

Obtaining the unknown mass by using the solver in experiment 2

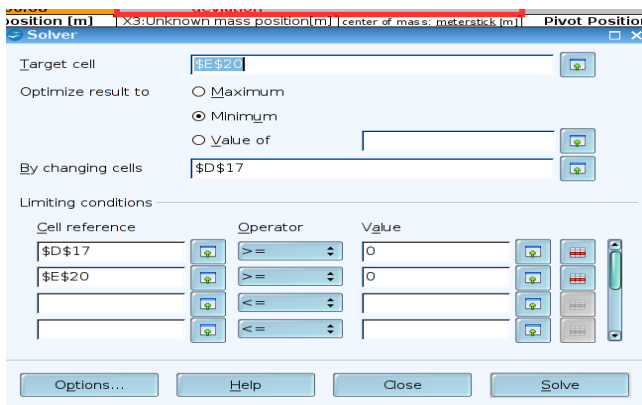
Your spreadsheet for experiment 2 might look something like this:

Experiment 2	C1 mass [g]	C2 mass [g]	Unknown Mass [g]	Meter stick mass [g]	Force from pivot [N]
Axis Location [m]	18.64	20.45	100	103.51	3.4073
0.5075		H2 mass	^^^^		
$\Sigma \tau_x$				% deviation of $\Sigma \tau$	
0.4398		M2: Mass placed on H2		32.9548	
$\Sigma \tau$		100.08			
-0.3154	X1:C1 position [m]	X2:C2 position [m]	X3:Unknown mass position[m]	center of mas: meterstick [m]	Pivot Position [m]
	0.5075	0.15	0.8293	0.5075	0.5075
	Torque 1 [Nm]	Torque 2 [Nm]	Torque 3 [Nm]	Torque 4 [Nm]	Torque 5 [Nm]
	0	0.4398	0.3154	0	0
Unknown mass: by weighing[g]	Torque 1 sign[0+ -]	Torque 2 sign[0+ -]	Torque 3 sign[0+ -]	Torque 4 sign[0+ -]	Torque 5 sign[0+ -]
139.7	0	+	-	0	0
% error in two methods	Signed torque 1 [Nm]	Signed torque 2 [Nm]	Signed torque 3 [Nm]	Signed torque 4 [Nm]	Signed torque 5 [Nm]
28.4180	0	0.4398	-0.3154	0	0

Notice the unknown mass cell and the %deviation cell shown by the arrows. The idea is to vary the unknown mass until the percent deviation cell is very small. You can do this manually simply by guessing at the unknown mass and working from there to make the %deviation small, or you can use the openoffice solver to do this.

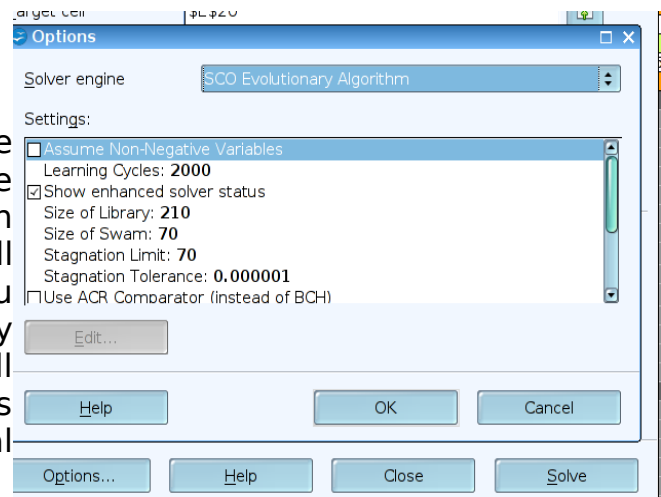
Procedure:

From the Openoffice menu, choose tools>solver



A pop up box will appear. Choose the options I have shown below: Target cell is E20, by changing cells D17, and require $D17 \geq 0$ and $E20 \geq 0$.

Under Options, choose SCO evolutionary algorithm and then click on ok. Next click on solve.



With non-linear fits such as this, you are not assured of a solution. You may have to choose a better initial guess (which here was cell D17). The algorithm will usually run till it reaches stagnation. You can then **keep** these results if they provided a good fit (indicated here by cell E20 being very close to zero). If this does not work, you can always use the manual procedure.