

### ESERCIZIO 3

Calcolare la massima velocità con la quale un autoveicolo può affrontare una curva sopraelevata, avente raggio di curvatura  $r = 26$  m, senza correre il rischio di ribaltamento all'esterno.

Sono noti i seguenti dati:

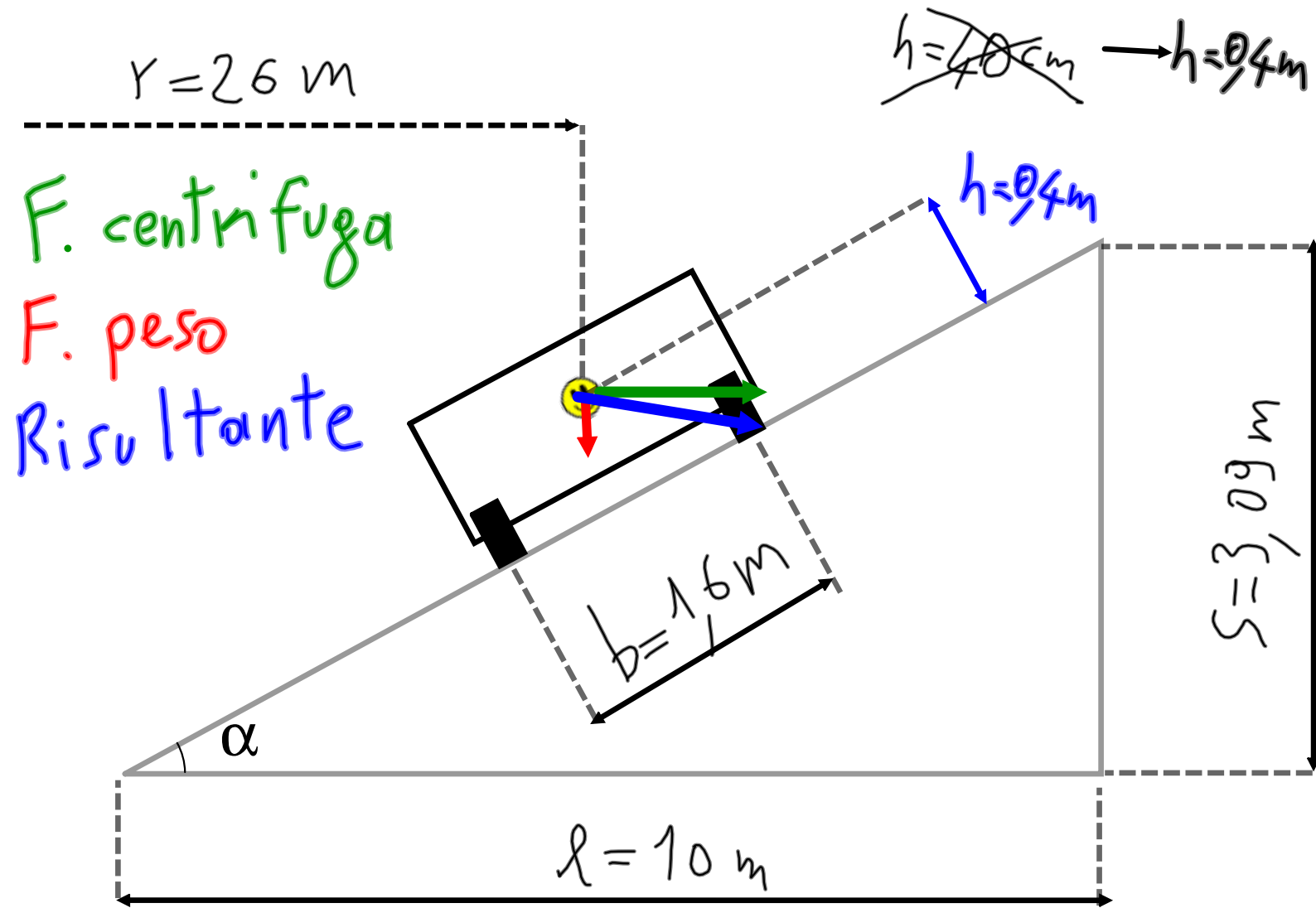
altezza del baricentro del veicolo ;  $h = 40$  cm

