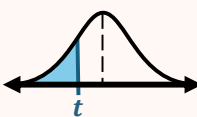## TOPIC: TWO MEANS - UNKNOWN, EQUAL VARIANCES

Performing Hypothesis Tests on Means with Unknown, Equal Variances

◆ If you can assume two populations have the _____ variance, run a t-test using the _____ standard dev., s_p.

EXAMPLE

A school claims a new math app will improve test scores. They have 2 independent, random samples of 50 students, one using the traditional method ($\bar{x}_1 = 77$, $s_1 = 4.8$) and the other using the new app ($\bar{x}_2 = 82$, $s_2 = 4.4$). The school assumes the population variances are equal. Test the claim that the app improves test scores with $\alpha = 0.05$.

New — **Hypothesis Tests for 2 Means: $\sigma_1 = \sigma_2$**

1) Hyp

$$H_0 : \mu_1 = \mu_2 \qquad H_a : \mu_1 \,[\, < \,|\, > \,|\, \neq \,]\, \mu_2$$

2) Test Stat

$\bar{x}_1 = $ _____ $s_1 = $ _____ $n_1 = $ _____

$\bar{x}_2 = $ _____ $s_2 = $ _____ $n_2 = $ _____

$$s_p^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{(n_1 - 1) + (n_2 - 1)} \qquad t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\dfrac{s_p^2}{n_1} + \dfrac{s_p^2}{n_2}}}$$

3) P-Value

Area "beyond" t

$df = n_1 - 1 + n_2 - 1 = $ _____

P-Value $= $ _____

4) Conclusion

Because P-value $= $ _____ $[\, < \,|\, > \,]\, \alpha, = $ _____, we

[REJECT | FAIL TO REJECT] H_0, there is

[ENOUGH | NOT ENOUGH] evidence to suggest…

Criteria

Independent, Random Samples? ☐

X is Normal **OR**

$n_1 > 30$ & $n_2 > 30$ ☐

HOW TO: Do Hyp. Test 2 Means, $\sigma_1 = \sigma_2$

1) (STAT) (>) **TESTS**

   4: 2-SampTTest

2) DATA **STATS**

   x̄1:   x̄2:
   Sx1:   Sx2:
   n1:   n2:

   μ1: ≠μ2 **<μ2** >μ2
   Pooled: No **Yes**
   Calculate Draw

TOPIC: TWO MEANS - UNKNOWN, EQUAL VARIANCES

HOW TO: Do Hyp. Test 2 Means, $\sigma_1 = \sigma_2$

1) STAT > TESTS

   4: 2-SampTTest

2) DATA STATS

   x̄1:   x̄2:
   Sx1:   Sx2:
   n1:   n2:

   μ1: ≠μ2 <μ2 >μ2
   Pooled: No Yes
   Calculate Draw

EXAMPLE

A grocery store is looking to outsource its home delivery service to another company. They collect a sample of wait times (in minutes) from two delivery services and get the following statistics:

Service A: $\bar{x}_1 = 18.4$, $s_{x_1} = 3.2$, $n_1 = 35$
Service B: $\bar{x}_2 = 14.6$, $s_{x_2} = 4.3$, $n_2 = 35$

(A) For $\alpha = 0.1$, perform a hypothesis test to see if there is evidence that Service B has shorter wait times. Assume the variances for wait times for both delivery services are equal.

(B) Based on the results of the hypothesis test, does the grocery chain have enough evidence to select Service B?

TOPIC: TWO MEANS - UNKNOWN, EQUAL VARIANCES

A social media manager at a large firm is concerned that posts on their two major platforms are not getting the same traffic, so they analyze the number of views (in millions) for a sample of posts on each platform and observe the following statistics:

Platform A: $\bar{x}_1 = 2.5$, $s_{x_1} = 0.57$, $n_1 = 90$
Platform B: $\bar{x}_2 = 2.4$, $s_{x_2} = 0.39$, $n_2 = 80$

(A) For a significance level of $\alpha = 0.01$, perform a hypothesis test to determine if there is enough evidence to support the manager's concerns.
Assume $\sigma_1 = \sigma_2$.

(B) Based on the results of the above test, should the company continue to spend an equal amount of time posting on each platform?

HOW TO: Do Hyp. Test 2 Means, $\sigma_1 = \sigma_2$

1) (STAT) (>) **TESTS**

   4: 2-SampTTest

2) **DATA STATS**

   $\bar{x}$1: $\bar{x}$2:
   Sx1:   Sx2:
   n1:   n2:

   μ1: **≠μ2** <μ2 >μ2
   Pooled: No **Yes**
   Calculate Draw