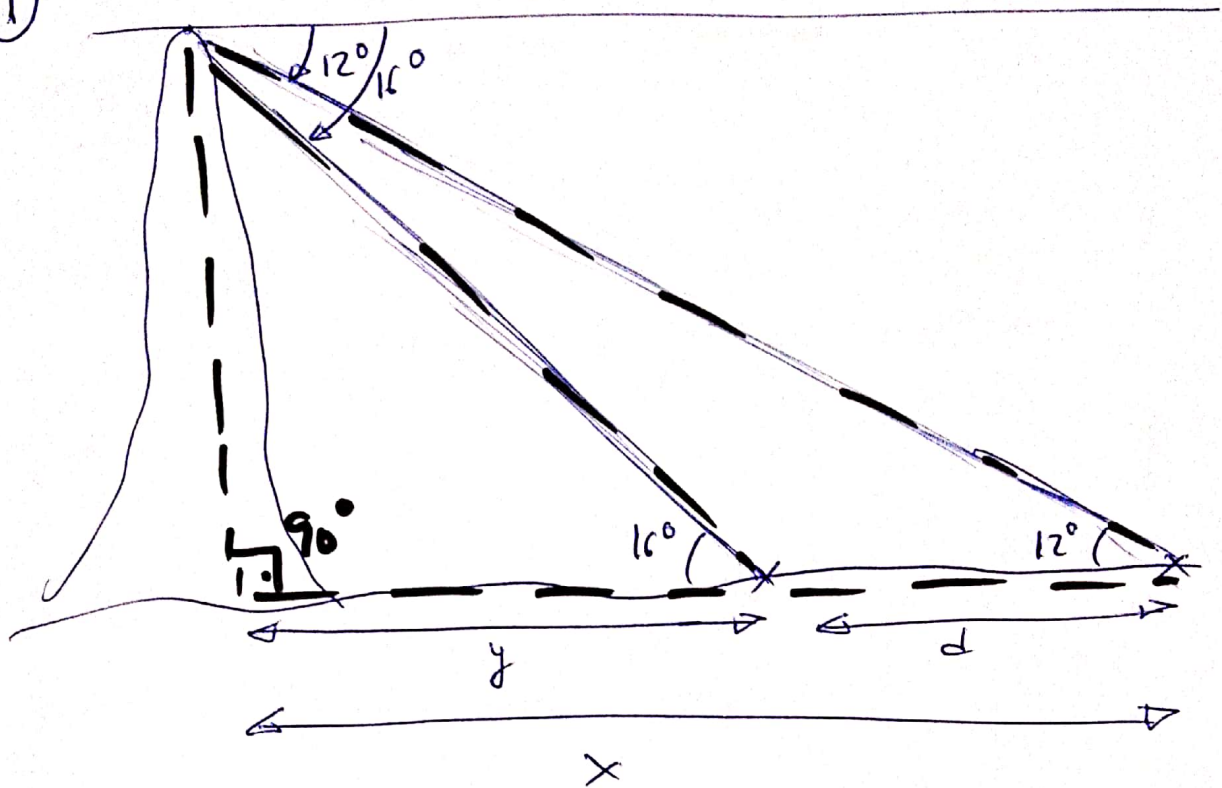


# SOLUCIONARIO

## TRIGONOMETRÍA

①



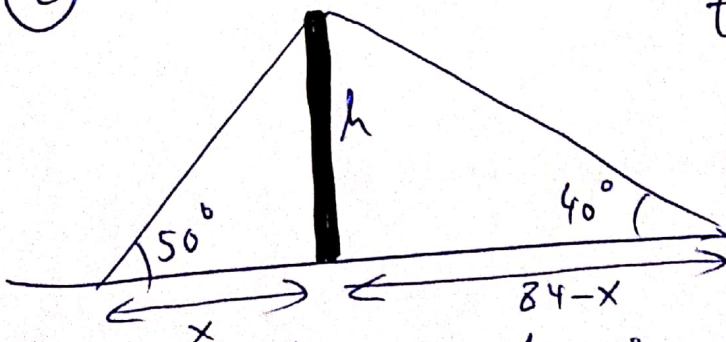
$$\tan(16^\circ) = \frac{90}{y} \rightarrow y = \frac{90}{\tan 16^\circ}$$

