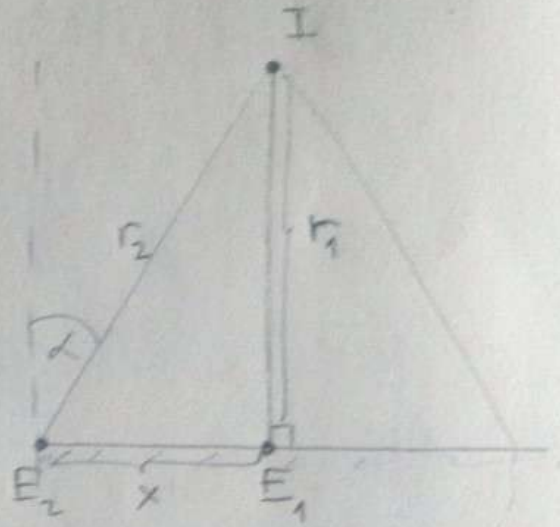
(7.1) $r_1 = 2\ m$

$E_1 = 2 \cdot 10^5\ lx$

$E_2 = 15 \cdot 10^4\ lx$

$x = ?$



$$E_1 = \frac{I}{r_1^2} \cos 0° = \frac{I}{r_1^2}$$

$$\Rightarrow I = r_1^2 \cdot E_1 = 4 \cdot 2 \cdot 10^5$$

$$I = 8 \cdot 10^5\ cd$$

$$\cos\alpha = \frac{r_1}{r_2}$$

$$E_2 = \frac{I}{r_2^2} \cos\alpha = \frac{I}{r_2^2} \cdot \frac{r_1}{r_2} \Rightarrow r_2^3 = \frac{I \cdot r_1}{E_2} = \frac{8 \cdot 10^5 \cdot 2}{15 \cdot 10^4}$$

$$r_2 = 2.2\ m$$

$$\Rightarrow x^2 = r_2^2 - r_1^2$$

$$x = \sqrt{r_2^2 - r_1^2} = \sqrt{2.2^2 - 2^2}$$

$$\boxed{x = 0.916\ m}$$

(7.2) $n = 1.33$

$I = 100\ cd$

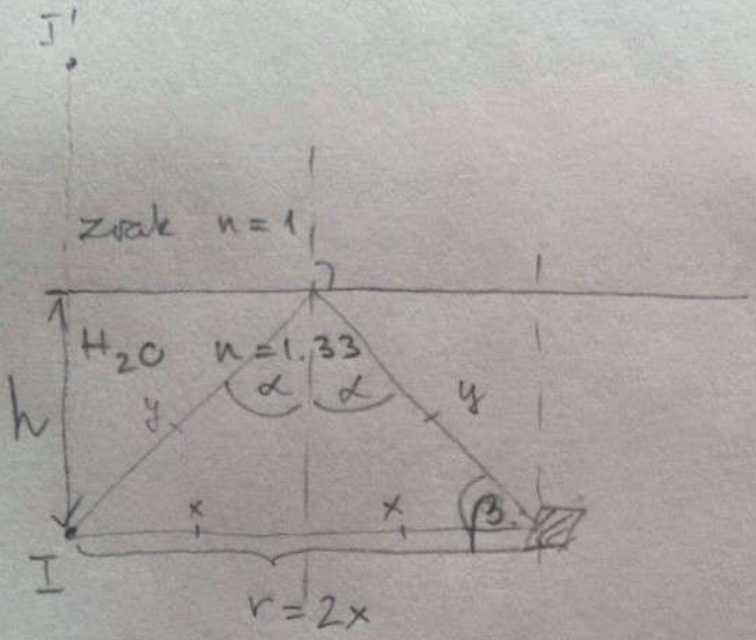
$h = 1\ m$

$E = ?$

$\alpha \Rightarrow$ kut upada za totalnu refleksiju

$$\sin\alpha = \frac{n_z}{n_v} = \frac{1}{1.33} \Rightarrow \alpha = 48.75°$$

$$\beta = 90° - \alpha \Rightarrow \cos\beta = \cos(90° - \alpha) = \sin\alpha$$



$$tg\alpha = \frac{x}{h} \Rightarrow x = h \cdot tg\alpha = 1 \cdot tg\,48.75°$$

$$x = 1.14\ m$$

$$\cos\alpha = \frac{h}{y} \Rightarrow y = \frac{h}{\cos\alpha} = \frac{1}{\cos 48.75°}$$

$$y = 1.52\ m$$

$$E = \frac{I}{(2x)^2} \cdot \cos 0° + \frac{I}{(2y)^2} \cos\beta$$

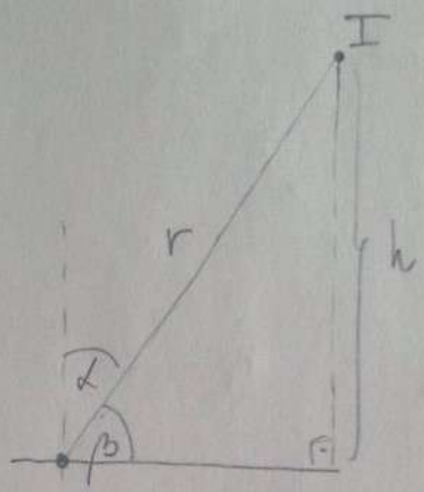
$$E = \frac{100}{4 \cdot 1.14^2} + \frac{100}{4 \cdot 1.52^2} \sin 48.75° \rightarrow \boxed{E = 27.4\ lx}$$

