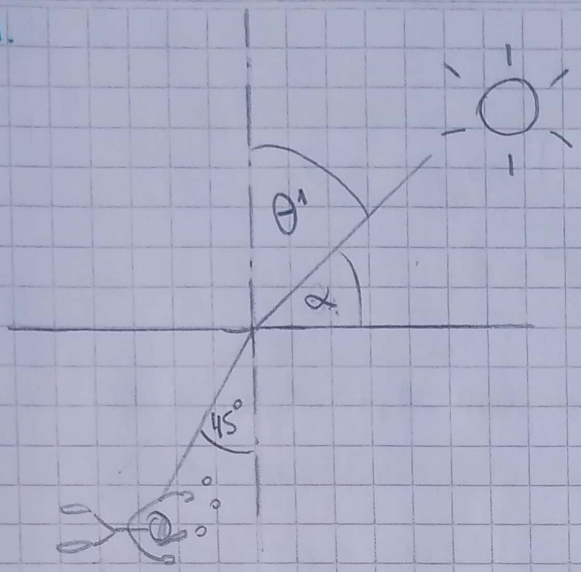
UNIDAD 1 : ÓPTICA GEOMÉTRICA

1.



$n_1 \cdot \text{sen}\,\theta_1 = n_2 \cdot \text{sen}\,\theta_2$

$1 \cdot \text{sen}\,\theta_1 = 1{,}33 \cdot \text{sen}\,45°$

$\theta_1 = \text{inv sen}\left(\frac{1{,}33 \cdot \text{sen}\,45°}{1}\right)$

$\hat{\alpha} = 70{,}1°$

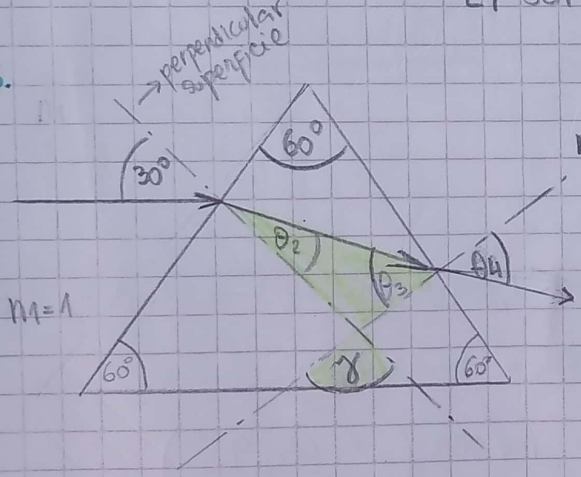
↳ no es respecto N

$\theta_2 = 90° - 70{,}1°$

$\boxed{\theta_2 = 20°}$

El sol se encuentra a 20° con respecto a N

3.



$n_A = 1{,}50$

$1 \cdot \text{sen}\,30° = 1{,}50 \cdot \text{sen}\,\theta_2$

$\left(\frac{1 \cdot \text{sen}\,30°}{1{,}50}\right) \text{inv sen} = \theta_2$

$\boxed{19{,}5° = \theta_2}$

$\boxed{\gamma = 60° = \theta_2 + \theta_3}$

$60° - 19{,}5° = \theta_3$

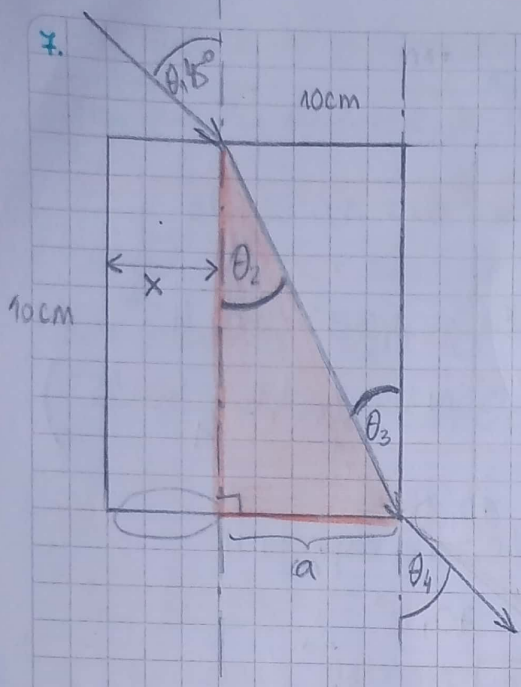
$\boxed{40{,}5° = \theta_3}$

$1{,}50 \cdot \text{sen}\,40{,}5° = 1 \cdot \text{sen}\,\theta_4$

$\left(\frac{1{,}50 \cdot \text{sen}\,40{,}5°}{1}\right) \text{inv sen} = \theta_4$

$\boxed{77° = \theta_4}$

7.