carreggiata del veicolo (distanza ruote) ;  $b = 1,60$  m

sopraelevazione esterna della strada ;  $s = 3,09$  m

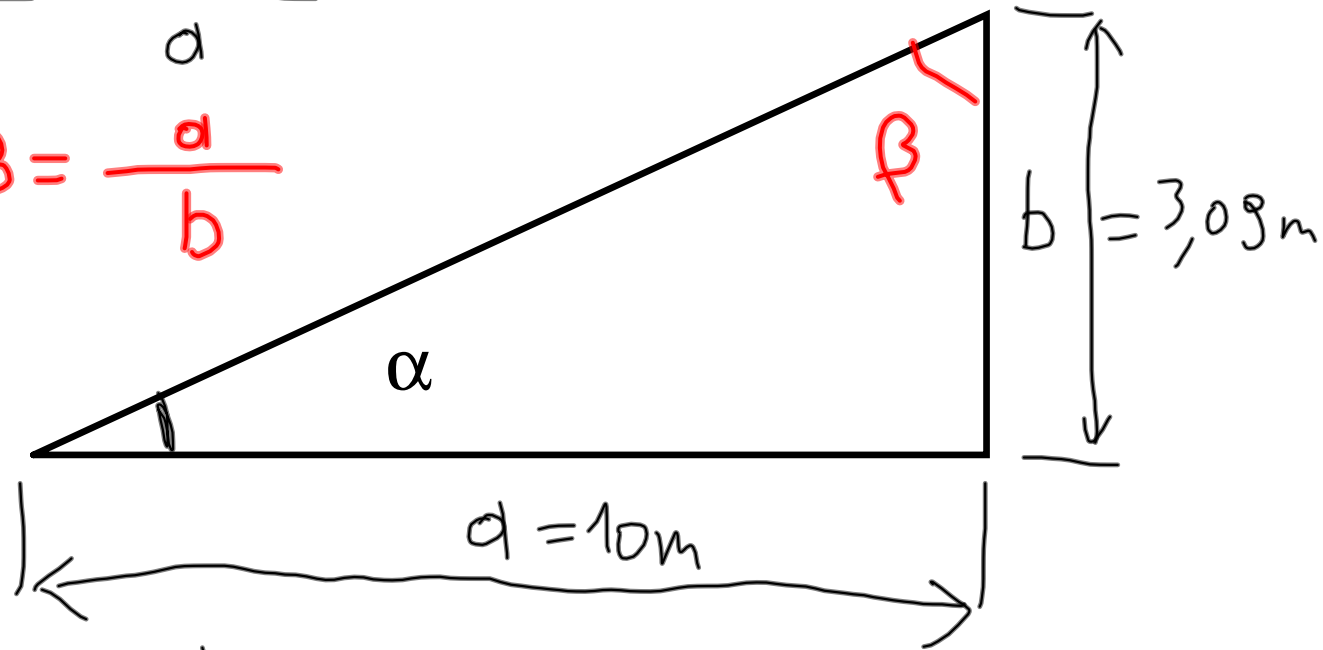
larghezza della strada o carreggiata ;  $l = 10$  m

(soluzione :  $v = 148,5$  km/h circa)

