

1) $x_c(t) = d - v_c \cdot t$ $x_c(t^*) = x_p(t^*) \Rightarrow d - v_c \cdot t^* = v_p^0 \cos d \cdot t^*$
 $x_p(t) = v_p^0 \cos d \cdot t$ $y_p(t^*) = 0$ $v_p^0 \sin d \cdot t^* - \frac{1}{2} g t^{*2} = 0$
 $y_p(t) = v_p^0 \sin d \cdot t - \frac{1}{2} g t^2$ RISOLVO IL SISTEMA

$2 \sin^2 d \cos^2 d v_p^0 + 2 v_c \sin d v_p^0 - g d = 0$

$0.866 v_p^0 + 2.25 v_p^0 - 147.15 = 0$ $v_p^0 = -2.25 \pm \sqrt{(2.25)^2 + 4 \cdot 0.866 \cdot 147.15}$ 11.8 m/s

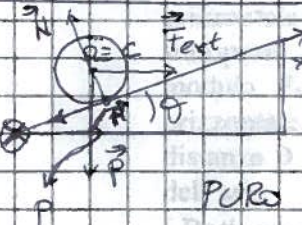
$v_p^0 = 11.8 \text{ m/s}$ 147.15

2) TEO Forze vive $\Rightarrow E_K - E_{K0} = W = W_{\text{For}} + W_{\text{Pess}} + W_{\text{N}}$ $\vec{F}_{\text{ext}} \cdot \Delta \vec{s} + \vec{P} \cdot \Delta \vec{s}$

$E_K = F_{\text{ext}} L - mgh = 2 \cdot 0 - 0.1 \cdot 9.81 \cdot 6 = 10.1 \text{ J}$ $v_{\text{FIN}} = \sqrt{\frac{2 E_K}{m}} = 14.6 \text{ m/s}$

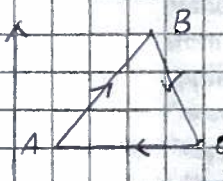
MODELO PROIETTILE velocità al culmine della rampa

$y = h - \frac{1}{2} g t^2$ $y(t^*) = 0 \Rightarrow t^* = \sqrt{2h/g}$
 $x = v_{\text{FIN}} \cdot t$ $x(t^*) = d = v_{\text{FIN}} \cdot t^* = v_{\text{FIN}} \sqrt{2h/g} = 18.6 \text{ m}$

3)  $\vec{R} = M \vec{\alpha}_{\text{CM}} \Rightarrow \vec{N} + \vec{A}_T + \vec{P} + \vec{F}_{\text{ext}} = M \vec{\alpha}_{\text{CM}}$ $x) -A - P \sin \theta + F_{\text{ext}} \cos \theta = M a$
 $\vec{M} = I_C \vec{\alpha}$ $\vec{r}_{P \times A} = I_C \vec{\alpha}$ $\Rightarrow R A = I_C \alpha$

PURO ROTOLAMENTO $\Rightarrow \theta = d \cdot R$ $-A - P \sin \theta + F_{\text{ext}} \cos \theta = M R d$
 $R A = I_C \alpha$

$F_{\text{ext}} = \frac{1}{5} M R d_0 + \frac{M g \sin \theta}{\cos \theta} = 5.8 \text{ N}$ RISOLVO IL SISTEMA (ELIMINO A) USO $I_C = \frac{2}{5} M R^2$

4)  $W_{\text{ciclo}} = \text{AREA TRIANGOLO} = (v_c - v_A)(p_B - p_A)/2 = 4 v_A p_A / 2 = 2 m R T A$

$Q_{\text{ASS}} = Q_{\text{AB}} = \Delta U_{\text{AB}} + W_{\text{AB}} = m c v (T_B - T_A) + \frac{1}{2} (p_A + p_B)(v_B - v_A) =$
 $= m c v \frac{p_B v_B - p_A v_A}{m R} + \frac{1}{2} (3 p_A)(3 v_A) = m c v \frac{4 p_A v_A}{m R} + \frac{9}{2} p_A v_A = 15 m R T A$ ASSORBITO

$\eta = \frac{W_{\text{ciclo}}}{Q_{\text{ASS}}} = \frac{2 m R T A}{15 m R T A} = \frac{2}{15} = 13.3 \%$ $Q_{BC} = \Delta U_{BC} + W_{BC} = 0 + (-3 m R T A) = -3 m R T A < 0$ CEDUTO

5) CICLO $\Delta S = 0 \Rightarrow \frac{Q_A}{T_A} + \frac{Q_B}{T_B} + \frac{Q_C}{T_C} = 0$ $Q_C = -T_C \left(\frac{Q_A}{T_A} + \frac{Q_B}{T_B} \right)$

$W_{\text{ciclo}} = Q_{\text{CICLO}} = Q_A + Q_B + Q_C = 1.045 \text{ J}$ $= -1.355 \text{ J}$

$\eta = \frac{W_{\text{ciclo}}}{Q_A + Q_B} = \frac{W_{\text{ciclo}}}{2.4} = \frac{1.045}{2.4} \approx 43.5 \%$