(7.3) $h = 15\ m$

$E_H = 10\ lx$

$E_V = 20\ lx$

$I = ?$



$$\left.\begin{aligned} E_H &= \frac{I}{r^2}\cos\alpha \\ E_V &= \frac{I}{r^2}\cos\beta \end{aligned}\right\} (*)$$

$\beta = 90° - \alpha \Rightarrow \cos\beta = \cos(90° - \alpha) = \sin\alpha$

$(*)$:
$$\left.\begin{aligned} 10 &= \frac{I}{r^2}\cos\alpha \\ 20 &= \frac{I}{r^2}\sin\alpha \end{aligned}\right\} :$$

$$\frac{10}{20} = \frac{\cos\alpha}{\sin\alpha} \Rightarrow \operatorname{tg}\alpha = 2$$

$$\alpha = 63.4°$$

$$\cos\alpha = \frac{h}{r} \Rightarrow r = \frac{h}{\cos\alpha} = \frac{15}{\cos 63.4°}$$

$$r = 33.5\ m$$

$$E_H = \frac{I}{r^2}\cos\alpha \Rightarrow I = \frac{E_H \cdot r^2}{\cos\alpha} = \frac{10 \cdot 33.5^2}{\cos 63.4°}$$

$$\boxed{I = 25063.7\ cd}$$

(RJEŠENJE NIJE IDENTIČNO ZBOG MOG ZAOKRUŽIVANJA 😊)

$\boxed{I = 25063.7\ cd}$ ← (RJEŠENJE NIJE IDENTIČNO ZBOG MOG ZAOKRUŽIVANJA 😊)

(7.4) $I_1 = 100\ cd$

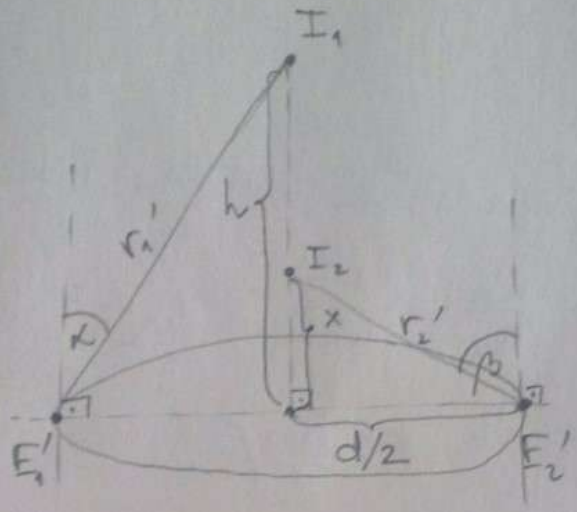
$d = 3\ m$

$h = 2\ m$

$I_2 = 25\ cd$

$E_2 = 2E_1$

$\frac{E_1'}{E_2'} = ?$



1° $E_1 = \frac{I_1}{h^2} = \frac{100}{4} = 25\ lx$

$E_2 = 2E_1 = 2 \cdot 25 = 50\ lx$

$E_2 = \frac{I_2}{x^2} \Rightarrow x = \sqrt{\frac{I_2}{E_2}} = \sqrt{\frac{25}{50}}$

$x = 0.71\ m$

2° $r_1' = \sqrt{h^2 + \frac{d^2}{4}} = \sqrt{4 + \frac{9}{4}} = 2.5\ m$

$r_2' = \sqrt{x^2 + \frac{d^2}{4}} = 1.66\ m$

3° $\cos\alpha = \frac{h}{r_1'} = \frac{2}{2.5} = 0.8$

$\cos\beta = \frac{x}{r_2'} = \frac{0.71}{1.66} = 0.43$

$\Rightarrow E_1' = \frac{I_1}{r_1'^2}\cos\alpha = \frac{100}{2.5^2} \cdot 0.8 = 12.8\ lx$

$E_2' = \frac{I_2}{r_2'^2}\cos\beta = \frac{25}{1.66^2} \cdot 0.43 = 3.9\ lx$

$\Rightarrow \boxed{\frac{E_1'}{E_2'} = \frac{12.8}{3.9} = 3.3}$ ←