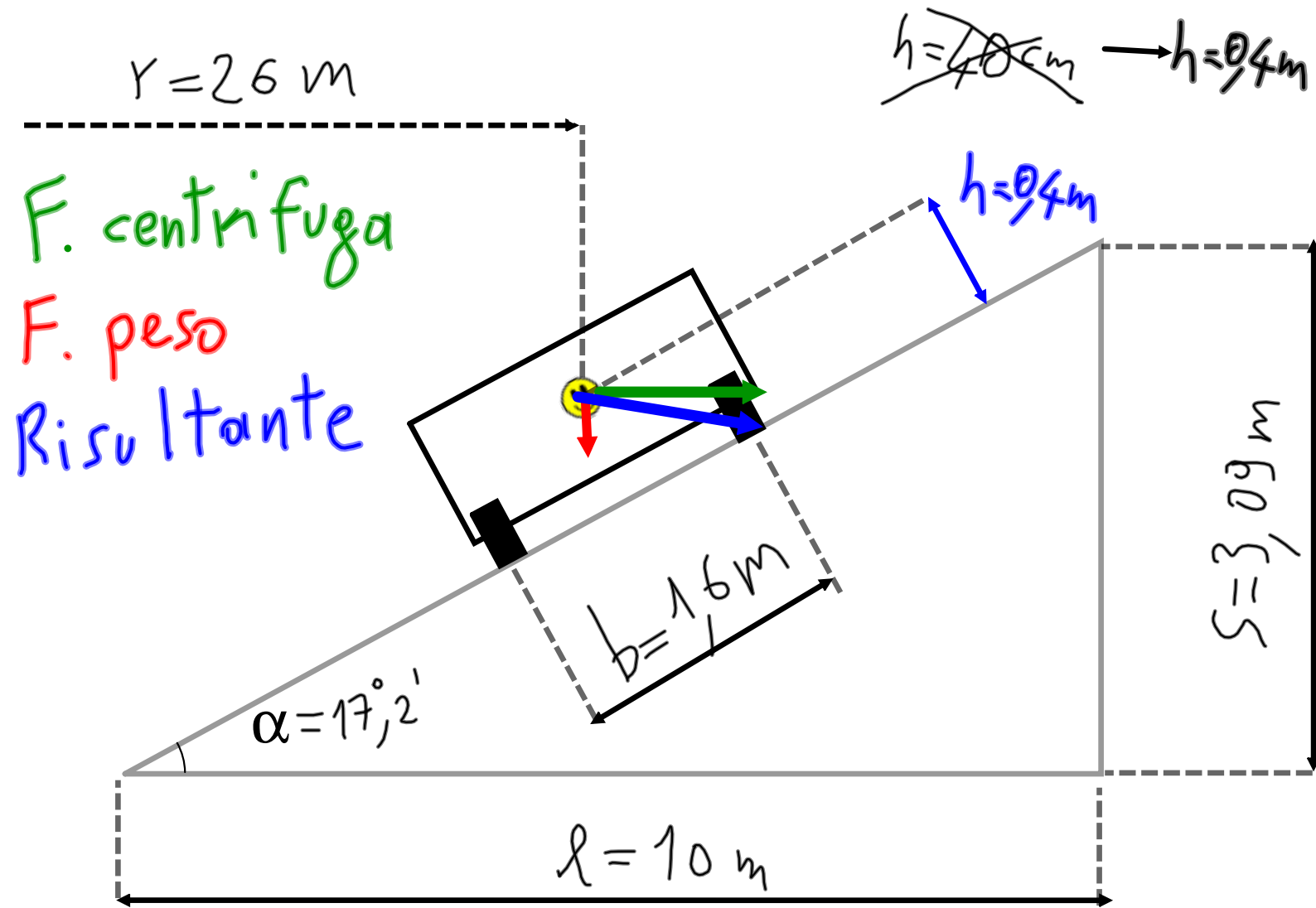


$$\operatorname{tg} \alpha = \frac{b}{a}$$

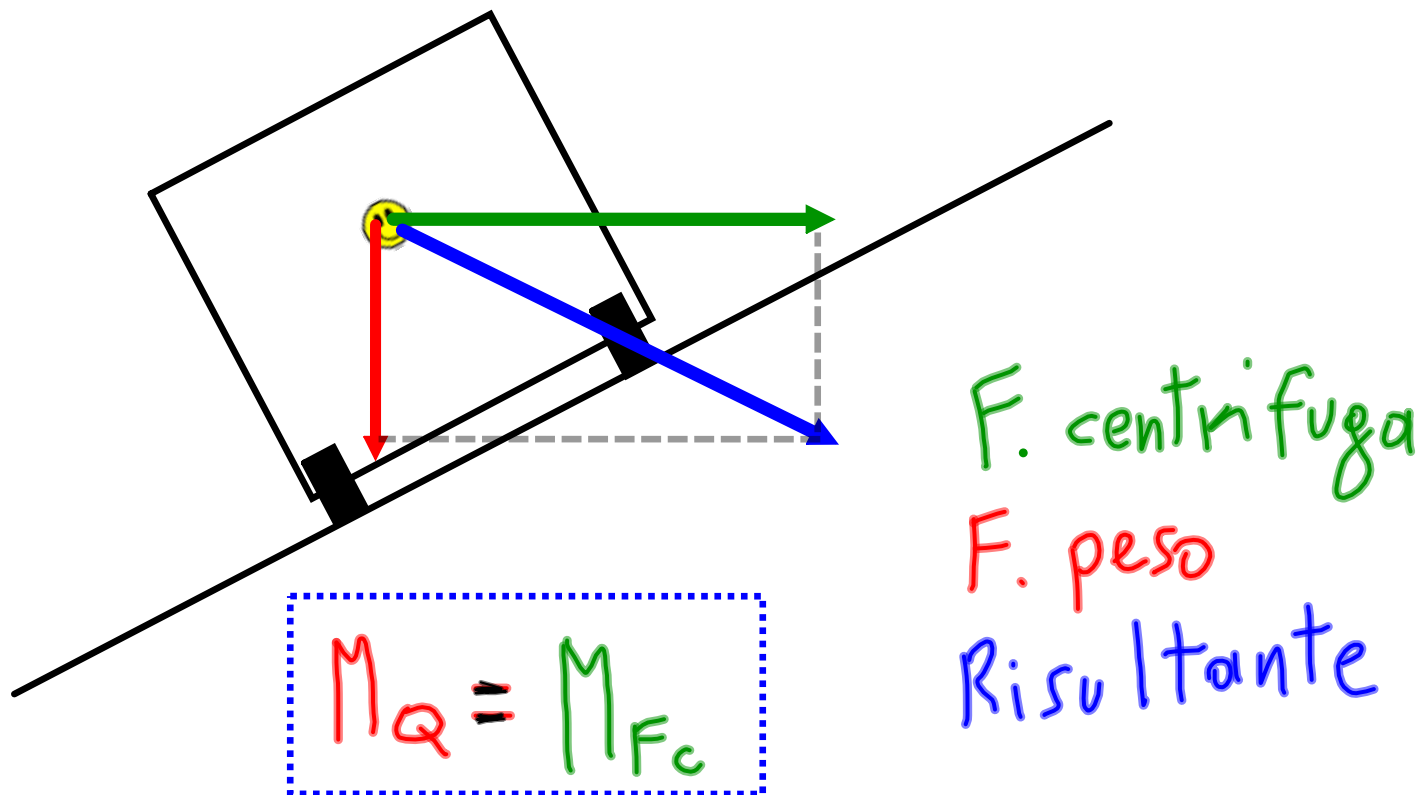
$$\operatorname{tg} \beta = \frac{a}{b}$$



