

## 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  $19.5^{\circ}\text{C}$ .

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

Enter the times 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	20			
2	19			
3	21			
4	21.3			
				21.3

GRAPH CALC TEST INTR DIST **▶**

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

Enter the temperatures in the second column.

	List 1	List 2	List 3	List 4
SUB				
1	20	140		
2	19	130		
3	21	140		
4	21.3	145		
				145

GRAPH CALC TEST INTR DIST **▶**

Press **F1** GRAPH.

Press **F6** .SET.

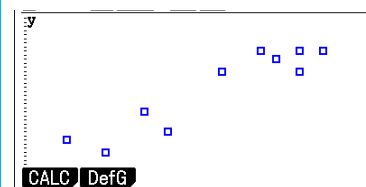
Choose Graph Type: **F1** Scatter, XList: List1 and YList: List2.

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

Press **EXIT**.

Press **F1** GRAPH1.

The GDC displays a scatter diagram of  $x$  against  $y$ .



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# Linear regression

To calculate the equation of the regression line

Press **F1** CALC, press **F2** X.

Press **F1** ax+b.

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

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

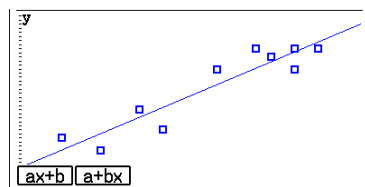
There is a strong positive correlation.

```
LinearReg(ax+b)
a =8.04554079
b =-24.747628
r =0.93141706
r²=0.86753774
MSe=14.9748576
y=ax+b
```

**[COPY]** **[DRAW]**

Press **F6** DRAW.

The GDC displays the scatter diagram and the regression line.



Press **SHIFT** **F5** G-SOLV **F1** Y-CAL and type 19.5.

Press **EXE**.

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

