

Chapter 2 / Example 9

The line of best fit

The results of ten students in their final Mathematics and Physics exams are given.

Student	1	2	3	4	5	6	7	8	9	10
Mathematics result (%)	78	56	88	93	44	76	33	59	82	99
Physics result (%)	84	62	84	100	51	90	42	74	80	89

- Plot the information on a scatter diagram.
- Plot the point (\bar{x}, \bar{y}) and draw the line of best fit.
- Predict the Physics result for a student who scored 65% on their Mathematics exam.
- State whether or not the results indicate that students who are good at Mathematics are also good at Physics.

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

Enter the Mathematics results 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	78			
2	56			
3	88			
4	93			
				93

GRAPH CALC TEST INTR DIST **▶**

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

Enter the Physics results in the second column.

	List 1	List 2	List 3	List 4
SUB				
1	78	84		
2	56	62		
3	88	84		
4	93	100		
				100

GRAPH CALC TEST INTR DIST **▶**

Press **F1** GRAPH.

Press **F6** .SET.

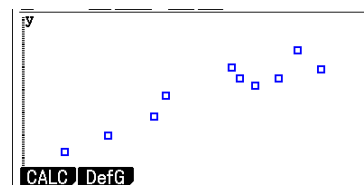
Choose Graph Type: **F1** Scatter, XList: List1 and YList: List2.

StatGraph1	
Graph Type	: Scatter
XList	: List1
YList	: List2
Frequency	: 1
Mark Type	: <input type="checkbox"/>
Color Link	: Off
GRAPH1 GRAPH2 GRAPH3	

Press **EXIT**.

Press **F1** GRAPH1.

The GDC displays a scatter diagram of x against y.



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Press **F1** CALC, press **F1** 2-VAR.

The GDC calculates $\bar{x} = 70.8$.

```
2-Variable
x̄ = 70.8
Σx = 708
Σx² = 54420
σx = 20.7210038
sx = 21.8418558
n = 10
DRAW
```

Scroll down using **▼**.

The GDC calculates $\bar{y} = 75.6$.

```
2-Variable
ȳ = 75.6
Σy = 756
Σy² = 60218
σy = 17.5054277
sy = 18.452341
Σxy = 56923
DRAW
```

The line of best fit is known as the regression line.

To calculate the equation of the regression line

Press **EXIT**, **F1** GRAPH1, **F1** CALC, **F2** X, **F1** ax+b.

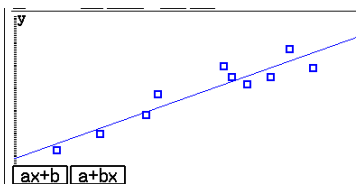
The form of the regression equation is $y = ax + b$.

The equation is $y = 0.791x + 19.6$.

```
LinearReg(ax+b)
a = 0.79145705
b = 19.5648406
r = 0.93683998
r² = 0.87766915
MSe = 46.8588305
y = ax + b
COPY DRAW
```

Press **F6** DRAW.

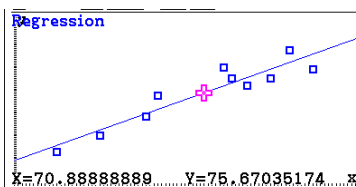
The GDC displays the scatter diagram and the regression line.



Press **SHIFT** **F1** TRACE.

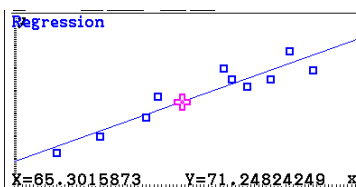
Press **▶** to move along the regression line.

You can move approximately to $(70.8, 75.6)$, which is (\bar{x}, \bar{y}) .



Press **◀** to move as close as possible to $x = 65$.

The predicted score is 71.



From the calculation of the regression line, it can be seen that the product-moment correlation coefficient is 0.937, which indicates strong positive correlation, which supports the idea that high results in Mathematics correspond to high results in Physics.

```
LinearReg(ax+b)
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b = 19.5648406
r = 0.93683998
r² = 0.87766915
MSe = 46.8588305
y = ax + b
COPY DRAW
```