

## 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.

Open a new document and add a Lists & Spreadsheet page.

Type 'math' in the first cell.

Enter the times in the first column.

Press **enter** or **▼** after each number to move to the next cell.

	A math	B	C	D
1	78			
2	56			
3	88			
4	93			
5	44			

Type 'phys' in the cell to the right of 'math'

Enter the temperatures in the second column.

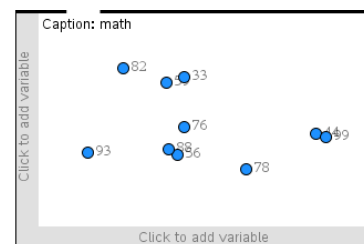
Use the **▲ ▼ ► ◀** keys on the touchpad to navigate the spreadsheet.

	A math	B phys	C	D
1	78	84		
2	56	62		
3	88	84		
4	93	100		
5	44	51		

Add a new Data & Statistics page to your document by pressing

**ctrl** **docv** (**⌕** + **page**) 5: Add Data & Statistics.

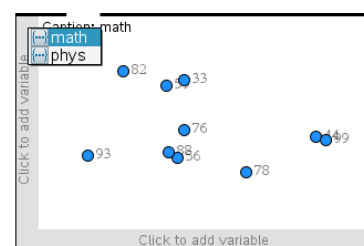
**Note:** Ignore the screen display that you see when this page first opens.



Press **menu** 2: Plot Properties | 5: Add X Variable.

The GDC displays the two variables you created in the spreadsheet: 'math' and 'phys'.

Select 'math' with the touchpad.



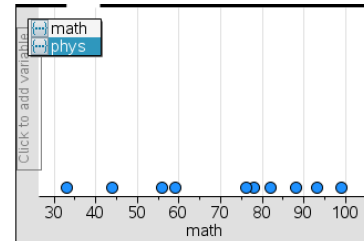
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# The line of best fit

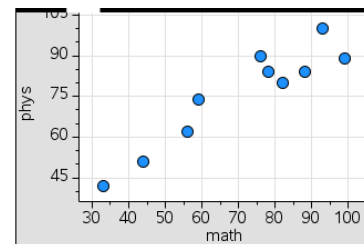
Press **menu** 2:Plot Properties | 8: Add Y Variable.

The GDC displays the two variables you created in the spreadsheet: 'math' and 'phys'.

Select 'phys' with the touchpad.



The GDC displays a scatter diagram of math against phys.



Press **ctrl** ◀ to return the lists and spreadsheet page. Press **menu** 4:Statistics | 1:Stat Calculations | 2:Two-Variable Statistics.

Open the drop down lists with ▶ and select using ▼ and **enter** **del**

Choose 'math' for X List and 'phys' for Y List and leave the remaining fields unchanged.

Click the touchpad on OK or press **enter** **del**

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

A	math	B	phys	C	D
=					=TwoVar(
1	78	84	Title		Two-Va...
2	56	62	$\bar{x}$		70.8
3	88	84	$\Sigma x$		708.
4	93	100	$\Sigma x^2$		54420.
5	44	51	$\Sigma x := \Sigma n \cdot x$		21.8419
D2	=70.8				

Scroll down using ▼.

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

A	math	B	phys	C	D
=					=TwoVar(
5	44	51	$\Sigma x := \Sigma n \cdot x$		21.8419
6	76	90	$\Sigma x := \Sigma n \cdot x$		20.721
7	33	42	n		10.
8	59	74	$\bar{y}$		75.6
9	82	80	$\Sigma y$		756.
D8	=75.6				

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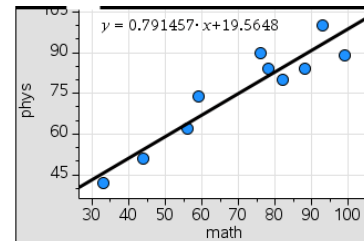
# The line of best fit

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

To calculate the equation of the regression line press **ctrl** ► to return the Data & Statistics page.

Press **menu** 4:Analyze | 6:Regression | 2 Show Linear (mx+b)

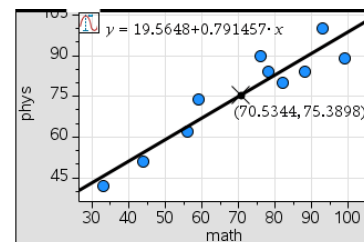
The equation is  $y = 0.791x + 19.6$ .



Press **menu** 4:Analyze | A:Graph Trace

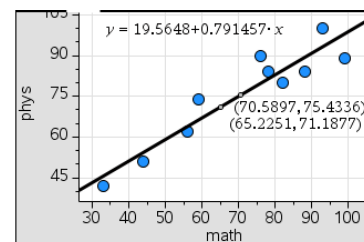
Press ► to move along the regression line.

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.



Press **ctrl** ◀ to return the lists and spreadsheet page.

Scroll down the Two Variable Statistics using ▼.

The GDC calculates  $r = 0.937$ .

This is the product-moment correlation coefficient which indicates strong positive correlation, which supports the idea that high results in Mathematics correspond to high results in Physics.

A	math	B	phys	C	D
					=TwoVar(
12				$\sigma_y := \sigma_{n...}$	17.5054
13				$\Sigma xy$	56923.
14				$r$	0.93684
15				MinX	33.
16				Q1X	56.
D14	=0.9368399831003				