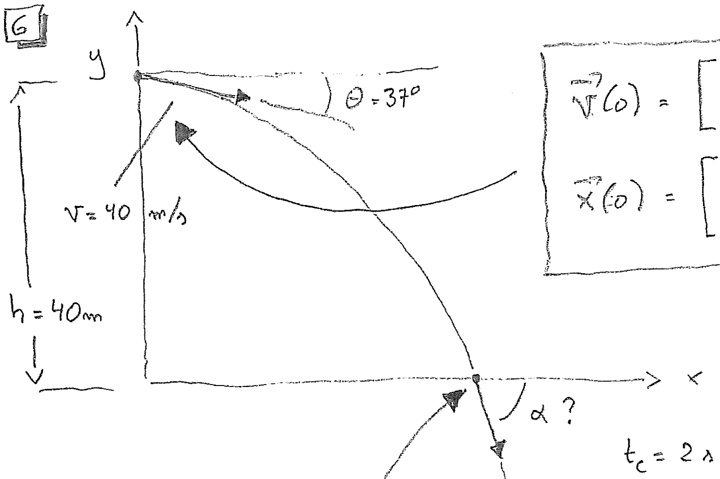
6



$$\vec{v}(0) = \begin{bmatrix} v \cos\theta \\ -v \sin\theta \end{bmatrix}$$

$$\vec{x}(0) = \begin{bmatrix} 0 \\ h \end{bmatrix}$$

$$\underset{\sim}{x} = \begin{bmatrix} x \\ y \end{bmatrix} \qquad \underset{\sim}{v} = \begin{bmatrix} u \\ v \end{bmatrix}$$

$$\vec{v}(t_c) = \begin{bmatrix} v \cos\theta \\ -v \sin\theta - g t_c \end{bmatrix}$$

$$\vec{x}(t_c) = \begin{bmatrix} 0 + v\cos\theta \, t_c \\ h - v \sin\theta \, t_c - g t_c^2/2 \end{bmatrix}$$

- LA CLE TOUCHE LE SOL EN $t_c = 2$

$$\underbrace{y(t_c)}_{=0} = h - v \sin\theta \, t_c - g \frac{t_c^2}{2}$$

$$\boxed{v = \frac{h}{\sin\theta \, t_c} - \frac{g t_c}{\sin\theta}}$$

CHECK DIMENSION !

$$\overbrace{\left[\frac{m}{s^2}\right][s]}$$

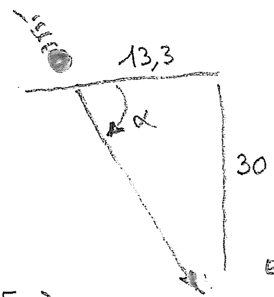
$$\frac{[m]}{[s]}$$ CHECK DIMENSION !

$$v = \underbrace{\frac{40 - 20}{2 \sin 37°}}_{16{,}6 \text{ m/s}}$$

IL FAUT SAVOIR OBTENIR L'EXPRESSION SYMBOLIQUE !

- VITESSE EN $t_c = 2$

$$\vec{v}(t_c) = \underbrace{\begin{bmatrix} v \cos 37° \\ -v \sin 37° - g t_c \end{bmatrix}}_{\begin{bmatrix} v_x(t_c) \\ v_y(t_c) \end{bmatrix}} = \begin{bmatrix} 13{,}3 \\ -30 \end{bmatrix}$$

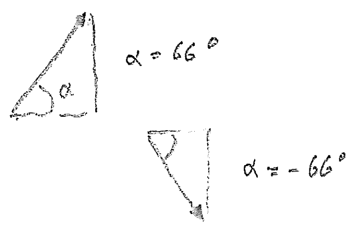


LA VALEUR NUMERIQUE SANS LE DESSIN EST AMBIGUE !

