

## Chapter 7 / Example 5

# Regression equation

How to find the equation of the  $y$  on  $x$  regression line from your GDC.

As a car's tires become worn, it uses more fuel to travel the same distance. This table shows the age of the tires and the number of kilometres the car travelled on one litre of diesel.

Age(years)	1	2	3	4	5	6
km/l	20	18.5	17.4	15.6	14.8	13.2

- Write down the regression equation.
- Interpret the meaning of the constant value.
- Interpret the meaning of the gradient of the regression line.
- Use the equation of the regression line to estimate the distance the car would have travelled on 1 litre of diesel when the tires were 3.5 years old.

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

Type 'x' in the first cell.

Type the age in years in the first column.

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

**Note:** 'x' is a label that will be used to calculate the regression equation. You can use any letter or name to label the list.

	A x	B	C	D
1	1			
2	2			
3	3			
4	4			
5	5			

Type 'y' in the cell to the right of 'x'

Enter the number of kilometres the car travelled on one litre of diesel in the second column.

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

	A x	B y	C	D
1	1	20		
2	2	18.5		
3	3	17.4		
4	4	15.6		
5	5	14.8		

To calculate the equation of the regression line

Press **menu** 4:Statistics | 1:Stat Calculations | 3:Linear Regression (mx+b)...

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

Choose 'x' for X List and 'y' for Y List and leave the remaining fields unchanged.

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

Linear Regression (mx+b)

X List: x

Y List: y

Save RegEqn to: f1

Frequency List: 1

Category List:

Include Categories:

OK Cancel

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

The GDC gives the values of  $m = -1.34$  and  $b = 21.3$

So the equation is  $y = -1.34x + 21.3$

With brand new tires, the car would probably have travelled 21.3 km on 1 litre of diesel. Every year, the car travels 1.34 km less far on 1 litre of fuel.

	A	B	C	D
	x	y		=LinRegV
1	1	20	Title	Linear R...
2	2	18.5	RegEqn	m*x+b
3	3	17.4	m	-1.34
4	4	15.6	b	21.2733
5	5	14.8	r <sup>2</sup>	0.994137
D1 = "Linear Regression (mx+b)"				

In the earlier dialogue box, the instruction said to save the regression equation to  $f1$ .

You can use this to calculate a value from the equation.

Add a new Calculator page to your document by pressing **ctrl** **doc** **(+page)** 1:Add Calculator.

Type **F1** **1** **(** **3** **.** **5** **)** and press **enter**

The distance the car would have travelled on 1 litre of diesel when the tires were 3.5 years old is 16.5 km.

	A	B	C	D
	f1(3.5)			16.5833