.
   a) What kind of distribution? normal
   b) Set level of confidence. for H_0
      $p < 0.05$ 95% conf $p < 0.01$ 99% conf.
4) List sample evidence.
   $n, \bar{x}, \sigma$ or $s, \sigma_{\bar{x}}, z^*$ (test statistic)
   $z^* = \frac{\bar{x} - \mu}{\sigma_{\bar{x}}}$
5) Find probability. ($p =$)

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: student test scores

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

H_a: $\mu > 50$

3) Criteria: normal distrib, $p < 0.05$

4) $n = 900$

$\bar{x} = 51.1$

$s = 10$

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

$z^* = \frac{\bar{x} - \mu}{\sigma_{\bar{x}}} = \frac{51.1 - 50}{0.333} = 3.3$

5) 

$p = 0.0005$

6) Reject the H_0

Millvale HS students performed better.

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one-tailed test: $H_0 = \mu \leq \#$ $H_a = \mu > \#$

two-tailed test: H_0: $H_a = \mu \neq \#$

99% Confidence
$\mu = 82$ $\sigma = 8$

Kelley Employment Agency

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

Does Brown test produce same results as Kelley Test?

1) Param: 36 test scores

2) H_0: $\mu \neq 82$

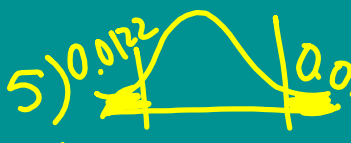
   H_a: $\mu = 82$

3) Criteria: Normal distr. $p < 0.01$

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

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

$$z^* = \frac{79 - 82}{1.333} = -2.25$$

5) 

$p = 0.0244$

6) Fail to Reject the H_0

Brown test is not same as Kelley Test.