

Comparing Two Independent Means

IQ and Lead Exposure

Data Set 5 in Appendix B lists full IQ scores for a random sample of subjects with medium lead levels in their blood and another random sample of subjects with high levels in their blood. The statistics are summarized below. Use a 0.05 significance level to test the claim that the mean IQ score of people with medium lead levels is higher than the mean IQ score of people with high lead levels.

Medium Lead Level:	$n_1 = 22,$	$\bar{x}_1 = 87.22727,$	$s_1 = 14.29263$
High Lead Level:	$n_2 = 21,$	$\bar{x}_2 = 86.90476,$	$s_2 = 8.988352$

$$\alpha = 0.05$$

We are testing that people with medium lead levels have a higher average IQ than people with high lead levels, or Group 1 > Group 2.

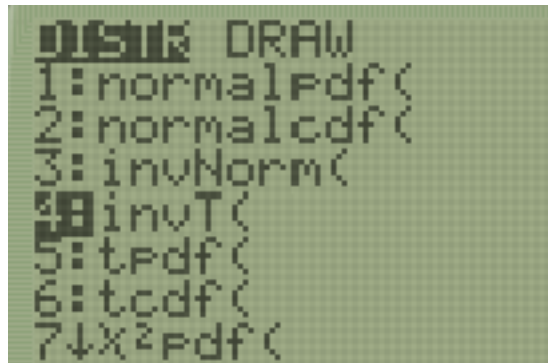
$$H_0 = \mu_1 \leq \mu_2$$

$$H_A = \mu_1 > \mu_2$$

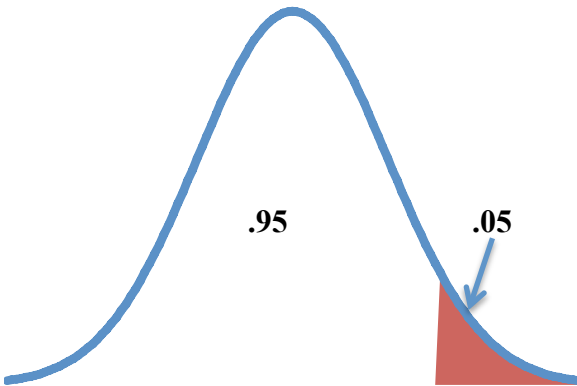
This problem is testing the difference between means. Since we are not given the population standard deviation, we must use **T Tests** for this problem.

Calculating Critical Value

Push **2ND**, then **VARS**. Select **invT**(and hit **ENTER**.



Next, we need to input two numbers into this function. First is the area from the left leading up to our rejection region (0.95). The last number is the degrees of freedom of our smallest sample size ($n_2 = 21$, $df = n - 1 = 20$). Then hit **ENTER**. The number below is our critical value.



```
invT(0.95,20)
1.724718218
```

Calculating Test Statistic and P Value

Push **STAT**, then select **TESTS** in the upper right hand corner. Select **2-PropZTest...** and hit **ENTER**.

```

STAT TESTS
1:Edit...
2:SortA(
3:SortD(
4:ClrList
5:SetUpEditor

```

```

EDIT CALC TESTS
1:Z-Test...
2:T-Test...
3:2-SampZTest...
4:2-SampTTest...
5:1-PropZTest...
6:2-PropZTest...
7:ZInterval...

```

First, for Input, select **Stats**. Next, add in the data for both groups and choose our alternative hypothesis ($H_A = \mu_1 > \mu_2$). For Pooled, choose **NO**. Now select **Calculate** and hit **ENTER**.

```

2-SampTTest
Inpt:Data STATS
x1:87.2273
Sx1:14.2926
n1:22
x2:86.9048
Sx2:8.9884
n2:21

```

```

2-SampTTest
n1:22
x2:86.9048
Sx2:8.9884
n2:21
mu1:#mu2 <mu2 NO
Pooled:NO Yes
Calculate Draw

```

The t = is our test statistic and the p = is our p value.

```

2-SampTTest
μ1 > μ2
t = .088992733
P = .4647932884
df = 35.59144025
x̄1 = 87.2273
↓ x̄2 = 86.9048

```

Calculating a Confidence Interval

We refer to the following table to choose our confidence level. We have a one-tailed test and $\alpha = 0.05$, so we will use a confidence level of 90%.

	α	Two-Tailed Test	One-Tailed Test
Significance Level for Hypothesis Test	0.01	99%	98%
	0.05	95%	90%
	0.10	90%	80%

Push **STAT**, then select **TESTS** in the upper right hand corner. Select **2-SampTInt...** and hit **ENTER**.

```

STAT CALC TESTS
1: Edit...
2: SortA(
3: SortD(
4: ClrList
5: SetUpEditor

```

```

EDIT CALC TESTS
4: 2-SampTTest...
5: 1-PropZTest...
6: 2-PropZTest...
7: ZInterval...
8: TInterval...
9: 2-SampZInt...
0: 2-SampTInt...

```

First, for Input, select **Stats**. Next, add in the data for both groups and choose our confidence level (90%). For Pooled, choose **NO**. Now select **Calculate** and hit **ENTER**.

```
2-SampTInt
Inpt:Data Stats
x̄1:87.2273
Sx1:14.2926
n1:22
x̄2:86.9048
Sx2:8.9884
↓n2:21
```

```
2-SampTInt
↑n1:22
x̄2:86.9048
Sx2:8.9884
n2:21
C-Level: .9
Pooled: NO Yes
Calculate
```

The top numbers in parentheses is our confidence interval.

```
2-SampTInt
(-5.798, 6.4426)
df=35.59144025
x̄1=87.2273
x̄2=86.9048
Sx1=14.2926
↓Sx2=8.9884
```