———— 3/15/2007 3:15:40 PM ————————————————————————

```
Saving file as: 'C:\rjs\Courses\3332\Minitab Demos\minitabdemo4.MPJ'
```

This illustrates the two-sample t test for two independent samples of the same size.
It is taken from Steve McKillup, "Statistics Explained: An Introductory Guide for Life Scientists", Cambridge University Press, 2006, page 92.

Setting: A freshwater ecologist sampled the shell length of 15 freshwater clams in each of two lakes to see if these samples were likely to have come from populations with the same mean.

The sample values are in columns C1 and C2 in the worksheet. NOTE. These are NOT matched or paired data.

```
MTB > print c1-c2
```

Data Display

Row	lakeA	lakeB
1	25	45
2	40	37
3	34	36
4	37	38
5	38	49
6	35	47
7	29	32
8	32	41
9	35	38
10	44	45
11	27	33
12	33	39
13	37	46
14	38	47
15	36	40

```
MTB > desc c1-c2
```

Descriptive Statistics: lakeA, lakeB

Variable	N	N*	Mean	SE Mean	StDev	Minimum	Q1	Median	Q3	Maximum
lakeA	15	0	34.67	1.28	4.97	25.00	32.00	35.00	38.00	44.00
lakeB	15	0	40.87	1.38	5.36	32.00	37.00	40.00	46.00	49.00

We have sample means of 34.67 and 40.87. Are these statistically different?

```
MTB > TwoSample 'lakeA' 'lakeB'.
```

Two-Sample T-Test and CI: lakeA, lakeB

```
Two-sample T for lakeA vs lakeB

        N   Mean  StDev  SE Mean
lakeA  15  34.67   4.97      1.3
lakeB  15  40.87   5.36      1.4


Difference = mu (lakeA) - mu (lakeB)
Estimate for difference:  -6.20
95% CI for difference:  (-10.07, -2.33)
T-Test of difference = 0 (vs not =): T-Value = -3.29  P-Value = 0.003  DF = 27
```

The above is a two-sample t-test, of the TWO-SIDED type, and NOT assuming equal variances.
The two-sided p-value of 0.003 represents strong evidence against the null hypothesis.

Note that a 95% confidence interval for the difference of means is provided by default in the above output.
We also can ask for a 99% confidence interval for the difference of means.

```
MTB > TwoSample 'lakeA' 'lakeB';
SUBC>   Confidence 99.0.
```

Two-Sample T-Test and CI: lakeA, lakeB

```
Two-sample T for lakeA vs lakeB

        N   Mean  StDev  SE Mean
lakeA  15  34.67   4.97      1.3
lakeB  15  40.87   5.36      1.4


Difference = mu (lakeA) - mu (lakeB)
Estimate for difference:  -6.20
99% CI for difference:  (-11.43, -0.97)
T-Test of difference = 0 (vs not =): T-Value = -3.29  P-Value = 0.003  DF = 27
```

We should also (always) take a look at the data.
This would better have been done sooner (why?), but let's do it now.

```
MTB > Dotplot 'lakeA' 'lakeB';
SUBC>   Overlay.
```

Dotplot of lakeA, lakeB

(This graph is separately saved -- see minitabdemo4graph1.gif)
But we can also do it in a less pretty form:

```
MTB > gstd

* NOTE * The character graph commands are obsolete.


* NOTE * Standard Graphics are now enabled, and Professional Graphics are
       * disabled. Use the GPRO command when you want to re-enable
       * Professional Graphics.

MTB > dotplot c1-c2;
SUBC> same.
```

Dotplot: lakeA, lakeB

```
           .   .   .     . . . : . : :   .       .
         ---+---------+---------+---------+---------+---------+---lakeA

                        . .     . . : . . .       : . :   .
         ---+---------+---------+---------+---------+---------+---lakeB
         25.0      30.0      35.0      40.0      45.0      50.0
```

```
MTB > gpro

* NOTE * Professional Graphics are now enabled, and Standard Graphics are
       * disabled. Use the GSTD command when you want to re-enable Standard
       * Graphics.

MTB > save
Saving file as: 'C:\rjs\Courses\3332\Minitab Demos\Minitab.MTW'
```