$n_1 = 1$

$n_{2\square} = 1{,}52$

$\theta_2 = \theta_3$ por alternos e internos entre //

$1 \cdot \text{Sen } 45° = 1{,}52 \cdot \text{Sen } \theta_2$

$\left(\frac{1 \cdot \text{Sen } 45°}{1{,}52}\right) \text{inv sen} = \theta_2$

$27{,}7° = \theta_2$

$\tan \theta_2 = \frac{a}{L} \rightarrow \tan 27{,}7° \cdot 10\,cm = a$

$5{,}25\,cm = a$

que siempre salga por abajo

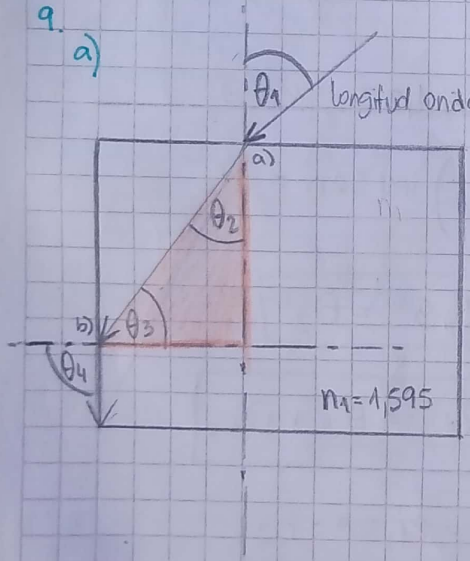
$x = 10\,cm - 5{,}25\,cm$

$x = 4{,}75\,cm$

x puede valer hasta 4,7cm para que el rayo emerje por la cara opuesta.

9.

a)



a) $1 \cdot \text{Sen } \theta_1 = 1{,}595 \cdot \text{sen } \theta_2 \rightarrow 90° = \theta_2 + \theta_3$

b) $1{,}595 \cdot \text{Sen } \theta_3 = 1 \cdot \text{Sen } 90°$

$\theta_3 = \text{inv sen}\left(\frac{1 \cdot \text{sen } 90°}{1{,}595}\right)$

$\theta_3 = 38{,}8°$

$90° - 38{,}8° = \theta_2$

$51{,}2 = \theta_2$

$1 \cdot \text{Sen } \theta_1 = 1{,}595 \cdot \text{sen } 51{,}2°$

$\theta_1 = \text{INV sen}\left(\frac{1{,}595 \cdot \text{sen } 51{,}2°}{1}\right)$

$\theta_1 = -e-$

↳ No hay θ_1 posible para que se de la reflexión interna total

b) $n_{H_2O} = 1{,}33$

$1{,}595 \cdot \operatorname{sen}\theta_3 = 1{,}33 \cdot \operatorname{sen} 90°$

$\theta_3 = \text{INV sen}\left(\frac{1{,}33 \cdot \operatorname{sen} 90°}{1{,}595}\right)$

$\boxed{\theta_3 = 56{,}4°}$

$90° - 56{,}4° = \theta_2$

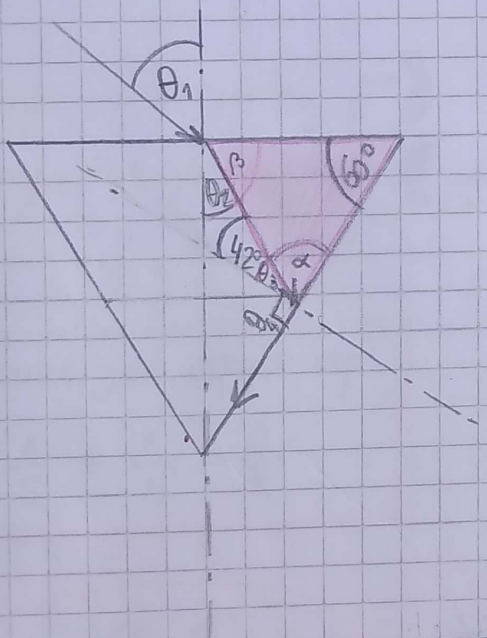
$\boxed{33{,}6 = \theta_2}$

$1{,}33 \cdot \operatorname{sen}\theta_1 = 1{,}595 \cdot \operatorname{sen} 33{,}6°$

$\theta_1 = \text{INV sen}\left(\frac{1{,}595 \cdot \operatorname{sen} 33{,}6°}{1{,}33}\right)$

$\boxed{\theta_1 = 41{,}6°}$

8.