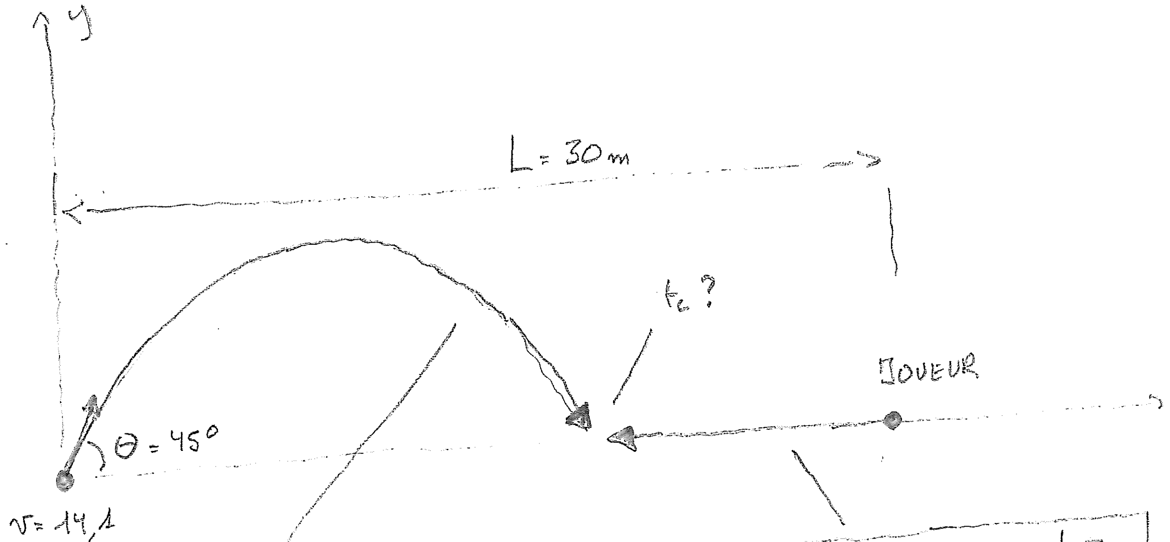
$$\alpha = \underbrace{\operatorname{arctg}\left(\frac{v_y}{v_x}\right)}_{-66°}$$

$$\boxed{\alpha = 66°}$$

- CAR C'EST UN ANGLE VERS LE BAS



$\boxed{7}$



$$\vec{x}(t) = \begin{bmatrix} v\cos\theta\, t \\ v\sin\theta\, t - g\frac{t^2}{2} \end{bmatrix}$$

$$\vec{x}_J(t) = \begin{bmatrix} L - u_J t \\ 0 \end{bmatrix}$$

u_J NORME DE LA VITESSE DU JOUEUR

$$\vec{v}_J = \begin{bmatrix} -u_J \\ 0 \end{bmatrix}$$

• TEMPS D'IMPACT ?

$$\underbrace{y(t_c)}_{=0} = v\sin\theta\, t_c - g\frac{t_c^2}{2}$$

$$t_c\,(\underbrace{v\sin\theta - g\,t_c/2}) = 0$$

LE POINT DE DEPART !

$[\frac{m}{s}][\frac{s^2}{m}]$ OK CHECK DIMENSION

$$\boxed{t_c = \frac{2v\sin\theta}{g}}$$

$v\sin\theta$

$$\boxed{t_c = \frac{20}{10} = 2 \text{ sec}}$$

• VITESSE DU JOUEUR POUR ATTRAPER LA BALLE ?

