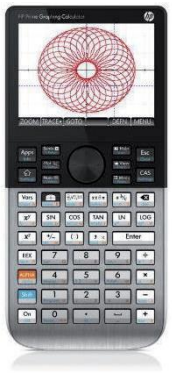
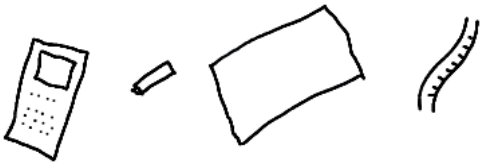
Blood Spots

HP Prime



When teaching practical and scientific methods, it is possible, in particular, to use examples of forensic criminology.
In this experiment we will analyse blood spots that were found at a crime scene, and the analysis will establish the link between the diameter of the spots and the height from which they fell.

Equipment: HP Prime, ink, blank sheets of paper, meter



Experiment:

1/ Let drops of ink fall from different heights onto large sheets of blank paper.

2/ For each height, calculate the mean droplet diameter after impact.
3/ Enter data into the HP Prime calculator and perform regression to establish the link between the height and the diameter of drops of blood.
4/ We found drops of blood with the mean value diameter of 19 mm, left by a killer who is bleeding from his head. How high is the killer?

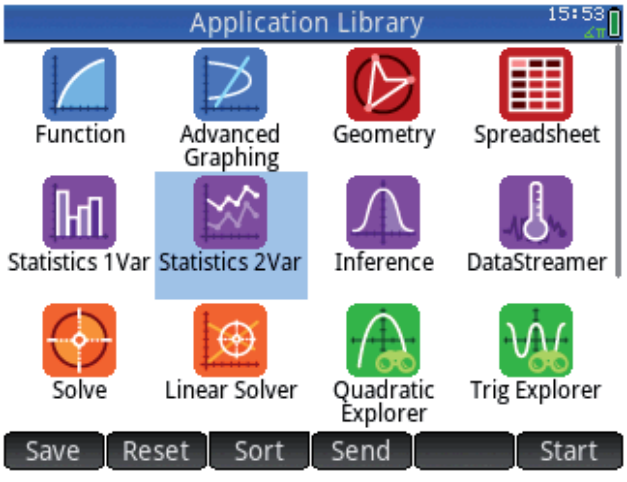
Step-by-step solution:

Sample results of the experiment:

Height (cm)	The mean value of the diameter (mm)
10	6.8
50	13.4
100	17
150	17.9
200	20

We enter the data into the calculator using the „Statistics 2Var“ application.

Screenshots:



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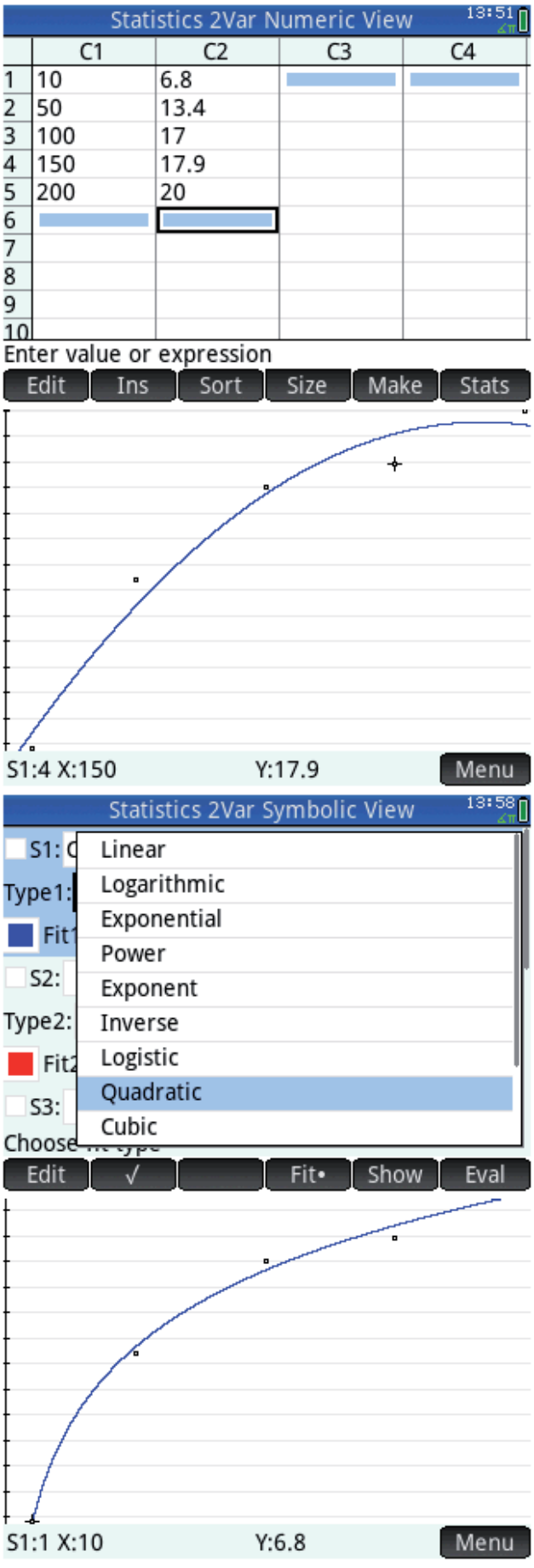
We can have a look at the graphical representation by pressing the P button and then the V button for the automatic scale selection.