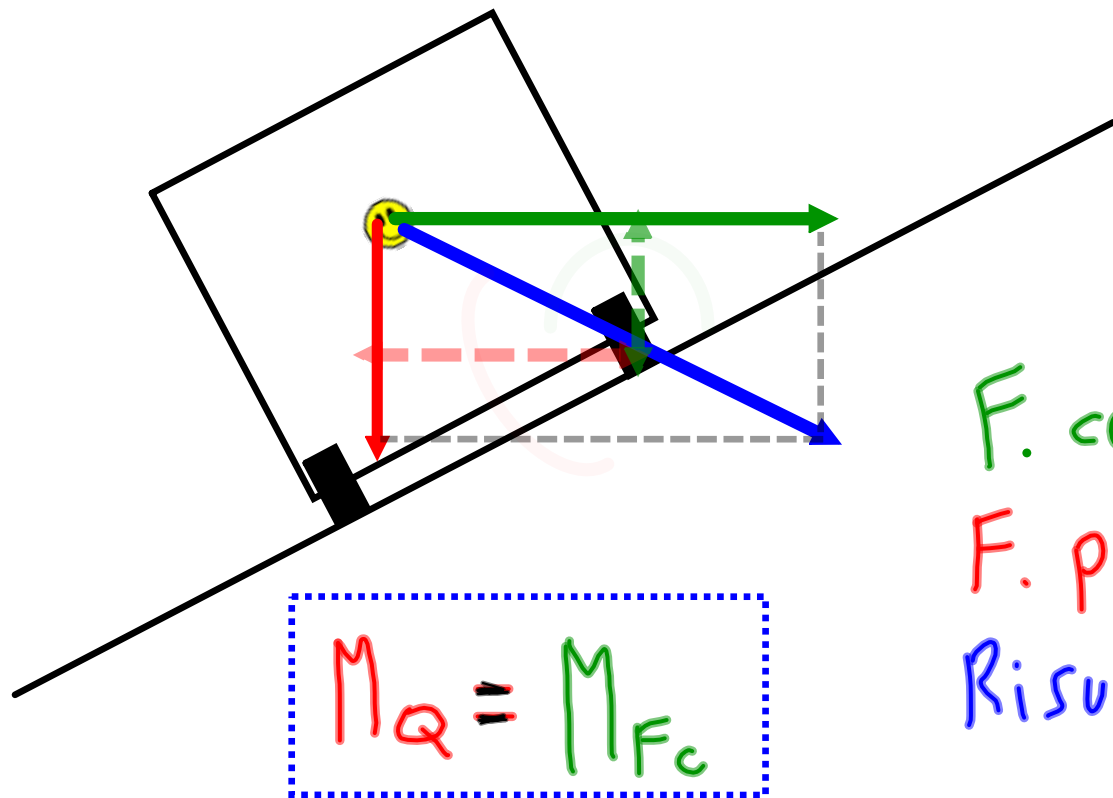
$$\operatorname{tg} \alpha = \frac{b}{a} \Rightarrow \alpha = \arctg \left( \frac{b}{a} \right) = \arctg \left( \frac{3,09}{10} \right) \approx 17,2'$$



SI CERCA LA CONDIZIONE LIMITE PER  
IL RIBALTAMENTO



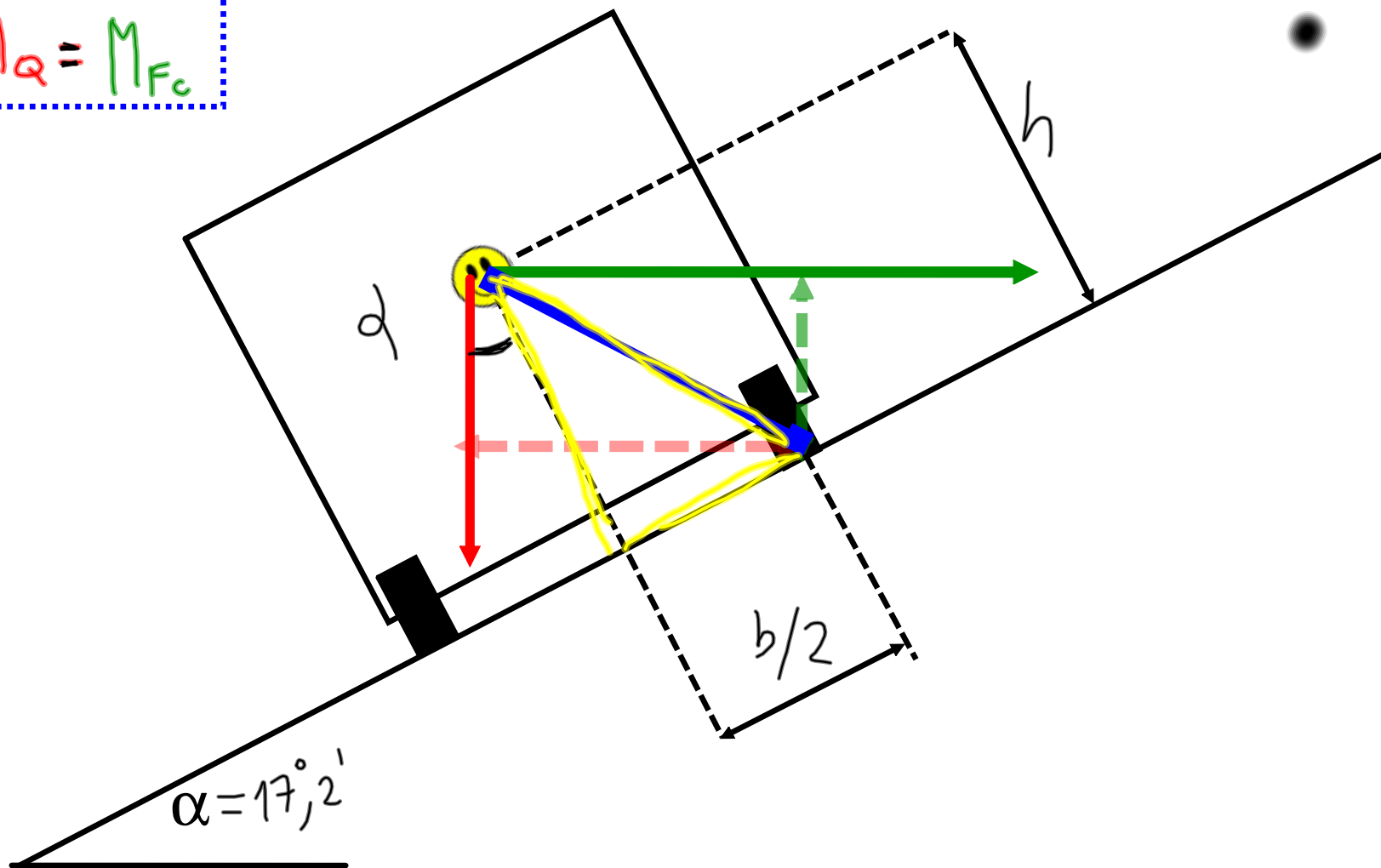
MA PER I MOMENTI SERVONO I BRACCI !



