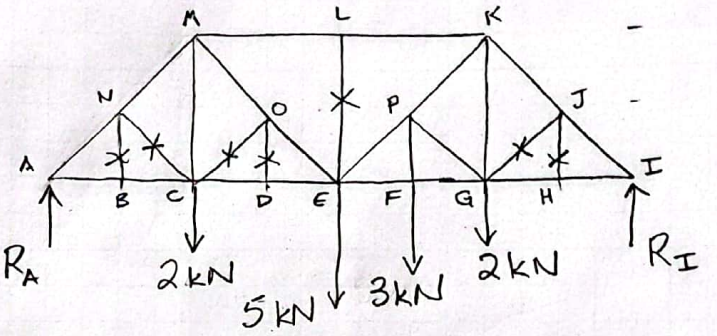
Truss Problem

FBD:

scale 2m

by inspection, all angles are either 90° or 45°



First, find reactions at A and I

$\circlearrowleft_A \Sigma M = \emptyset = R_I(16m) - 2kN(12m) - 3kN(10m) - 5kN(8m) - 2kN(4m) \Rightarrow R_I = 6.375\ kN$

$\circlearrowleft_I \Sigma M = \emptyset = 2kN(4m) + 3kN(6m) + 5kN(8m) + 2kN(12m) - R_A(16m) \Rightarrow R_A = 5.625\ kN$

Check: $\Sigma F_y = 6.375\ kN + 5.625\ kN - 2\ kN - 5\ kN - 3\ kN - 2kN = \emptyset$ ✓

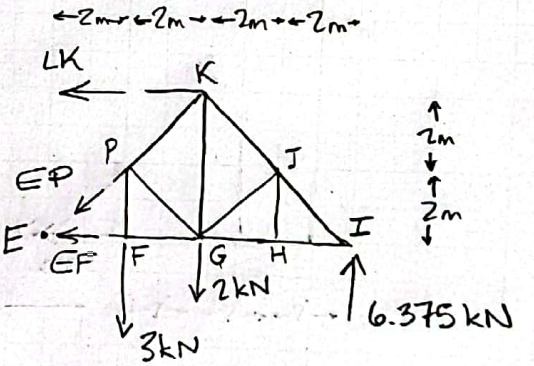
Next, identify zero-force members (x on FBD)

by inspection $\boxed{EL = \emptyset,\ BN = \emptyset,\ DO = \emptyset,\ HJ = \emptyset}$

once these are identified, several more become apparent: $\boxed{CN = \emptyset,\ CO = \emptyset,\ GJ = \emptyset}$

Use Method of Sections

FBD:



(all angles 90° or 45°)

$\Sigma F_y = \emptyset$

$= 6.375\ kN - 3kN - 2kN - EP \sin 45°$

$\Rightarrow \boxed{EP = 1.94\ kN}$

$\circlearrowleft_E \Sigma M = \emptyset$

$= 6.375kN(8m) - 2kN(4m) - 3kN(2m) + LK(4m)$

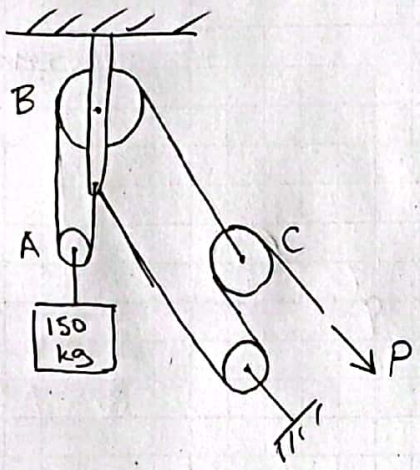
$\Rightarrow \boxed{LK = -9.25\ kN}$

$\Sigma F_x = \emptyset$

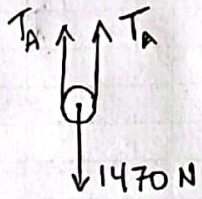
$= -EF - (-9.25\ kN) - 1.94\ kN \sin 45°$

$\Rightarrow \boxed{EF = 7.88\ kN}$

Second Problem



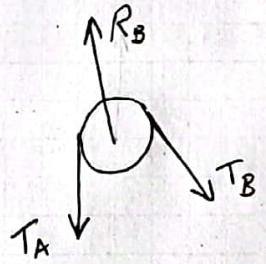
$w = (150\ kg)(9.8\ m/s^2)$
$= 1470\ N$



FBD of Pulley A:

$\Sigma F_y = \emptyset = 2T_A - 1470\ kN$

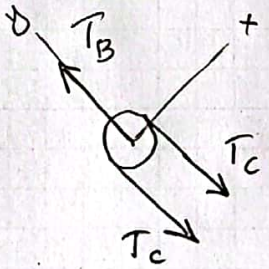
$\Rightarrow T_A = 735\ N$



FBD of Pulley B:

$T_A = T_B$ (frictionless pulley)

$\Rightarrow T_B = 735\ N$



FBD of Pulley C:

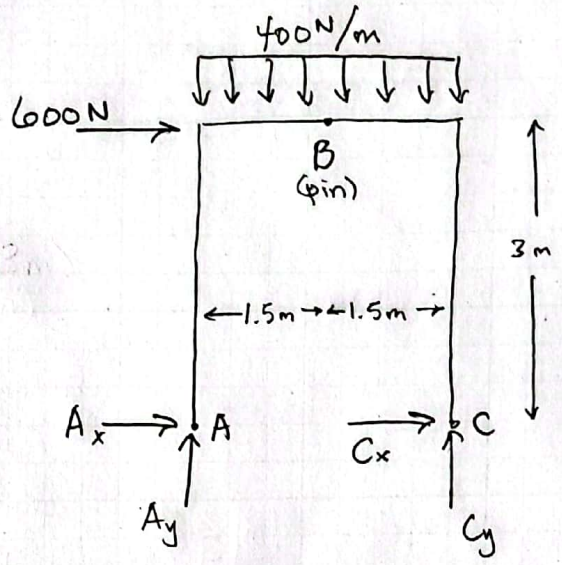
$\Sigma F_y = \emptyset = T_B - 2T_C$

$\Rightarrow T_C = 368\ N$

$\Rightarrow P = T_C = \boxed{368\ N}$

Third Problem

Overall FBD:

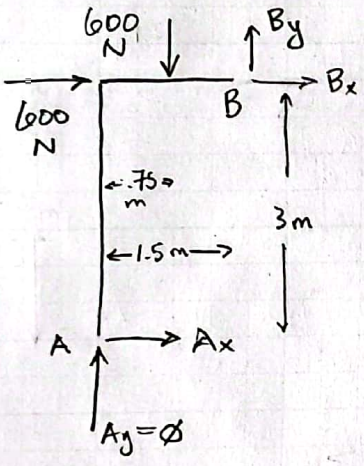


$\circlearrowleft_A \quad \Sigma M = \emptyset = C_y(3m) + 600N(3m) - 400N/m(3m)(1.5m)$

$\Rightarrow \boxed{C_y = 1200\,N}$

$\circlearrowleft_C \quad \Sigma M = \emptyset = A_y(3m) - 600N(3m) + 400N/m(3m)(1.5m)$

$\Rightarrow \boxed{A_y = \emptyset}$



$(400\,N/m)(1.5m) = 600N$

$\Sigma F_y = \emptyset = \cancel{A_y}^{\,\emptyset} + B_y - 600N$

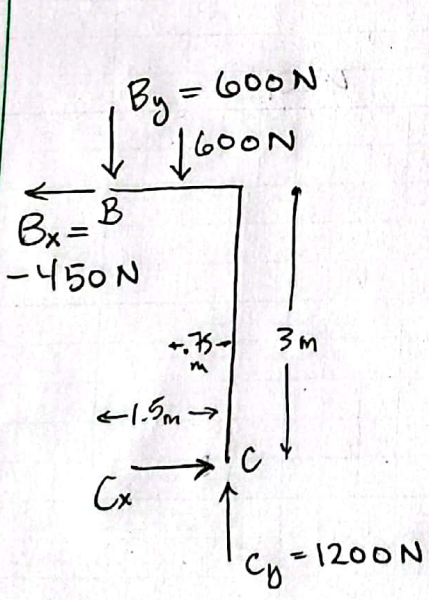
$\Rightarrow B_y = 600N$

$\circlearrowleft_A \quad \Sigma M = \emptyset = B_y(1.5m) - 600N(0.75m) - 600N(3m) - B_x(3m)$

$\Rightarrow B_x = -450\,N$

$\circlearrowleft_B \quad \Sigma M = \emptyset = 600N(0.75m) - \cancel{A_y(3m)}^{\,\emptyset} + A_x(3m)$

$\Rightarrow \boxed{A_x = -150\,N}$



$\Sigma F_x = \emptyset = C_x - R$

$\Rightarrow \boxed{C_x = -450\,N}$

check: $\circlearrowleft_B \quad \Sigma M = 1200\,N(1.5m) + (-450N)(3m) - (600N)(0.75m) = \emptyset$ ✓