The HP Prime calculator will directly perform regression (the picture opposite shows a quadratic regression).

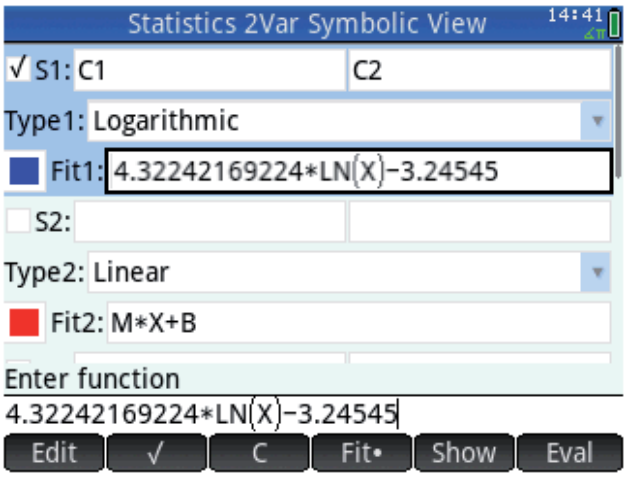
By pressing the Y button we set the type. We test each type of regression to find the most accurate one (the curve which passes closest to all points).

The logarithmic regression is the most suitable.

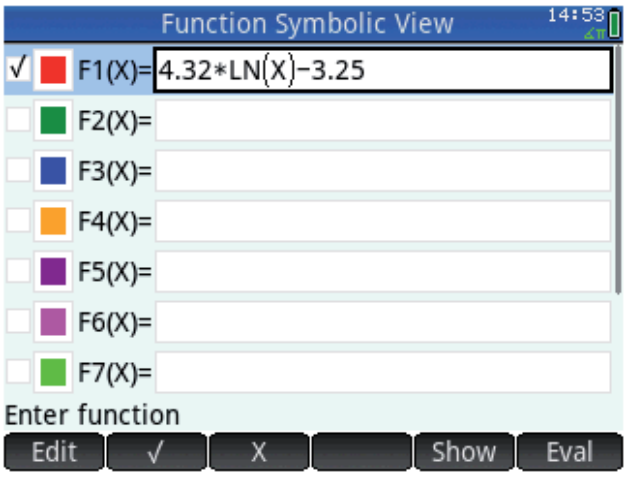


By pressing the Y button again, we get the values of regression coefficients:

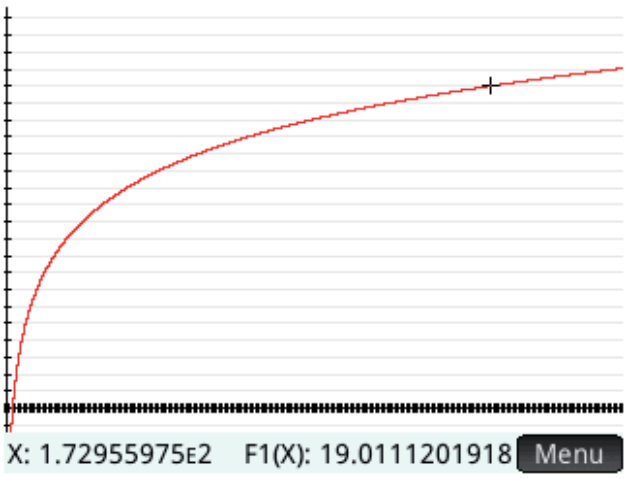
Equation: $f(x) = 4.32*\ln(x) - 3.25$



Now we can enter this expression to the „Function" application and display the value corresponding to 19 mm to find the perpetrator's height in cm.



The killer is approx 1.73 m.



Traces of Blood: Student Worksheet

HP Prime

Explain how the diameter of the drops of blood is changing depending on the height from which they fall:

Height of fall (cm)	Drop diameter 1 (mm)	Drop diameter 2 (mm)	Drop diameter 3 (mm)	Mean drop diameter (mm)

Specify the type of regression, which allows obtaining a representative curve of the mean diameter of drops of blood, depending on the height from which the drops fall:

Determine the height of the killer:

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