Homework 5.

Optical power.

We have discussed ***optical*** or ***refractive power***. The lens equation

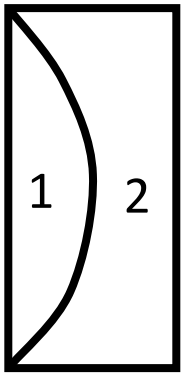
$$\frac{1}{s_o} + \frac{1}{s_i} = \frac{1}{f} \quad (1)$$

can be rewritten as

$$V_o + V_i = D \quad (2).$$

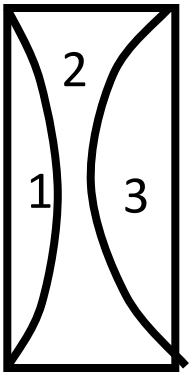
Here we denoted $1/s_o$ as V_o. Parameter V_o is called ***vergence*** since it is related to the curvature of the wavefront propagating from the point object. Parameter $D=1/f$ is called optical or ***refractive power*** of the lens. We know that net optical power of a two thin lens system, where the lenses are placed together is equal to the sum of the optical power of the lenses.

1. Two lenses are made from the same sort of glass (see picture below).



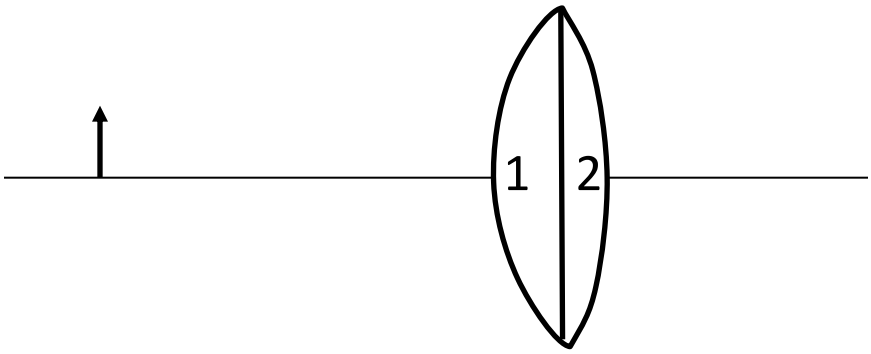
   The refractive power of the lens 1 is 3dpt. Find the optical power of the lens 2.

2. There are 3 lenses made from a glass plate. (see picture below).



The system consisting just from the lenses 1 and 2 has the refractive power of -2dpt, the refractive power of the lenses2 and 3 together is -3dpt. Find the refractive power of the lens 2.

3. There is a system consisting of two lenses and an object. The distance between the object and the lenses is higher than the focal distances of each lens. If we will remove the lens 2, the magnification is 2; if we will remove the lens 1, then the magnification is 3.What magnification we have with the two lenses?



4. The distance between a candle and a screen is 20cm. If you put a convex lens with a focal distance of 4/5 cm in between the object and the screen, a sharp image of the candle will be projected on the screen. There are two such positions for the lens. Find them. (Hint: take the distance from the object to the lens as **x**, and the distance from the lens to the screen as **20-x**. Then try to use our "main lens equation")