δ Cephei is a cepheid type variable star. The main property of the cepheid type variable stars is that their apparent magnitude is pulsating with a constant frequency. In 1979 Schweitzer measured the pulsation period of δ Cephei to be 5,36 days.

In 1908 one of the first woman astronomers Henrietta Leavitt measured the brightnesses and pulsation periods P of cepheids in the Small Magellanic Cloud. Her results are in Table 1. In 1908 it was accepted that the Small Magellanic Cloud is at the distance of 50 kpc from us.

The following empirical relation holds true for all cepheids:

$$M = a\log(P) + b,$$

Where P is the period of pulsation of the cepheid in days, M is the mean absolute magnitude of the cepheid, a and b are constants. You can assume that all cepheids measured by Henrietta Leavitt are at the same distance from us.

Table 1

$\log(P)$	0,21	0,30	0,35	0,41	0,45	0,50	0,63	0,71	0,81
m_v	16,8	16,7	16,3	16,0	16,1	16,0	15,6	15,6	15,2
$\log(P)$	1,01	1,11	1,22	1,44	1,52	1,60	1,63	1,70	
m_v	14,3	14,7	13,8	13,8	13,4	13,6	13,1	13,1	

a) Find a and b by plotting a graph and making a linear fit. Estimate the uncertainties. Take the uncertainty of m_v to be 0,1.
b) Find the distance to $\boldsymbol{\delta}$ Cephei. Estimate the uncertainties.