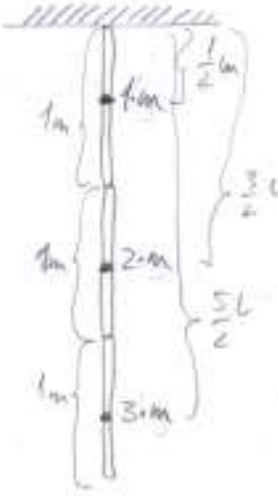
1.



$$T = 2\pi\sqrt{\frac{I}{mgL}} \qquad L = 3 \cdot 1m = \underline{3m}$$

$$r_{CM} = \frac{\sum_{i=1}^{n} m_i r_i}{\sum_{i=1}^{n} m_i} = \frac{m\cdot\frac{1}{2}L + 2m\cdot\frac{3}{2}L + 3m\cdot\frac{5}{2}L}{m+2m+3m} = \frac{\cancel{m}\cdot\left(\frac{22}{2}L\right)}{6\cdot\cancel{m}} =$$

$$= \frac{22L}{12} = \boxed{\frac{11\cdot L}{6}}$$

$$I = \frac{1m\cdot L^2}{12} + \frac{2m\cdot L^2}{12} + \frac{3m\cdot L^2}{12} + (1+2+3)m\cdot(r_{CM})^2 =$$

$$= \frac{6m}{12} + \frac{6m\cdot 121}{36} = \frac{18m}{36} + \frac{726m}{36} = \boxed{\frac{744m}{36}}$$

$$T = 2\pi\cdot\sqrt{\frac{744\,\cancel{m}}{36\cdot 3\cdot 6\cancel{m}\cdot g}} = 2\pi\sqrt{\frac{744}{648g}} = 2\pi\cdot 0{,}3424 = 2{,}149 \approx \boxed{2{,}15s}$$

L

3.

$$x_2 = \sqrt{1360^2 + 720^2} = 1538{,}83$$

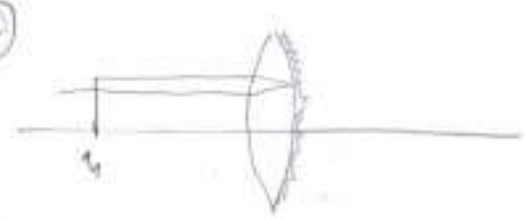
$$x_1 = \sqrt{80^2 + 720^2} = 724{,}43$$

$$\Delta\varphi = k\cdot\delta = k(x_2 - x_1) = \frac{2\pi}{n}\cdot 814{,}4 = 2\pi\cdot 1{,}416\,(\text{rad } 2\pi) =$$

$n = 575\,nm$ (2)

$$= 0{,}416\cdot 2\pi = \boxed{2{,}616\text{ rad}}$$

2.



sferni dioptar → zrcalo → sferni dioptar

$r = a_5$

I $\frac{n_1}{a_1} + \frac{n_2}{b_1} = \frac{n_2 - n_1}{r}$

$\frac{1}{a_1} + \frac{1.5}{b_1} = \frac{0.5}{0.4} \Rightarrow \frac{1.5}{b_1} = \frac{1.25a_1}{a_1} - \frac{1}{a_1} \Rightarrow \boxed{b_1 = \frac{1.5a_1}{1.25a_1 - 1}}$

$a_2 = -b_1$

II $\frac{1}{a_2} + \frac{1}{b_2} = \frac{2}{r}$

$\frac{-1.25a_1 + 1}{1.5a_1} + \frac{1}{b_2} = 5 \Rightarrow \frac{1}{b_2} = \frac{7.5a_1}{1.5a_1} + \frac{1.25a_1 - 1}{1.5a_1} \Rightarrow \boxed{b_2 = \frac{1.5a_1}{8.75a_1 - 1}}$

$a_3 = b_2$

III $\frac{n_1}{a_3} + \frac{n_2}{b_3} = \frac{n_2 - n_1}{r}$

$(1.5)\frac{1.75a_1 - 1}{1.5a_1} + \frac{1}{b_3} = \frac{1 - 1.5}{0.4}$

$\frac{1}{b_3} = \frac{-1.875a_1}{1.5a_1} - \frac{(13.125a_1 - 1.5)}{1.5a_1} \Rightarrow \boxed{\frac{1}{b_3} = -10 + \frac{1}{a_1}}$

ako $a_1 = f$ onda $\frac{1}{b_3} = 0 \Rightarrow 0 = -10 + \frac{1}{f} \Rightarrow \boxed{f = \frac{1}{10} = 0.1}$