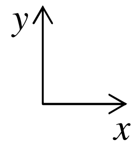
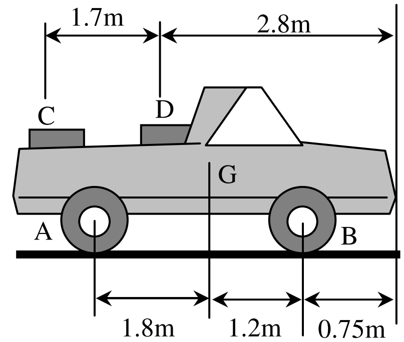
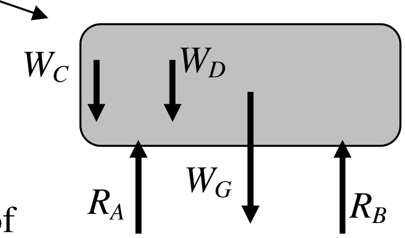
## Problem 4-1, page 167




Crates: $m_C = m_D = 350$ kg.
Truck: $m_G = 1400$ kg

Note that $W = mg$; $g = 9.81$ m/s$^2$.
FBD is everything above the ground




$\Sigma M_A = 0$

$+(W_C\, L_{ACx}) - (W_D\, L_{ADx}) - (W_G\, L_{AGx}) + (R_B\, L_{ABx}) = 0$

→ all are known except $R_B$

→ plug 'n' chug → = $R_B$ = 8469.3 N

Since there are two front tires, each tire holds a weight of

$\boxed{W_{\text{front}} = R_B/2 = 4.235 \text{ kN}}$

$\Sigma F_y = 0$

$-W_C - W_D - W_G + R_A + R_B = 0$ → only unknown is $R_A$ → $R_A$ = 12131.7 N;

$\boxed{W_{\text{back}} = R_A/2 = 6.066 \text{ kN}}$

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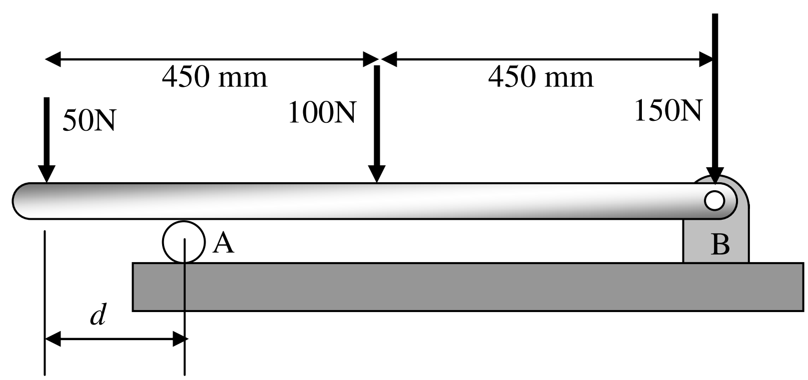
## Problem 4-13, page 168

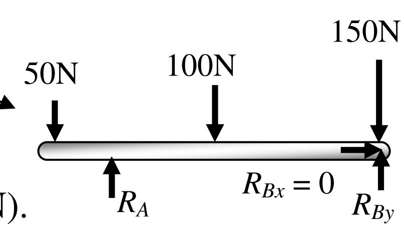



Given: $R_{\text{Amax}} = 180$N
$R_{\text{Bmax}} = 180$N

$\Sigma M_B = 0$
$+ (0.9\text{m})(50\text{N}) - (0.9\text{m} - d)(R_A)$
$+ (0.45\text{m})(100\text{N}) + 0 + 0 = 0$

→ $R_A = (90\text{N})/(0.9\text{m} - d)$ [1]

