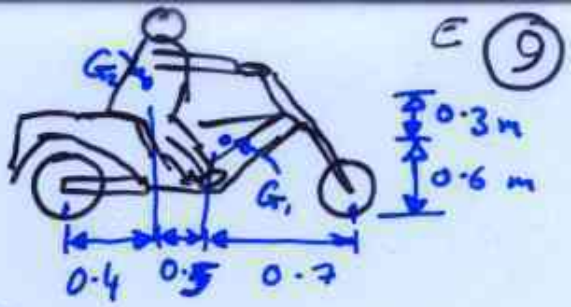
Motorcycle

MASS = 125kg C.O.G = $G_1$

RIDER

MASS = 75kg C.O.G = $G_2$




Coeff of friction WHEEL → ROAD = 0.8 = $\mu_s$

CALCULATE if a WHEELIE is possible & if so @ WHAT ACCLN IT will occur

Assume mass of WHEELS small & front WHEEL free to roll.

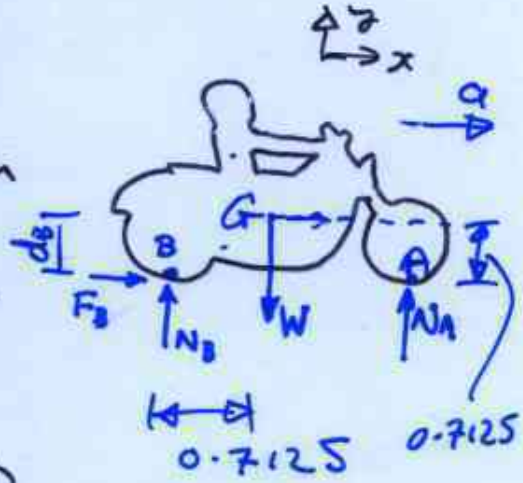


First, FIND centre of mass

$$x\text{-coord} = \frac{(125)(0.9)+(75)(0.4)}{200} = 0.7125\,m$$

$$y\text{-coord} = \frac{(125)(0.6)+(75)(0.9)}{200} = 0.7125\,m$$

Both relative to B




$\Sigma F_x = m a_{Gx} \Rightarrow F_B = m a_G$ ①

$\Sigma F_y = m a_{Gy} = 0 \Rightarrow N_B + N_A - W = 0$ ②

$\Sigma M_B = m a_G d_B \Rightarrow (N_A)(1.6) - (W)(0.7125) = -m a_G (0.7125)$ ③

IF A WHEELIE is about to occur $\Rightarrow N_A = 0$

② $\Rightarrow N_B = W = (200)(9.81)$

③ $\Rightarrow (0.7125)(200)(9.81) = +(200)(a_G)(0.7125)$

$\Rightarrow a_G = 9.81\ ms^{-2}$

① $\Rightarrow F_B = m a_G = (200)(9.81)$

So we have $F_B = (200)(9.81)$ & $N_B = (200)(9.81)$

BUT, $\mu_s = 0.8$ $\Rightarrow$ MAX value of $F_B$ is $(0.8)(N_B)$

$\therefore$ WHEELIE CANNOT occur.