

## Chapter 14 / Example 10

# Paired samples

Five candidates attended a revision course hoping to improve their chemistry grades. They were tested before the course started and again at the end of the course. The results were as follows.

Candidate	1	2	3	4	5
Score before course	64	43	29	56	61
Score after course	72	60	33	55	62

Determine at the 5% level whether the course improved the candidates' performance in their chemistry tests.

Press **MENU** 2 **STAT** to display the List Editor screen.

Type the before scores in the first column.

Press **EXE** after each number to move to the next cell.

**Note:** If the list contains other numbers, you can clear it by pressing **F4** DEL-ALL.

	List 1	List 2	List 3	List 4
SUB				
1	64			
2	43			
3	29			
4	56			
				56
				GRAPH CALC TEST INTR DIST ▶

Press **▶** to move to the next column.

Enter the after scores in the second column.

	List 1	List 2	List 3	List 4
SUB				
1	64	72		
2	43	60		
3	29	33		
4	56	55		
				55
				GRAPH CALC TEST INTR DIST ▶

Press **MENU** 1 **RUN-MAT** to display the Run-Matrix screen for arithmetical calculations.

Press **OPTN** **F1** LIST **F1** List and type 2.

Type -

Press **F1** List and type 1

Press **→** press **F1** List and type 3

Press **EXE**.

List 2-List 1→List 3
{8,17,4,-1,1}
□
List Lst→Mat Dim Fill( Seq ▶

Press **MENU** 2 **STAT** to return to the List Editor screen.

The differences are shown in List 3.

	List 1	List 2	List 3	List 4
SUB				
1	64	72	8	
2	43	60	17	
3	29	33	4	
4	56	55	-1	
				64
				GRAPH CALC TEST INTR DIST ▶

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# Paired samples

$H_0: \mu_D = 0, H_1: \mu_D > 0$

To calculate the  $p$ -value press **F3** TEST **F2** t **F1** 1-SAMPLE

```
1-Sample tTest
Data      :List
μ         :≠μ0
μ0        :0
List      :List1
Freq      :1
Save Res  :None
List Var  :
```

Choose Data: **F1** List

**F3**  $\mu > \mu_0$

$\mu_0 = 0$

List: List3

Freq: 1

Press **EXE**.

```
1-Sample tTest
Data      :List
μ         :>μ0
μ0        :0
List      :List3
Freq      :1
Save Res  :None
LIST
```

$p$ -value = 0.0713 > 0.05, not significant so no reason to reject  $H_0$  that the grades have not improved.

```
1-Sample tTest
μ         :>0
t         :1.82141545
p         :0.07132118
x̄         :5.8
sx        :7.12039325
n         :5
```