

## 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 **[STAT]** 1:Edit and press **[ENTER]**

Enter the Mathematics results in the first column.

Press **[ENTER]** or **[↓]** after each number to move to the next cell.

**Note:** If the list contains other numbers, you can clear it by pressing **[STAT]** 4:ClrList and press **[ENTER]**. The home screen displays ClrList. Press **[2nd]** **[1]** **[L1]** and press **[ENTER]**. Press **[STAT]** 1:Edit and press **[ENTER]** to return to the table.

L1	L2	L3	L4	L5	1
78					
56					
88					
93					
44					
76					
33					
59					
82					
99					
-----					

L1(11)=

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

Enter the Physics results in the second column.

L1	L2	L3	L4	L5	2
78	84				
56	62				
88	84				
93	100				
44	51				
76	90				
33	42				
59	74				
82	80				
99	89				
-----	-----				

L2(11)=

Press **[2nd]** **[F1]** **[STAT PLOT]**.

Press **[ENTER]**.

STAT PLOTS	
1:Plot1...Off	
2:Plot2...Off	
3:Plot3...Off	
4:PlotsOff	
5:PlotsOn	

Press **[ENTER]** and navigate through the list using **[▶]** **[◀]** **[▲]** **[▼]** keys.

Select Type **[X<sub>sc</sub>]**, Xlist L1 and Ylist L2 and Mark **+**. Choose any color.

Press **[ENTER]** after each choice.

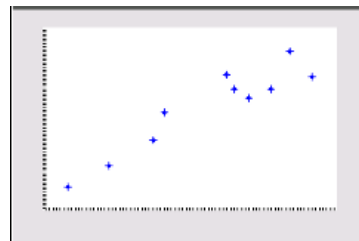
Plot1 Plot2 Plot3	
On Off	
Type: <b>[X<sub>sc</sub>]</b>	
Xlist: L1	
Ylist: L2	
Mark: <b>+</b>	
Color: <b>BLUE</b>	

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Press **[F3]** **[ZOOM]** 9:ZoomStat

The GDC displays a scatter diagram of x against y.



Press **[STAT]** and **[▶]** to access the CALC menu.

Select 2:2-Var Stats.

Choose Xlist L<sub>1</sub> and Ylist L<sub>2</sub>. Navigate down to Calculate and press **[ENTER]**.

```
2-Var Stats
Xlist:L1
Ylist:L2
FreqList:
Calculate
```

The GDC calculates  $\bar{x} = 70.8$  and  $\bar{y} = 75.6$ .

```
2-Var Stats
x̄=70.8
Σx=708
Σx²=54420
Sx=21.84185584
σx=20.72100384
n=10
ȳ=75.6
↓Σy=756
```

To calculate the equation of the regression line

Press **[STAT]** and **[▶]** to access the CALC menu.

Select 4:LinReg(ax+b) and press **[ENTER]**.

Leave the X List as L<sub>1</sub> and the Y List as L<sub>2</sub>.

Enter Y<sub>1</sub> as the place to store the regression equation. To enter Y<sub>1</sub> press **[ALPHA]** **[F4]** 1:Y<sub>1</sub>

Navigate down to Calculate and press **[ENTER]**.

```
LinReg(ax+b)
Xlist:L1
Ylist:L2
FreqList:
Store RegEQ:Y1
Calculate
```

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

The equation is  $y = 0.791x + 19.6$

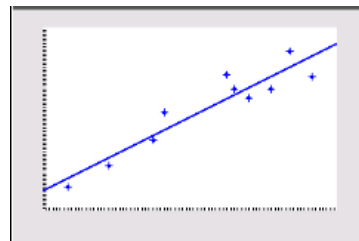
```
LinReg
y=ax+b
a=.7914570524
b=19.56484069
```

## Chapter 2 / Example 9

# The line of best fit

Press **[F5]** **GRAPH**.

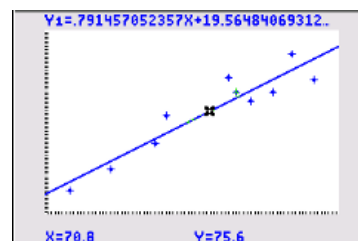
The GDC displays the scatter diagram and the regression line.



Press **[F4]** **TRACE**.

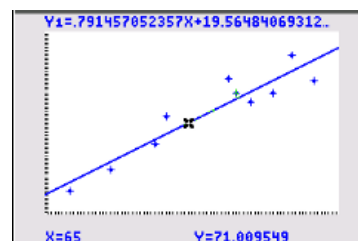
Use the **▼** key to select the regression line and then move along it using the **►** key.

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



Type 65 to move to a point where  $x = 65$ .

The predicted score is 71.



Before calculating a correlation coefficient, you must switch this option on.

Press **MODE**

Using **▼** and **▼**, navigate down to STAT DIAGNOSTICS and select 'ON' by pressing **ENTER**.

```

NORMAL FLOAT AUTO REAL RADIAN MP
DISPLAY CORR COEFF (P, R², R²)
MATHPRINT CLASSIC
NORMAL SCI ENG
FLOAT 0 1 2 3 4 5 6 7 8 9
RADIAN DEGREE
FUNCTION PARAMETRIC POLAR SEQ
THICK DOT-THICK THIN DOT-THIN
SEQUENTIAL SIMUL
REAL a+bt re^(bt)
FULL HORIZONTAL GRAPH-TABLE
FRACTION TYPE: 0/1 Und
ANSWERS: AUTO DEC FRAC-APPROX
GO TO 2ND FORMAT GRAPH: NO YES
STAT DIAGNOSTICS: OFF ON
STAT WIZARDS: ON OFF
SET CLOCK 09/23/18 2:41PM
  
```

Press **STAT** and **►** to access the CALC menu.

Select 4:LinReg(ax+b) and press **ENTER**.

Navigate down to Calculate and press **ENTER**.

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.

```

LinReg
y=ax+b
a=.7914570524
b=19.56484069
r²=.8776691539
r=.9368399831
  
```