F. centrifuga  
F. peso  
Risultante

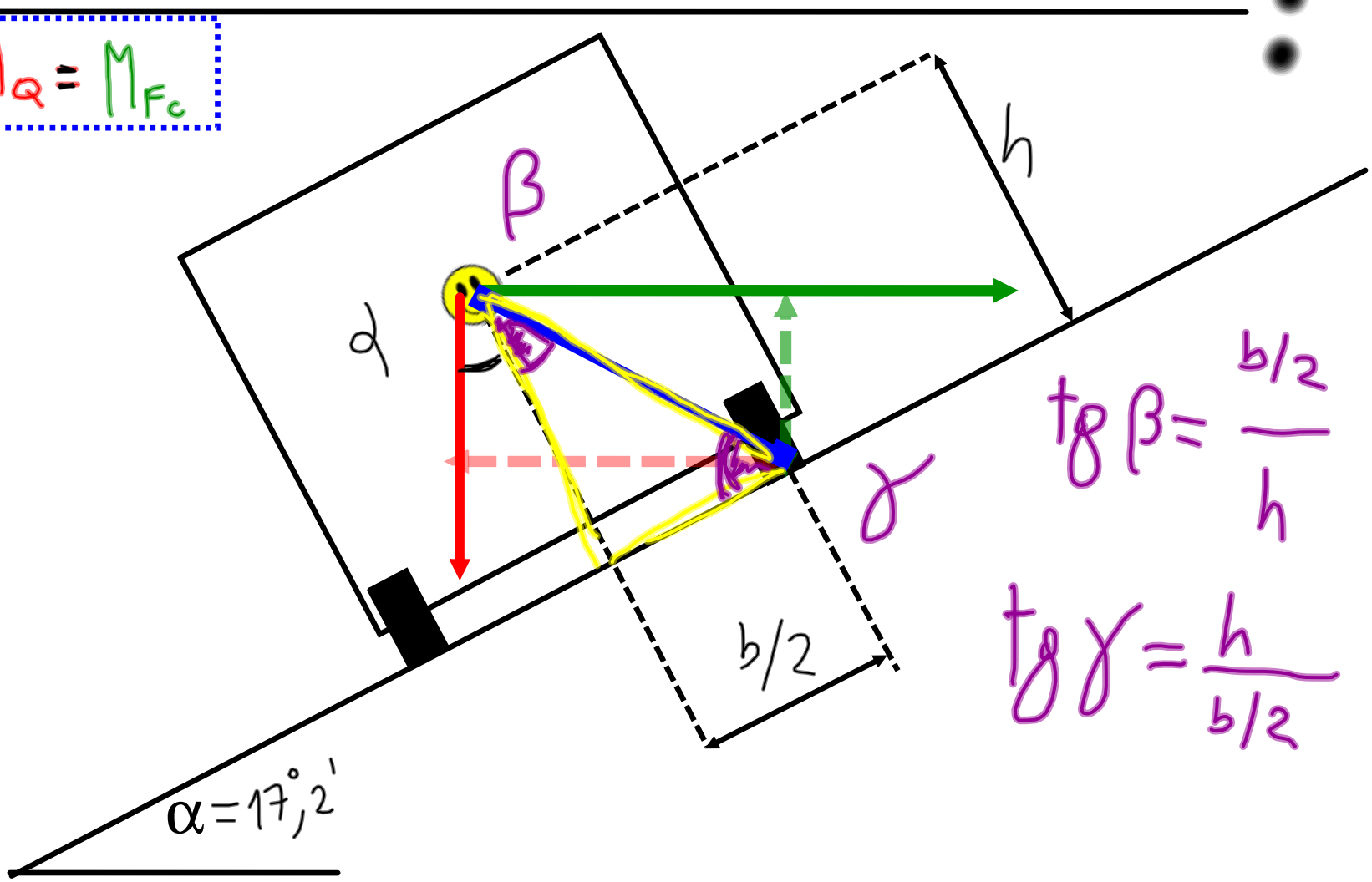
MA PER I MOMENTI SERVONO I BRACCI !