$$\tan 12^\circ = \frac{90}{x} \rightarrow x = \frac{90}{\tan 12^\circ}$$

$$d = x - y = \frac{90}{\tan 12^\circ} - \frac{90}{\tan 16^\circ}$$

$$\boxed{d = 109,55 \text{ m}}$$

②



$$\tan 40^\circ = \frac{h}{84-x} \rightarrow h = (84-x) \cdot \tan 40^\circ$$

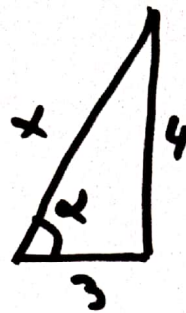
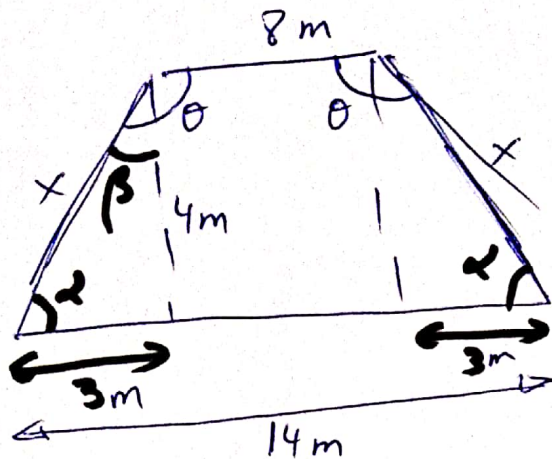
$$\tan 50^\circ = \frac{h}{x} \rightarrow h = x \cdot \tan 50^\circ$$

$$(84-x) \tan 40^\circ = x \cdot \tan 50^\circ$$

$$84 \cdot \tan 40^\circ - x \cdot \tan 40^\circ = x \cdot \tan 50^\circ \rightarrow 84 \tan 40^\circ = x (\tan 40^\circ + \tan 50^\circ)$$

$$x = \frac{84 \tan 40^\circ}{\tan 40^\circ + \tan 50^\circ} = 34,71$$

$$\boxed{h = 34,71 \cdot \tan 50^\circ = 41,37 \text{ m}}$$



$$x = \sqrt{3^2 + 4^2}$$

$$x = 5 \text{ m}$$

$$\tan \alpha = \frac{4}{3} ; \alpha = \tan^{-1}\left(\frac{4}{3}\right) \Rightarrow \boxed{\alpha = 53^\circ 7' 48,57''}$$

$$\beta = 90 - \alpha ; \theta = 90 + \beta ; \theta = 90 + (90 - \alpha)$$

$$\theta = 180 - \alpha$$

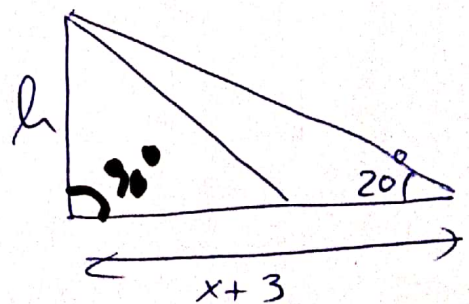
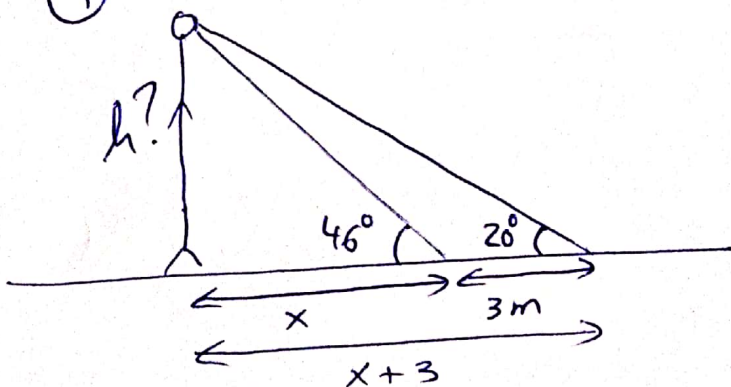
$$\theta = 180 - (53^\circ 7' 48,57'') \Rightarrow \boxed{\theta = 126^\circ 52' 11,63''}$$

