Solutions

2.1 Horizontal: $T_1 \sin 40° = T_2 \sin 60°$; vertical: $T_1 \cos 40° + T_2 \cos 60° = 50$. From the first, $T_2 = \frac{\sin 40°}{\sin 60°} T_1 = 0.742 T_1$; then $T_1(0.766 + 0.371) = 50$, so $T_1 = 44$ N and $T_2 = 33$ N (2 s.f.).

2.2 Along the slope: $mg \sin 25° = F$; perpendicular: $R = mg \cos 25°$. Limiting: $\mu = \frac{F}{R} = \tan 25° = 0.466$ (0.47).

2.3 Moments about the left support: $R_R(6) = 300(3) + 800(1)$, so $R_R = \frac{1700}{6} = 283$ N (280); vertically: $R_L = 1100 - 283 = 817$ N (820).

2.4 Moments about the pivot: $40g(2) = 30g\, d$, so $d = \frac{80}{30} = 2.7$ m ($\frac{8}{3}$ m).

3.1 Tilting about A (reaction at C zero): moments about A, $P(3a) = Wd$. Tilting about C (reaction at A zero): moments about C, $1.25P(a) = W(2a - d)$. Substituting $P = \frac{Wd}{3a}$ into the second: $1.25 \cdot \frac{Wd}{3a} \cdot a = W(2a - d)$, i.e. $\frac{1.25d}{3} = 2a - d$, so $1.25d = 6a - 3d$, $4.25d = 6a$, and $d = \frac{6a}{4.25} = \frac{24a}{17}$.

3.2 Moments about A: $R_C(3) = W(1.5) + 0.3W(4) = 1.5W + 1.2W = 2.7W$, so $R_C = 0.9W$. Total vertical: $R_A + R_C = W + 0.3W = 1.3W$, so $R_A = 0.4W$.

Local review guidance: two resolution equations (or moments about a killing pivot) with every force included; limiting friction only when the words license it; tilting answers as exact fractions with the pivot named per case. This is authored classroom guidance.