$n_1 \cdot \operatorname{sen}\theta_1 = n_2 \cdot \operatorname{sen}\theta_2$

$n_v \cdot \operatorname{sen} 42° = \underbrace{n_2}_{?} \cdot \operatorname{sen} 90°$

$n_v = \frac{1 \cdot \operatorname{sen} 90°}{\operatorname{sen} 42°}$

$n_v = 1{,}49$

$90° - 42° = 48°$ $\quad \theta_3 + \alpha = 90$

$180 - 60° - 48° = 72°$ $\quad \alpha + \beta + 60° = 180$

$90 - 72° = 18°$ $\quad \theta_2 + \beta = 190°$

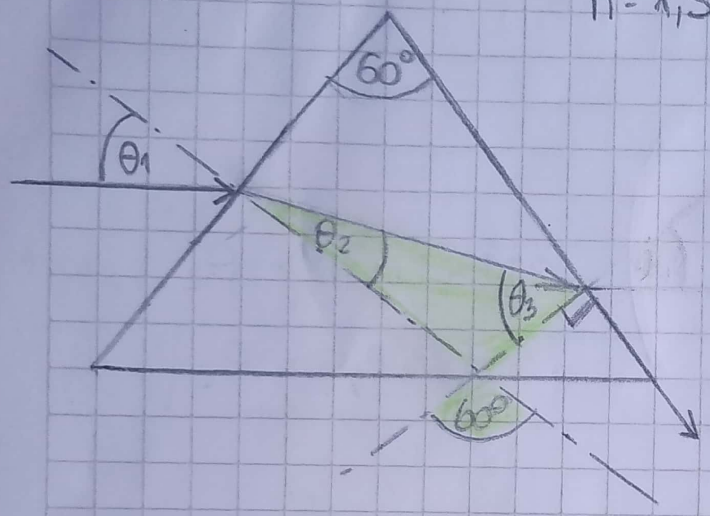
$\theta_2 = 18°$

$1 \cdot \operatorname{Sen}\theta_1 = 1{,}49 \cdot \operatorname{sen}\theta_2$

$\theta_1 = \left(\frac{1{,}49 \cdot \operatorname{Sen} 18°}{1}\right) \text{invsen}$

$\boxed{\theta_1 = 27{,}4°}$

4.



$n = 1,50$

$\circledast \; n_1 \cdot \operatorname{Sen} \widehat{\theta_1} = n_2 \cdot \operatorname{Sen} \widehat{\theta_2}$

$\theta_2 + \theta_3 = 60°$

$n_\Delta \cdot \operatorname{sen} \theta_3 = n_1 \cdot \operatorname{sen} \theta_4$

$1,50 \cdot \operatorname{sen} \theta_3 = 1 \cdot \operatorname{sen} 90°$

$\theta_3 = \left(\dfrac{1 \cdot \operatorname{sen} 90°}{1,50} \right)$ INV sen

$\theta_3 = 42°$

$\theta_2 + \theta_3 = 60°$

$\theta_2 = 60° - 42° = 18°$

$\circledast \; 1 \cdot \operatorname{sen} \theta_1 = 1,50 \cdot \operatorname{sen} 18°$

$\theta_1 = \text{INV sen} \left(\dfrac{1,50 \cdot \operatorname{sen} 18°}{1} \right)$

$\boxed{\theta_1 = 27,6°}$

θ_1 tiene que ser mayor o igual a 27,6° para que el rayo de luz salga por la otra cara

12. → El espejo convexo averiguar S' y M

a)