$$\text{Perímetro} = 14 + 8 + 2x = 14 + 8 + 2 \cdot 5 \Rightarrow \boxed{\text{Perímetro} = 32 \text{ m}}$$

$$\text{Área} = \frac{(B+b) \cdot h}{2} = \frac{(14+8) \cdot 4}{2} \Rightarrow \boxed{\text{Área} = 44 \text{ m}^2}$$



④



$$\frac{h}{x+3} = \tan 20^\circ \rightarrow h = (x+3) \tan 20^\circ \rightarrow x \tan 20^\circ + 3 \tan 20^\circ = x \tan 46^\circ$$

$$\frac{h}{x} = \tan 46^\circ \rightarrow h = x \tan 46^\circ$$

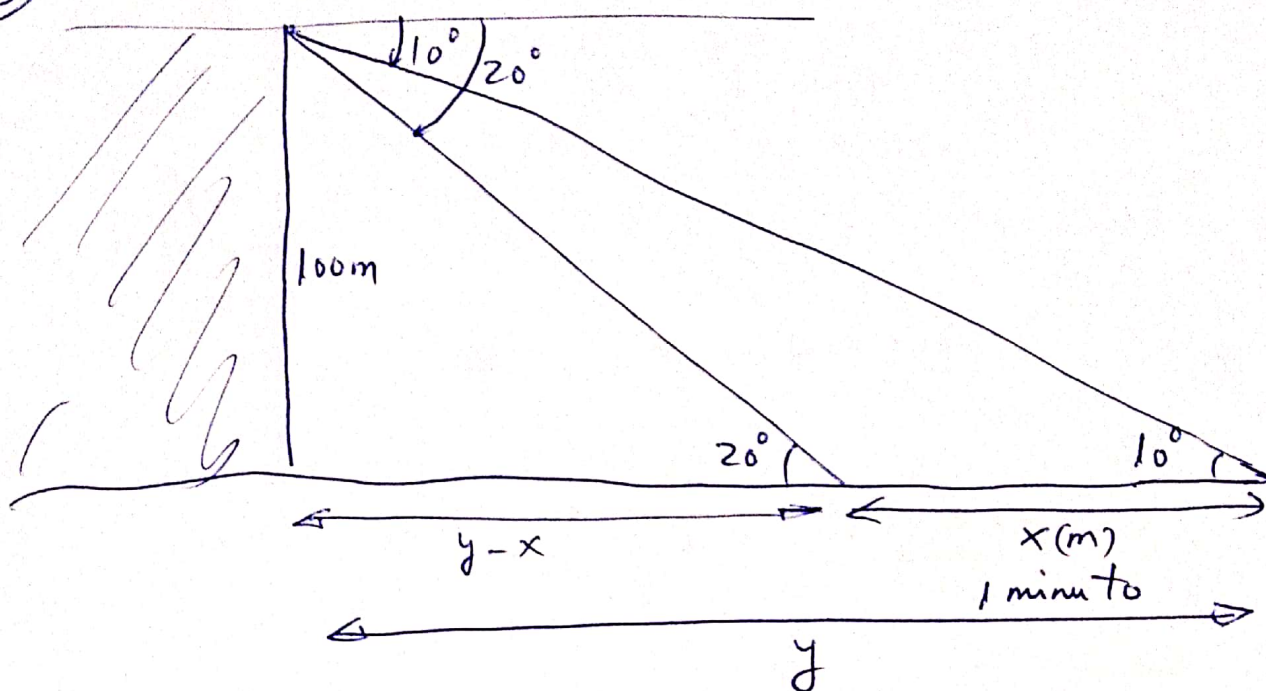
$$3 \tan 20^\circ = x (\tan 46^\circ - \tan 20^\circ)$$

$$x = \frac{3 \tan 20^\circ}{\tan 46^\circ - \tan 20^\circ} = 1,63 \text{ m} \rightarrow h = 1,63 \cdot \tan 46^\circ$$

$$\boxed{h = 1,69 \text{ m}}$$



(5)