$$M_Q = M_{Fc}$$



MA PER I MOMENTI SERVONO I BRACCI !

$$M_Q = M_{Fc}$$



$$\text{tg } \beta = \frac{b/2}{h}$$

$$\text{tg } \gamma = \frac{h}{b/2}$$



$$\operatorname{tg} \beta = \frac{b/2}{h} \Rightarrow \beta = \operatorname{arctg} \left( \frac{b/2}{h} \right) = \operatorname{arctg} \left( \frac{0,8}{0,4} \right)$$

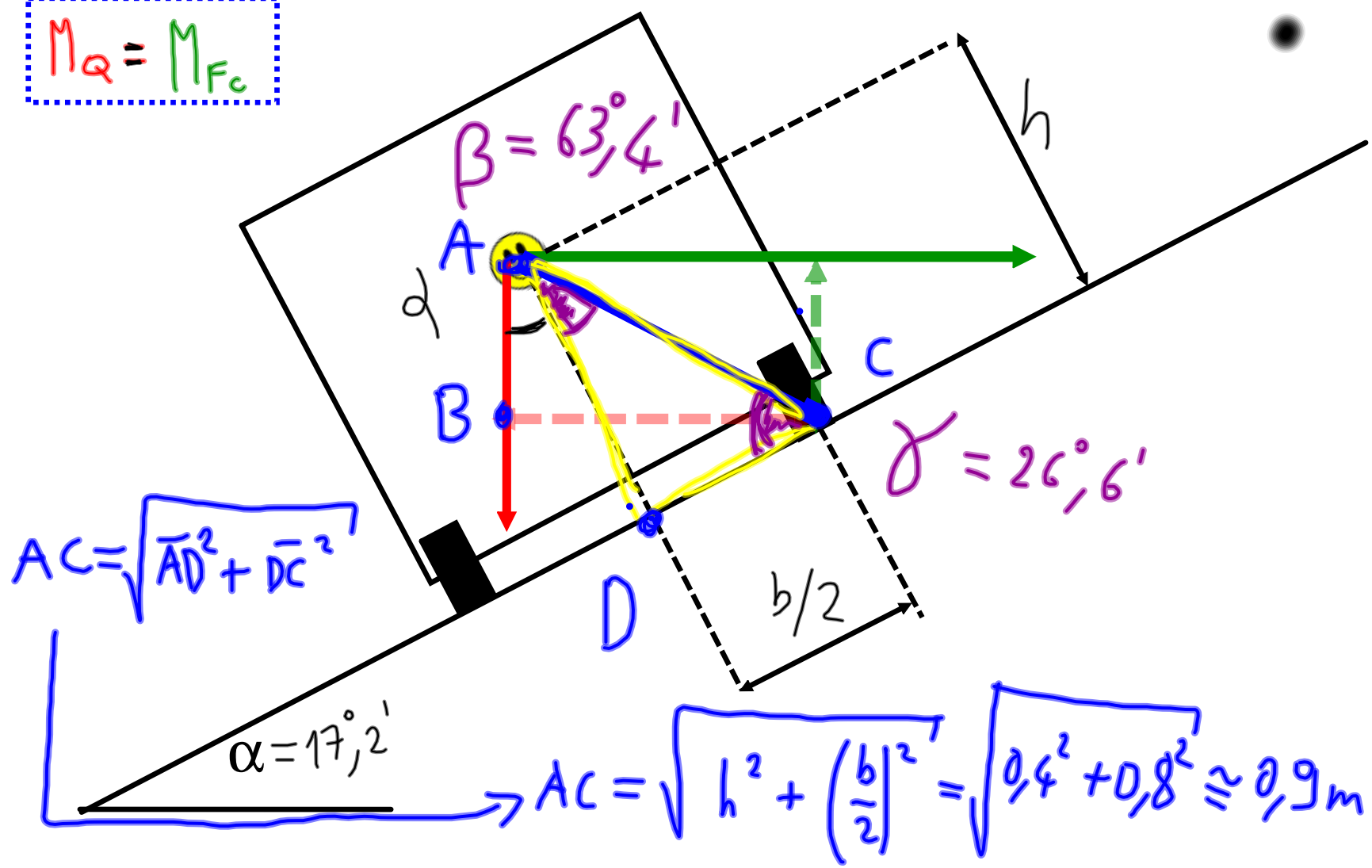
|  
 $\approx 63^{\circ},4'$

$$\operatorname{tg} \gamma = \frac{h}{b/2} \Rightarrow \gamma = \operatorname{arctg} \left( \frac{h}{b/2} \right) = \operatorname{arctg} \left( \frac{0,4}{0,8} \right)$$

|  
 $\approx 26^{\circ},6'$

MA PER I MOMENTI SERVONO I BRACCI !

