

Chapter 4 / Example 20

Linear regression

At a coach station, the maximum temperature in $^{\circ}\text{C}$ (x) and the number of bottles of water sold (y) were recorded over 10 consecutive days. The collected data are summarized in the table.

Day	1	2	3	4	5	6	7	8	9	10
x	20	19	21	21.3	20.7	20.5	21	19.3	18.5	18
y	140	130	140	145	143	145	145	125	120	123

- Use a graph of the data to justify why a linear regression is appropriate.
- Find the regression line of y on x .
- Interpret the gradient and y -intercept of the regression equation in context.
- Use the regression equation to predict the number of bottles that will be sold at a temperature of 19.5°C .

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

Enter the values of x 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
20					
19					
21					
21.3					
20.7					
20.5					
21					
19.3					
18.5					
18					

L1(11)=					

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

Enter the values of y in the second column.

L1	L2	L3	L4	L5	2
20	140				
19	130				
21	140				
21.3	145				
20.7	143				
20.5	145				
21	145				
19.3	125				
18.5	120				
18	123				

L2(11)=					

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

Press **[ENTER]**.

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

Navigate through the list using **[→]** **[←]** **[↑]** **[↓]** keys.

Select Type **[X-]**, Xlist L_1 and Ylist L_2 and Mark **+**. Choose any color.

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

Plot1 Plot2 Plot3	
On Off	
Type: [X-]	
Xlist: L_1	
Ylist: L_2	
Mark: +	
Color: BLUE	

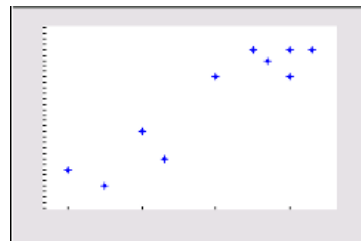
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Press **[F3]** **[ZOOM]** 9:ZoomStat

The GDC displays a scatter diagram of x against y .

Because the data is approximately linear, linear regression is appropriate.



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_1 and the Y List as L_2 .

Enter Y_1 as the place to store the regression equation. To enter Y_1 press **[ALPHA]** **[F4]** 1: Y_1

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 GDC gives the values of $a = 8.05$ and $b = -24.7$

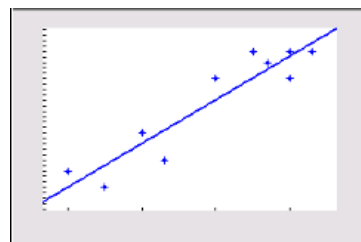
So the equation is $y = 8.05x - 24.7$.

There is a strong positive correlation.

```
LinReg
y=ax+b
a=8.045540797
b=-24.74762808
```

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

The GDC displays the scatter diagram and the regression line.



Press **[2nd]** **[F4]** **[CALC]** 1:value and type 19.5.

Press **[ENTER]**.

The number of bottles of water that should be stocked is 133 (132 would be insufficient).