$R = -40\,cm$

$S = 30\,cm$

$$M = \frac{S'}{S}$$

$$M = -\frac{-12\,cm}{30\,cm} \quad \frac{4}{10} \quad \frac{2}{5}$$

$$M = +\frac{2}{5}$$

$$M = 0,4$$

↳ imagen de pie

$$\frac{1}{S} + \frac{1}{S'} = \frac{2}{R}$$

$$\frac{1}{S'} = \frac{2}{R} - \frac{1}{S} \quad \cdot S'$$

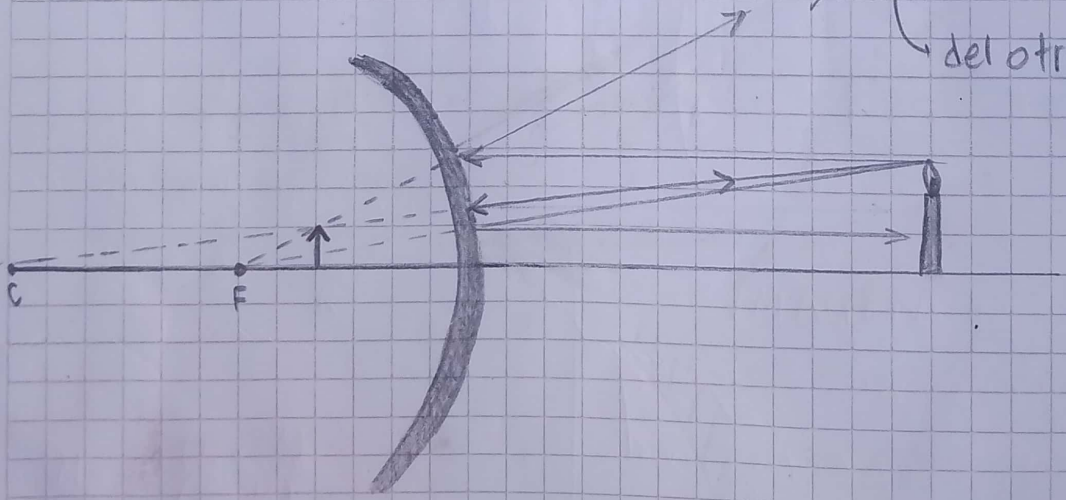
$$\frac{1}{\frac{2}{R} - \frac{1}{S}} = S'$$

$$1 : \frac{2}{-40} - \frac{1}{30} = S'$$

$$1 : \frac{-3-2}{60} = S'$$

$$-\frac{60}{5}\,\ominus 12\,cm = S'$$

↳ del otro lado del espejo



13.