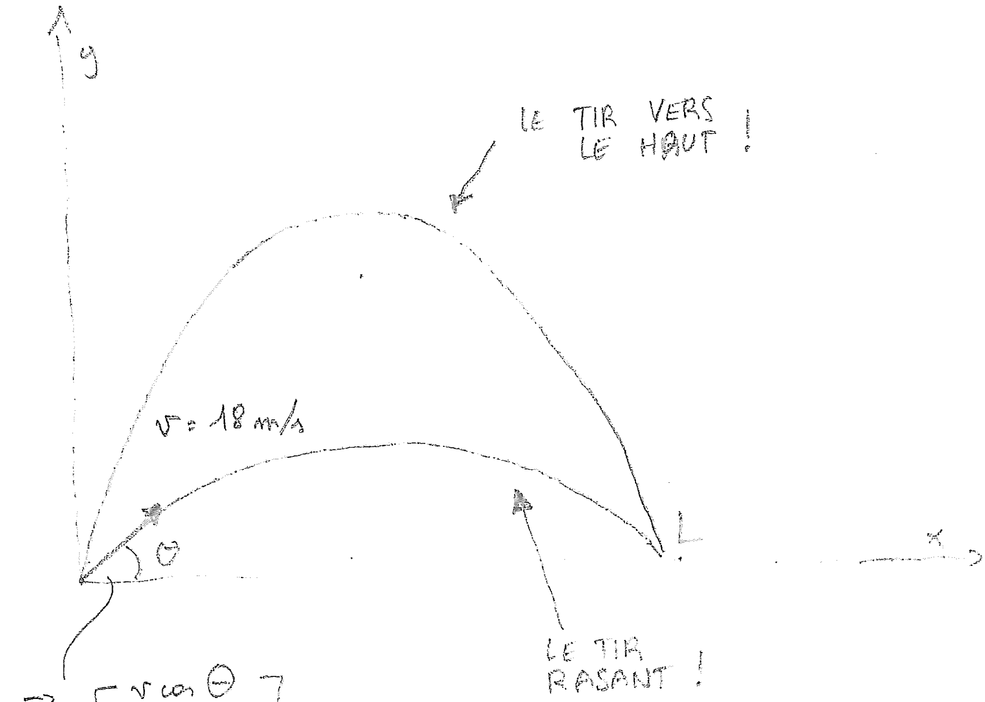
$$\underbrace{v\cos\theta\, t_c}_{x(t_c)} = \underbrace{L - u_J t_c}_{x_J(t_c)}$$

POSITION DE LA BALLE !

POSITION DU JOUEUR

$$\boxed{u_J = \underbrace{\frac{L}{t_c}}_{30/2} - \underbrace{v\cos\theta}_{10}}$$

$$\boxed{u_J = 5 \text{ m/s}}$$



$$\vec{v} = \begin{bmatrix} v\cos\theta \\ v\sin\theta \end{bmatrix}$$

$$\underbrace{\vec{x}(t_c)}_{\begin{bmatrix} L \\ 0 \end{bmatrix}} = \begin{bmatrix} v\cos\theta\, t_c \\ -g\frac{t_c^2}{2} + v\sin\theta_c\, t_c \end{bmatrix}$$

2 EQUATIONS AVEC 2 INCONNUES t_c et θ

$$\begin{cases} L = v\cos\theta\, t_c & (1) \\ 0 = -g\frac{t_c^2}{2} + v\sin\theta\, t_c & (2) \end{cases}$$

EN REMPLACANT DANS (2) $\underbrace{t_c = \frac{L}{v\cos\theta}}_{\text{OBTENU A PARTIR DE (1)}}$

