

Weight: Gravitational Force

HP Prime



Duration: 1 hour

Objective: Reaction of a weight to gravitational force, an introduction to gravitational acceleration and familiarisation with the formula $F = m.g$

Equipment: HP Prime, StreamSmart, dynamometer, scales



Task: Measuring weights of different objects of different masses using a force sensor (dynamometer).

Step-by-step solution:

First we set the force sensor to $\pm 10\text{N}$. We weigh the object first and then we hang it on the hook of the sensor. We start obtaining data in the DataStreamer application to measure the force in Newtons (N).

If we hang, for example, an HP Prime calculator (which weighs $224\text{ g} = 0.224\text{ kg}$), the sensor displays value -2.60 N .

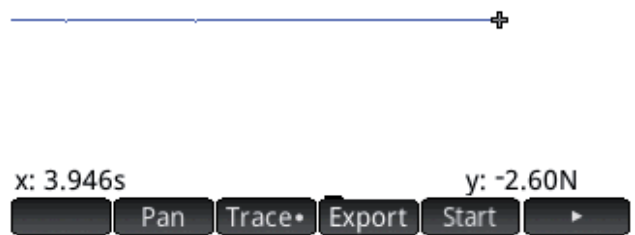
We weigh other objects (such as another three new generation HP calculators) to get the following table:

Object	Weight (kg)	Force (N)
HP Prime	0.224	2.60
HP 39gII	0.249	2.61
HP 300S+	0.146	1.89
HP 10S+	0.122	1.61

Screenshots:

Canal 1 Force

Win 5.0s



We insert this table to the „Statistics 2Var“ application (the M button).

We add row 0 N for 0 kg.

	C1	C2	C3	C4
1	.224	2.6		
2	.249	2.61		
3	.146	1.89		
4	.122	1.61		
5	0	0		
6				
7				
8				
9				
10				

We set the regression to a linear type (the Y button).

Enter value or expression
 Edit Ins Sort Size Make Stats

Statistics 2Var Symbolic View 12:32

✓ S1: C1 C2

Type1: Linear

Fit1: M*X+B

S2:

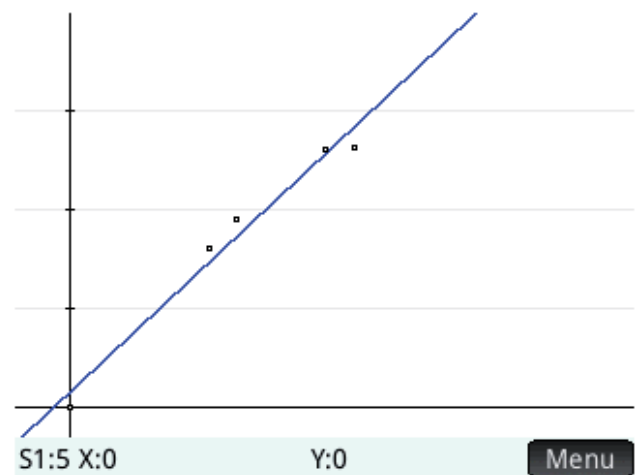
Type2: Linear

Fit2: M*X+B

S3:

Enter independent column
 Edit ✓ C Fit• Show Eval

Points are more or less aligned (the P button).



By pressing the Y button we obtain characteristics of the straight line.

The passing of the straight line through the beginning can be written using the equation $y = 10x$. This means that $F = m \cdot g$, where F is the weight expressed in N, in relation to m expressing the weight in kg.

g is the slope of the straight line (approx. 10). This is the so called gravitational acceleration (which in fact has a value of about 9.81 N/kg).

Statistics 2Var Symbolic View 12:35

✓ S1: C1 C2

Type1: Linear

Fit1: 10.7318312898*X+.1515426028