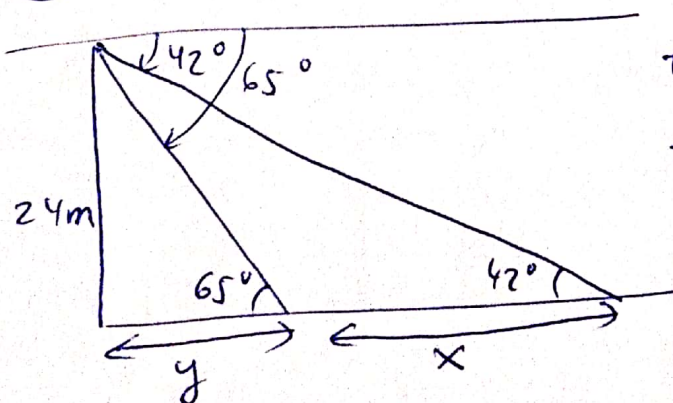


$$\begin{aligned} \tan 10^\circ &= \frac{100}{y} \rightarrow y = \frac{100}{\tan 10^\circ} \\ \tan 20^\circ &= \frac{100}{y-x} \rightarrow y-x = \frac{100}{\tan 20^\circ} \end{aligned} \quad \left\{ \begin{aligned} \frac{100}{\tan 10^\circ} - x &= \frac{100}{\tan 20^\circ} \\ x &= \frac{100}{\tan 10^\circ} - \frac{100}{\tan 20^\circ} \end{aligned} \right.$$

$$x = 292,38 \text{ m}$$

$$\text{velocidade} = \frac{x}{t} = \frac{292,38 \text{ m}}{1 \text{ min}} \cdot \frac{1 \text{ min}}{60 \text{ s}} = \boxed{4,87 \frac{\text{m}}{\text{s}}}$$

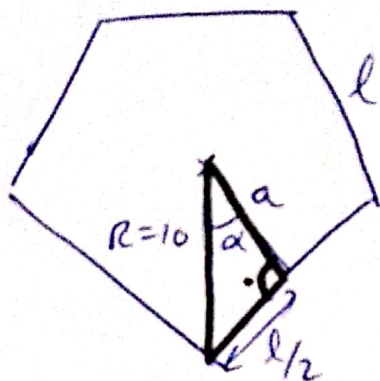
(6)



$$\begin{aligned} \tan 65^\circ &= \frac{24}{y} \rightarrow y = \frac{24}{\tan 65^\circ} \\ \tan 42^\circ &= \frac{24}{x+y} \rightarrow x+y = \frac{24}{\tan 42^\circ} \end{aligned} \quad \left\{ \right.$$

$$x = \frac{24}{\tan 42^\circ} - y = \frac{24}{\tan 42^\circ} - \frac{24}{\tan 65^\circ}$$

$$\boxed{x = 15,46 \text{ m}}$$



$$\alpha = \frac{360^\circ}{2 \cdot 5} \Rightarrow \boxed{\alpha = 36^\circ}$$

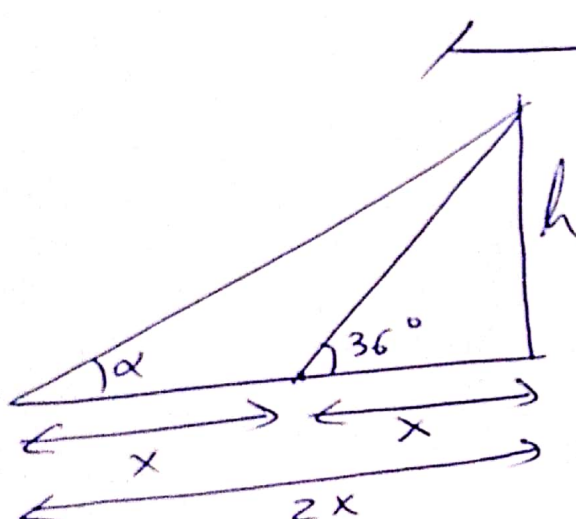
$$\frac{l/2}{10} = \sin 36^\circ \Rightarrow l = 20 \cdot \sin 36^\circ = 11,76$$