$$\frac{gL^2}{2v^2\cos^2\theta} = \frac{\sin\theta}{\cos\theta}L$$

$$\frac{gL}{2v^2\cos\theta} = \sin\theta \ldots$$

$$\frac{gL}{v^2} = \underbrace{2\sin\theta\cos\theta}_{\sin(2\theta)}$$

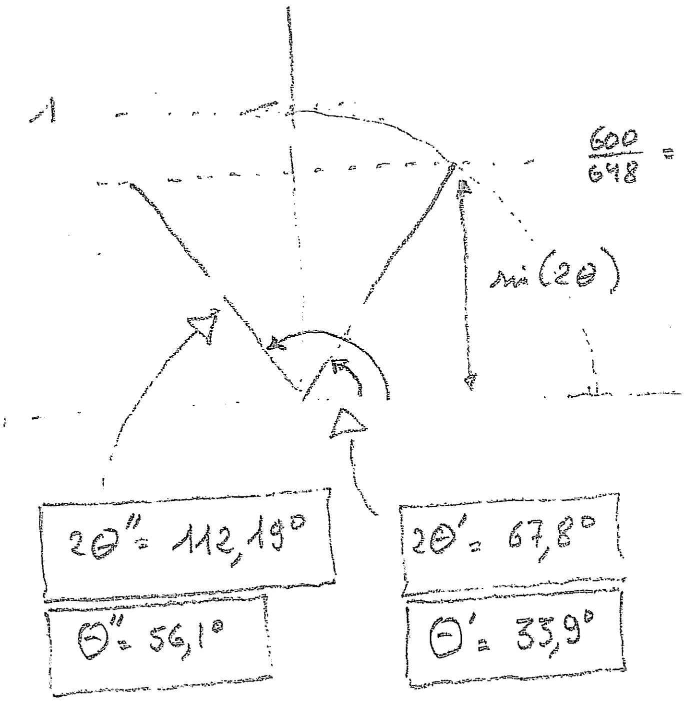
CHECK DIMENSION

$$\left[\frac{m}{s^2}\right][m]\left[\frac{s^2}{m^2}\right] \text{ ok!}$$

$$\frac{600}{648} = \sin(2\theta)$$

$$\boxed{\theta = \frac{1}{2}\underbrace{\operatorname{asin}\left(\frac{600}{648}\right)}_{32^\circ}}$$

ET LE DEUXIEME ANGLE ?

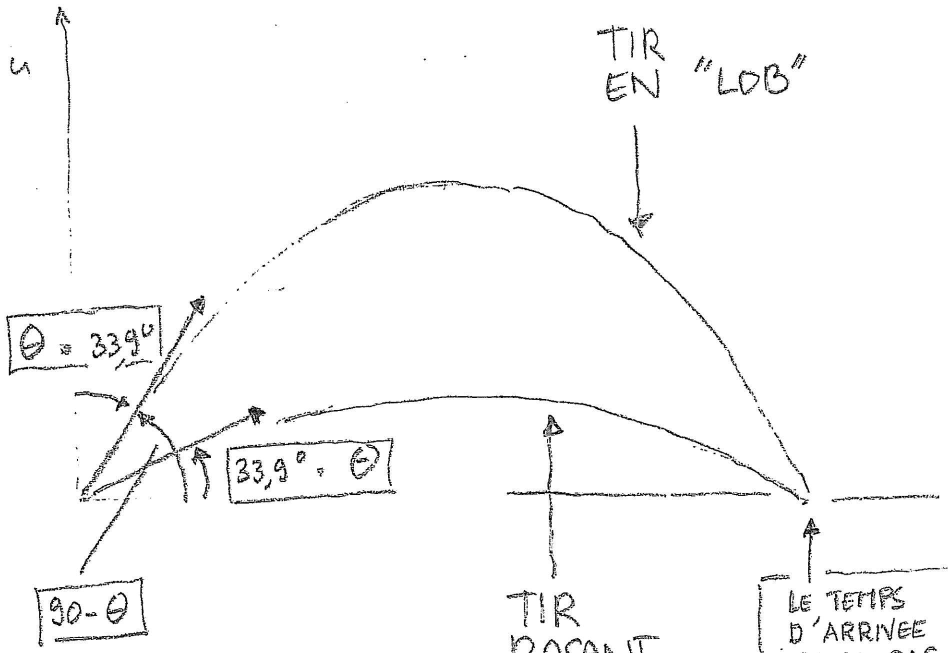


$\frac{600}{648} = 0{,}926$

CERCLE TRIGONOMETRIQUE

TRIGONOMETRIE !

$2\Theta'' = 180 - 2\Theta'$!



LE TEMPS D'ARRIVEE N'EST PAS IDENTIQUE !

$\cos(56°) < \cos(33°)$ $\qquad t_c = \frac{L}{v \cos\theta}$

LE TIR EN "LOB" PRENDRA PLUS DE TEMPS QUE LE TIR "RASANT" !