FBD is the bar



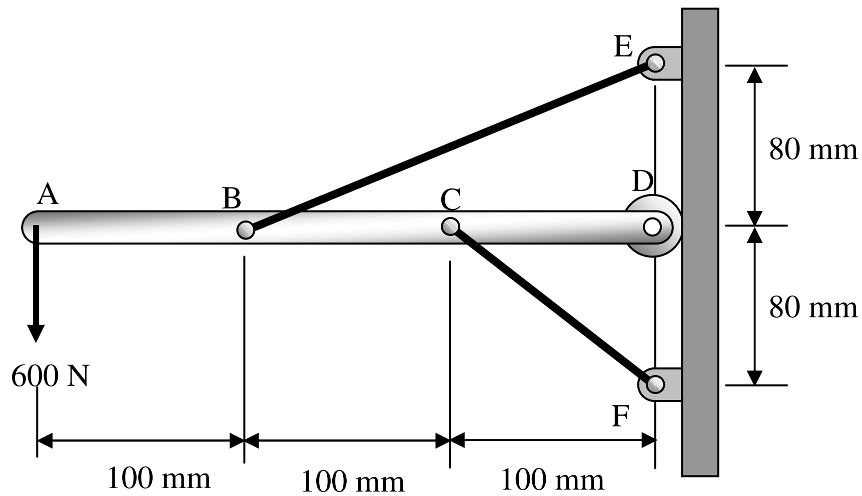

$\Sigma F_y = 0$
$-50\text{N} - 100\text{N} - 150\text{N} + R_A + R_B = 0$
→ $R_{By} = 300 - (90\text{N})/(0.9\text{m} - d)$ [2]

From [1], using $R_{\text{Amax}} = 180$N, $d_{\min} = 0.4$m (for this $d$, $R_{By} = 120$N).
From [2], using $R_{\text{Bmax}} = 180$N, $d_{\min} = 0.15$m. For this $d$, $R_A = 120$N.

If $d > 0.4$m, then $R_A > R_{\text{Amax}}$ (for example, if $d = 0.5$m, then $R_A = 225$N.
If $d < 0.15$m, then $R_{By} > R_{\text{Bmax}}$ (for example, if $d = 0.0$m, then $R_A = 200$N.

So, we require that $\boxed{0.15\text{m} \le d \le 0.4\text{m}}$

## Problem 4-35, page 172

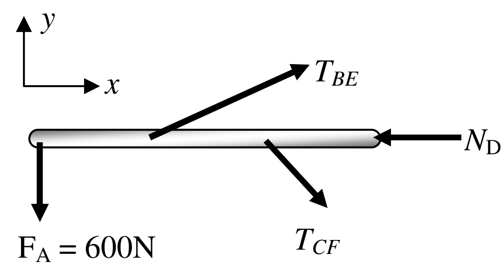


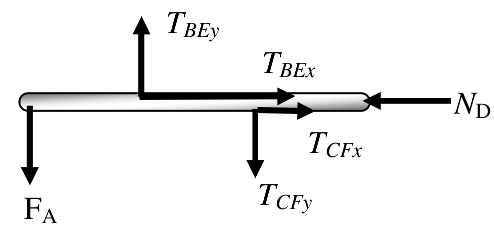

$L_{AB} = L_{BC} = L_{CD} = 100$ mm

$L_{BEx} = 200$ mm
$L_{BEy} = 80$ mm
$L_{BE} = 215.41$ mm

$L_{CFx} = 100$ mm
$L_{CFy} = 80$ mm
$L_{CF} = 128.06$ mm

My object is the horizontal beam:




I. $\Sigma M_C = 0$

$(+F_A)(L_{AC}) - (+T_{BEy})(L_{BC}) + 0 + 0 + 0 + 0 = 0$

Algebra →

$$\boxed{T_{BE} = \left(\frac{L_{BE}}{L_{BEy}}\right)\frac{F_A L_{AC}}{L_{BC}}} = \boxed{T_{BE} = 2131 \text{ N}}$$

II. $\Sigma F_y = 0$

$-F_A + T_{BEy} - T_{CFy} = 0$

$$-F_A + T_{BE}\frac{L_{BEy}}{L_{BE}} - T_{CF}\frac{L_{CFy}}{L_{CF}} = 0 \quad \text{algebra} \rightarrow \boxed{T_{CF} = 960.5 \text{ N}}$$

III. $\Sigma F_x = 0$

$-N_D + T_{BEx} + T_{CFx} = 0$

$$+T_{BE}\frac{L_{BEx}}{L_{BE}} + T_{CF}\frac{L_{CFx}}{L_{CF}} = N_D \quad \text{algebra} \rightarrow \boxed{N_D = 3750 \text{ N}}$$