$$\cos 36^\circ = \frac{a}{10} \Rightarrow a = 10 \cdot \cos 36^\circ = 8,09 \text{ m}$$

$$\text{Perimetro} = 5 \cdot l = \boxed{58,8 \text{ m}}$$

$$\text{Area} = \frac{P \cdot a}{2} = \frac{58,8 \cdot 8,09}{2} = \boxed{237,75 \text{ m}^2}$$

(8)



$$\tan 36^\circ = \frac{h}{x} \Rightarrow h = x \cdot \tan 36^\circ$$

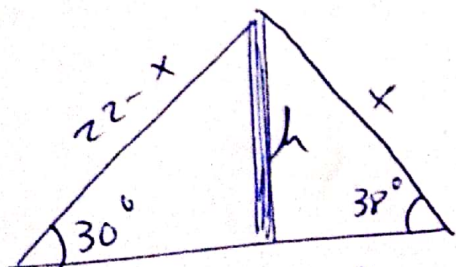
$$\tan \alpha = \frac{h}{2x} \Rightarrow h = 2x \cdot \tan \alpha$$

$$2x \cdot \tan \alpha = x \cdot \tan 36^\circ$$

$$\tan \alpha = \frac{x \cdot \tan 36^\circ}{2 \cdot x}; x \neq 0$$

$$\tan \alpha = 0,3633 \rightarrow \alpha = \tan^{-1}(0,3633) \Rightarrow \boxed{\alpha \approx 20^\circ}$$

(9)



$$\text{Sen } 30^\circ = \frac{h}{22-x} \Rightarrow h = (22-x) \cdot \text{sen } 30^\circ$$

$$\text{Sen } 38^\circ = \frac{h}{x} \Rightarrow h = x \cdot \text{sen } 38^\circ$$

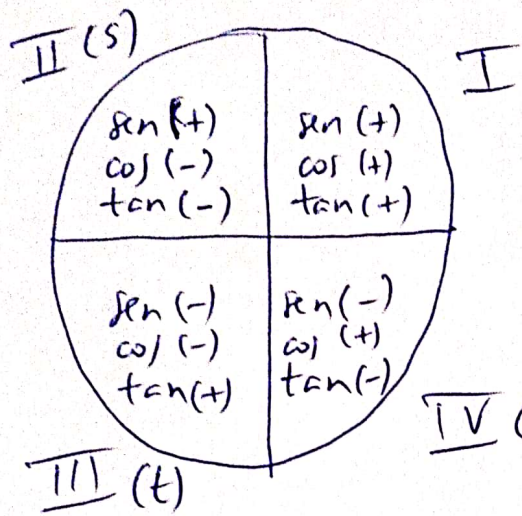
$$22 \cdot \text{sen } 30^\circ - x \cdot \text{sen } 30^\circ = x \cdot \text{sen } 38^\circ$$

$$x = \frac{22 \cdot \text{sen } 30^\circ}{\text{sen } 30^\circ + \text{sen } 38^\circ} = 9,86 \text{ m}; h = 9,86 \cdot \text{sen } 38^\circ$$

$$\boxed{h = 6,07 \text{ m}}$$



1) Recordatorio de los signos de las funciones trigonométricas en los distintos cuadrantes



a)  $\tan x = \frac{3}{4}$

$$\frac{\sin x}{\cos x} = \frac{3}{4} \rightarrow \sin x = \frac{3}{4} \cos x$$

$$\sin^2 x + \cos^2 x = 1$$

$$\left(\frac{3}{4} \cos x\right)^2 + \cos^2 x = 1$$

$$\frac{9}{16} \cos^2 x + \cos^2 x = 1 \rightarrow \frac{25}{16} \cos^2 x = 1 \rightarrow \cos^2 x = \frac{16}{25}$$

$$\cos x = -\left[\begin{array}{l} \frac{4}{5} \\ -\frac{4}{5} \end{array}\right]; x \in \text{III} \rightarrow \boxed{\cos x = -\frac{4}{5}}$$

$$\sin x = \frac{3}{4} \cdot \cos x = \frac{3}{4} \cdot \left(-\frac{4}{5}\right) \Rightarrow \boxed{\sin x = -\frac{3}{5}}$$