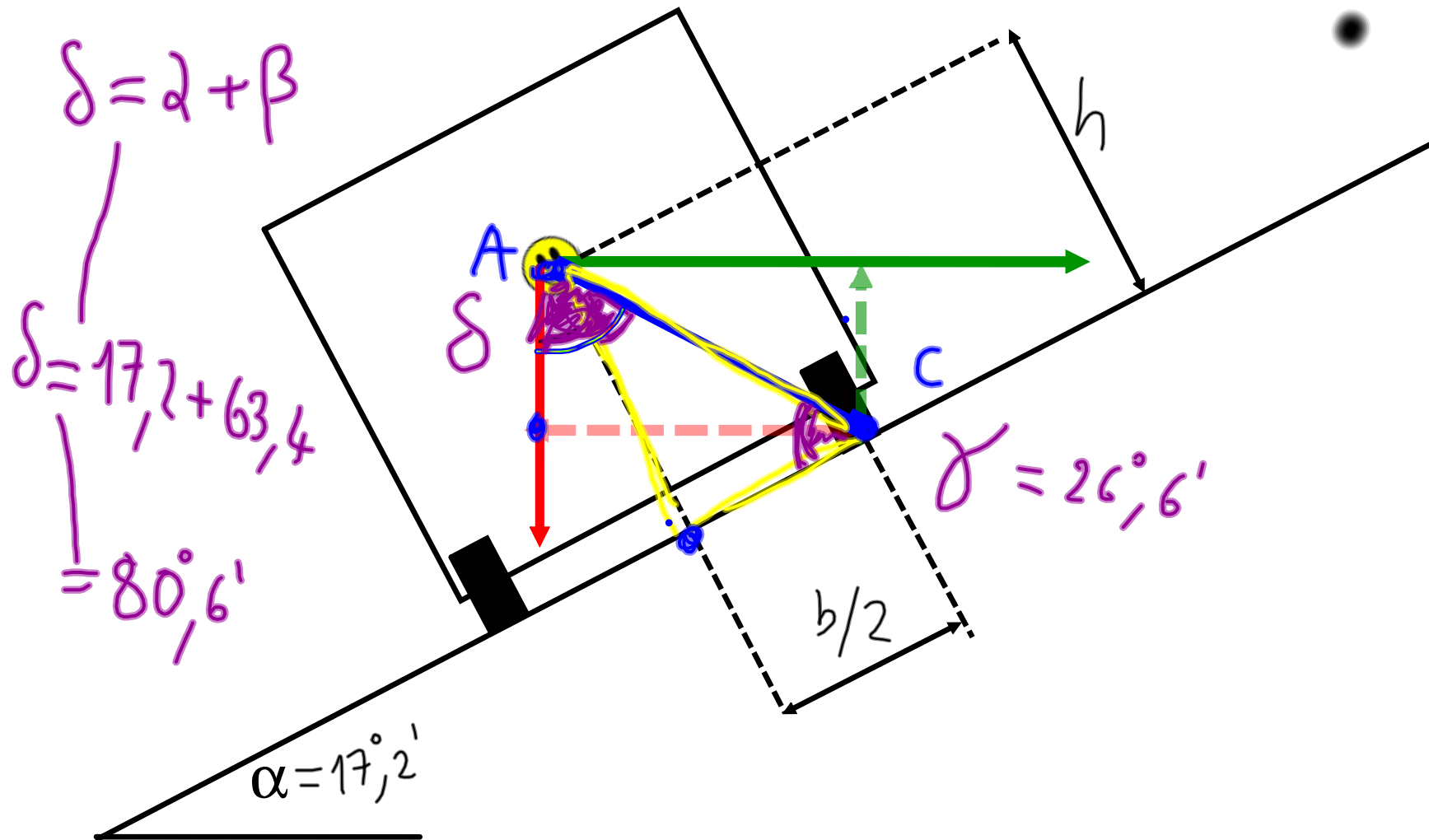
$$M_Q = M_{Fc}$$



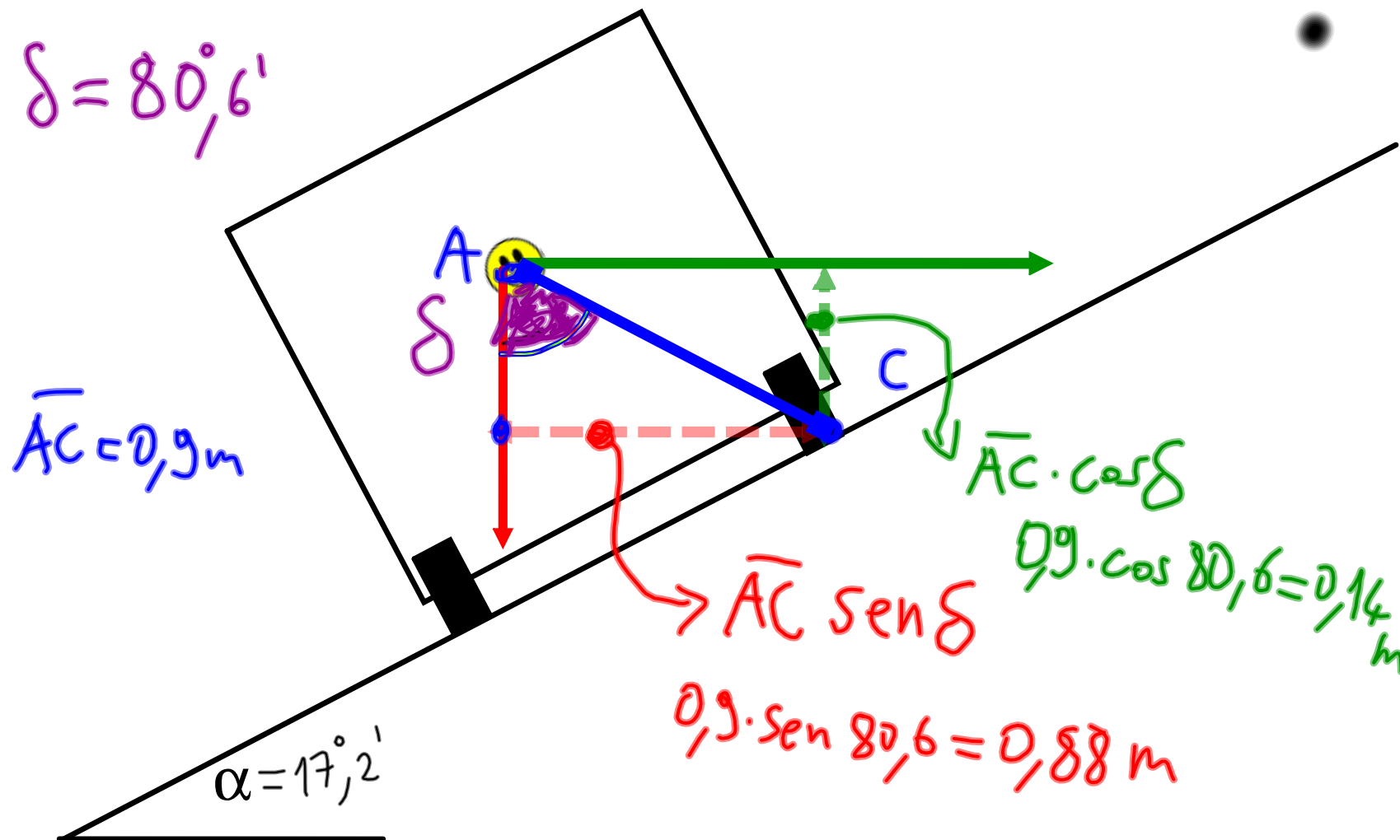
$$AC = \sqrt{AD^2 + DC^2}$$

$$AC = \sqrt{h^2 + \left(\frac{b}{2}\right)^2} = \sqrt{0,4^2 + 0,8^2} \approx 0,9m$$

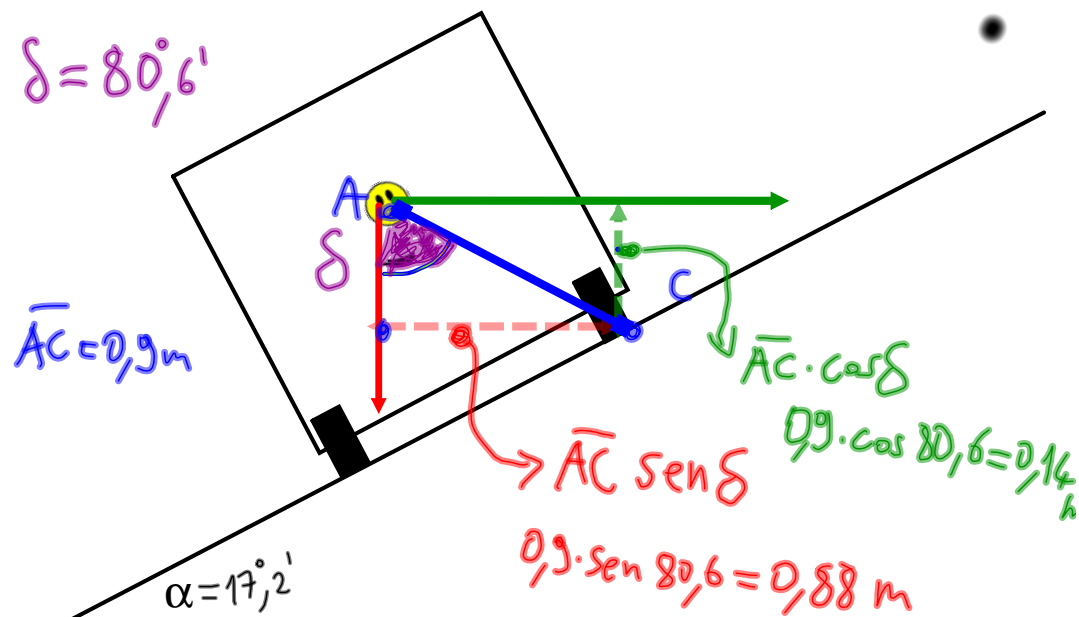
MA PER I MOMENTI SERVONO I BRACCI !



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$$M_Q = M_{F_c}$$

$$m \cdot g \cdot 0,88 = m \frac{v^2}{r} \cdot 0,14$$

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$$v = \sqrt{\frac{9,81 \cdot 0,88 \cdot 26}{0,14}} = 40,04 \text{ m/s} \Rightarrow v \approx 144 \frac{\text{km}}{\text{h}}$$