$S = 30\,cm$ averiguar R espejo cóncavo

$M = 4$ → está de pie

$$M = -\frac{S'}{S}$$

$$\frac{1}{30cm} + \left(-\frac{1}{120}\right) = \frac{2}{R}$$

$$\frac{4-1}{120} = \frac{2}{R}$$

$4 \cdot -30cm = S'$

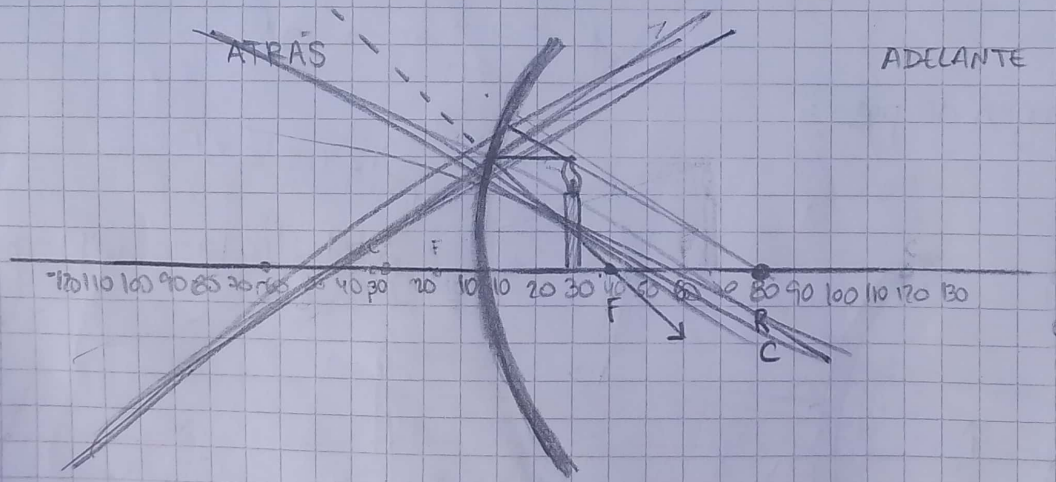
$\boxed{-120\,cm = S'}$

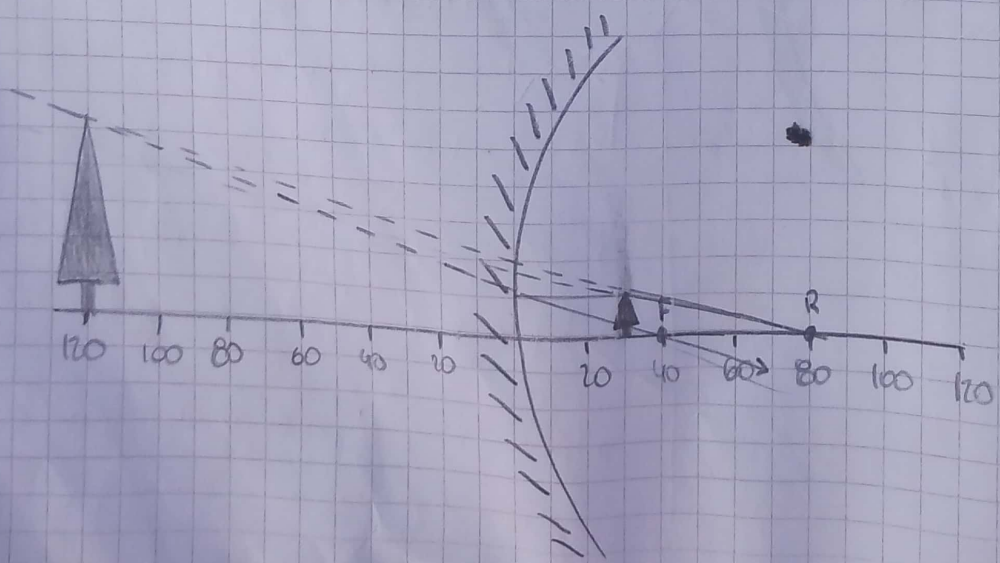
↳ la imagen se forma del otro lado del espejo

$$\frac{3}{120} \cdot \frac{1}{40cm} \cdot R = 2$$

$$R = 2 : \frac{1}{40cm}$$

$\boxed{R = 80\,cm}$ → espejo cóncavo ☑





15.

$S = 32\,cm$ averiguar F, M, tipo de lente

$S' = +8\,cm$ → detrás de la lente

$$\frac{1}{S} + \frac{1}{S'} = \frac{1}{f}$$

$$\frac{S' + S}{SS'} = \frac{1}{f}$$

$$\frac{SS'}{S' + S} = f$$

$$\frac{32 \cdot (+8)}{+8cm + 32} = f$$

$$\frac{256}{40} = f$$

$$\boxed{6,4 = f}$$

lente convergente

$$M = -\frac{8\,cm}{32}$$

$$M = -\frac{1}{4}\,cm$$

$$\boxed{M = -0,25\,cm}$$

imagen invertida

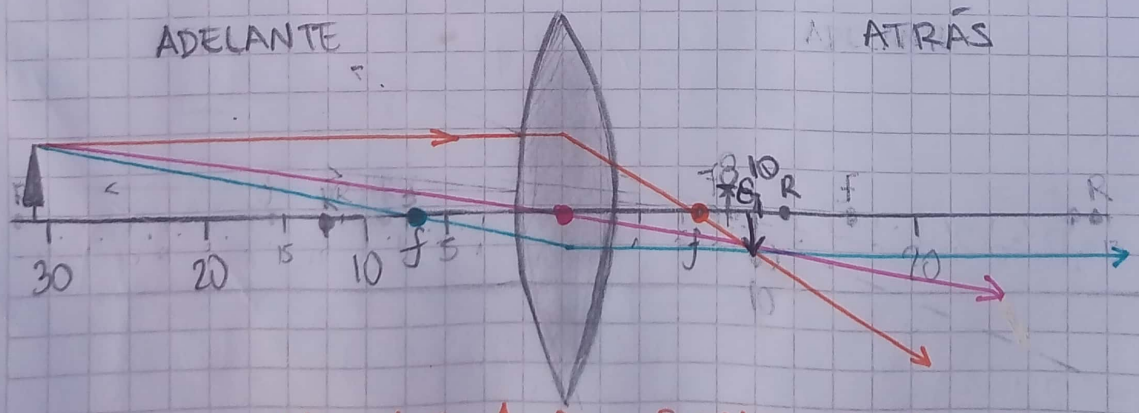
$$\frac{1}{32} + \frac{1}{8} = \frac{2}{R}$$