•  $\cos x = -\frac{4}{5}$ ;  $\sin^2 x + \cos^2 x = 1 \rightarrow \sin^2 x + \left(-\frac{4}{5}\right)^2 = 1$   
 $\sin^2 x = 1 - \left(-\frac{4}{5}\right)^2 = 1 - \frac{16}{25} = \frac{9}{25} \rightarrow \sin x = -\left[\begin{array}{l} \frac{3}{5} \\ -\frac{3}{5} \end{array}\right]; x \in \text{II}$   
 $\boxed{\sin x = \frac{3}{5}}$   $\tan x = \frac{\sin x}{\cos x} = \frac{\frac{3}{5}}{-\frac{4}{5}} = -\frac{3 \cdot 5}{4 \cdot 5} \Rightarrow \boxed{\tan x = -\frac{3}{4}}$

•  $\sin x = -0,8$ ;  $\sin^2 x + \cos^2 x = 1 \cdot (-0,8)^2 + \cos^2 x = 1$   
 $\cos^2 x = 1 - 0,64$ ;  $\cos^2 x = 0,36 \rightarrow \boxed{\cos x = 0,6}; x \in \text{IV}$   
 $\tan x = \frac{\sin x}{\cos x} = \frac{-0,8}{0,6} \Rightarrow \boxed{\tan x = -\frac{4}{3}}$



## Continuation 10 a

$$\bullet \tan x = \sqrt{3} ; \frac{\operatorname{sen} x}{\cos x} = \sqrt{3} ; \operatorname{sen} x = \sqrt{3} \cos x$$

$$\operatorname{sen}^2 x + \cos^2 x = 1 \rightarrow (\sqrt{3} \cos x)^2 + \cos^2 x = 1$$

$$3 \cos^2 x + \cos^2 x = 1 \rightarrow 4 \cos^2 x = 1 \rightarrow \cos^2 x = \frac{1}{4}$$

$$\rightarrow \boxed{\cos x = \frac{1}{2}} ; x \in \mathbb{I}$$

$$\rightarrow \cancel{\cos x = -\frac{1}{2}}$$

$$\operatorname{sen} x = \sqrt{3} \cdot \cos x = \sqrt{3} \cdot \frac{1}{2}$$

$$\boxed{\operatorname{sen} x = \frac{\sqrt{3}}{2}}$$

10. b

$$\bullet \cos x + \frac{\operatorname{sen} x}{\frac{\operatorname{sen} x}{\cos x}} = \cos x + \frac{\cancel{\operatorname{sen} x} \cdot \cos x}{\cancel{\operatorname{sen} x}} = \boxed{2 \cos x}$$

$$\bullet \frac{(\tan x)^2}{1 - (\cos x)^2} \cdot \cos^2 x = \frac{\frac{\operatorname{sen}^2 x}{\cos^2 x}}{\operatorname{sen}^2 x} \cdot \cos^2 x =$$
$$= \frac{\cancel{\operatorname{sen}^2 x}}{\cancel{\operatorname{sen}^2 x} \cdot \cancel{\cos^2 x}} \cdot \cancel{\cos^2 x} = \boxed{1}$$

$$\bullet \frac{1 + \tan x}{\operatorname{sen} x + \cos x} = \frac{1 + \frac{\operatorname{sen} x}{\cos x}}{\operatorname{sen} x + \cos x} = \frac{\frac{\cos x + \operatorname{sen} x}{\cos x}}{\operatorname{sen} x + \cos x} =$$
$$= \frac{\frac{1}{\cancel{(\cos x + \operatorname{sen} x)}}}{\cos x (\cancel{\operatorname{sen} x + \cos x})} = \boxed{\frac{1}{\cos x}}$$

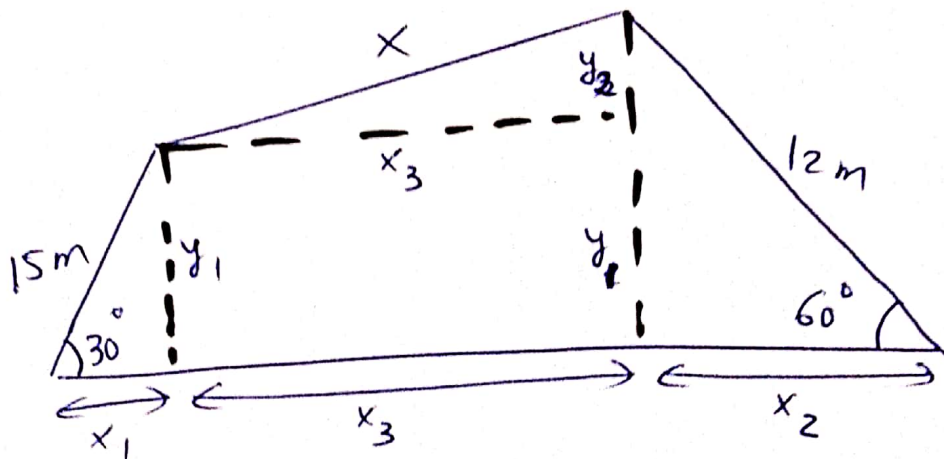
## Continuación de 10b

$$\begin{aligned}
 \bullet \quad \frac{1}{\cos^2 x} - \frac{\cancel{1}}{\cancel{1}} \cdot \frac{\cancel{\cos^2 x}}{\cos^2 x} - \frac{\cancel{\cos^2 x}}{\cos^2 x} - \cancel{\cos^2 x} &= \\
 = \frac{\cancel{\cos^2 x}}{\cos^2 x} + \frac{\cancel{\cos^2 x}}{\cancel{\cos^2 x}} - \cancel{\cos^2 x} &= \tan^2 x + 1 - \cancel{\cos^2 x} = \\
 = \boxed{\tan^2 x + \cos^2 x} \quad \perp
 \end{aligned}$$

$$\begin{aligned}
 \bullet \quad \cos^4 x - \sin^4 x &= (\cos^2 x + \sin^2 x)(\cos^2 x - \sin^2 x) = \\
 = \cos^2 x - (1 - \cos^2 x) &= \cos^2 x - 1 + \cos^2 x = \boxed{2\cos^2 x - 1}
 \end{aligned}$$



(11)



$$\cos 30^\circ = \frac{x_1}{15} \Rightarrow x_1 = 15 \cdot \cos 30^\circ = \boxed{13\text{ m} = x_1}$$

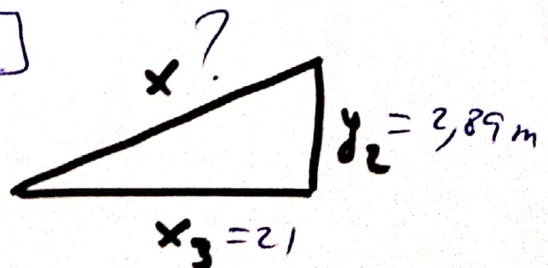
$$\cos 60^\circ = \frac{x_2}{12} \Rightarrow x_2 = 12 \cdot \cos 60^\circ = \boxed{6\text{ m} = x_2}$$

$$x_3 = 40 - x_1 - x_2 \Rightarrow \boxed{x_3 = 21\text{ m}}$$

$$\sin 30^\circ = \frac{y_1}{15} \Rightarrow y_1 = 7,5\text{ m}$$

$$\sin 60^\circ = \frac{y_1 + y_2}{12} \Rightarrow 7,5 + y_2 = 12 \cdot \sin 60^\circ$$

$$y_2 = 12 \sin 60^\circ - 7,5 \Rightarrow y_2 = 2,89\text{ m}$$



$$x = \sqrt{21^2 + 2,89^2}$$

$$\boxed{x = 21,20\text{ m}}$$