$$\frac{1+4}{32} \cdot R = 2$$

$$R = 2 : \frac{5}{32}$$

$$R = \frac{64}{5}$$

$$R = 12,8$$



todo rayo sale cabeza ↑ se refracta pasando x foco
todo rayo pasa x centro lente no sufre desviación
todo rayo sale cabeza ↑ pasando x f, se refracta paralelo EP.

16. lupa - lente convergente

$M = 2$

$S' = ?$

$F = 15cm$

$M = -\frac{S'}{S}$

$2 = \frac{-S'}{S}$

$-2S = S'$

$2 = \frac{-S'}{\frac{15}{2}}$

$\frac{30}{2} - 15 = S'$

$\frac{1}{S} + \frac{1}{S'} = \frac{1}{f}$

$\frac{1}{S} + -\frac{1}{2S} = \frac{1}{f}$

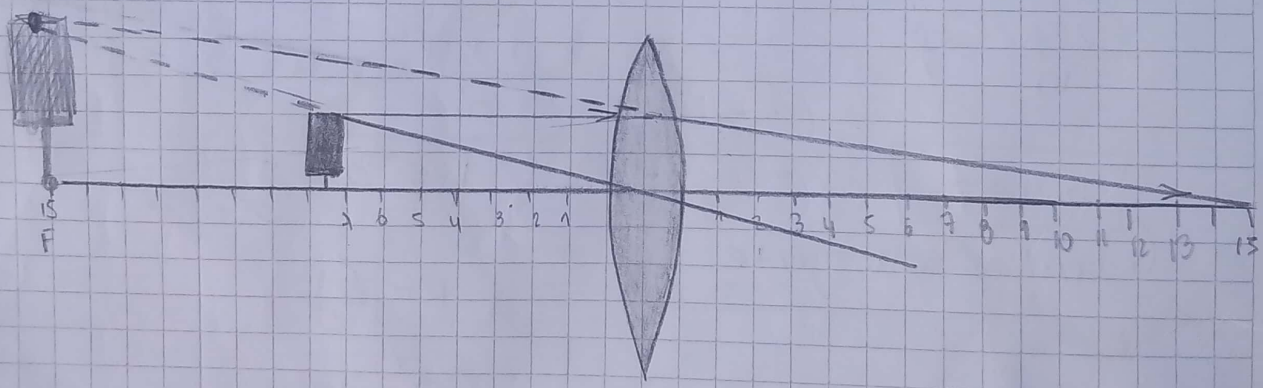
$\frac{2-1}{2S} = \frac{1}{15cm}$

$1 = \frac{1}{15cm} \cdot 2S$

$1 : \frac{1}{15} = 2S$

$15 : 2 = S$

$\frac{15}{2} = 7{,}5cm = S$



R

$\frac{1}{\frac{15}{2}} + \frac{1}{-15} = \frac{2}{R}$

$\frac{2}{15} - \frac{1}{15} \cdot R = 2$

$R = 2 : \frac{1}{15}$

$R = 30$

17.

lente divergente

$F = -32\,cm$

$S = 20\,cm$

$$\frac{1}{S} + \frac{1}{S'} = \frac{1}{f}$$

$$\frac{1}{20} + \frac{1}{S'} = \frac{1}{-32}$$

$$\frac{1}{20} + \frac{1}{32} = -\frac{1}{S'}$$

$$\frac{32+20}{640} \cdot S' = -1$$

$$S' = -1 : \frac{52}{640} \quad \frac{26}{320}$$

$$\boxed{S' = -\frac{320}{26} = -12,3\,cm} \rightarrow \text{mismo lado}$$

M, S'

$$M = -\frac{-12,3\,cm}{20\,cm}$$

$$M = +\frac{6,15\,cm}{10\,cm}$$

$$\boxed{M = 0,61} \rightarrow \text{de pie y más chica}$$