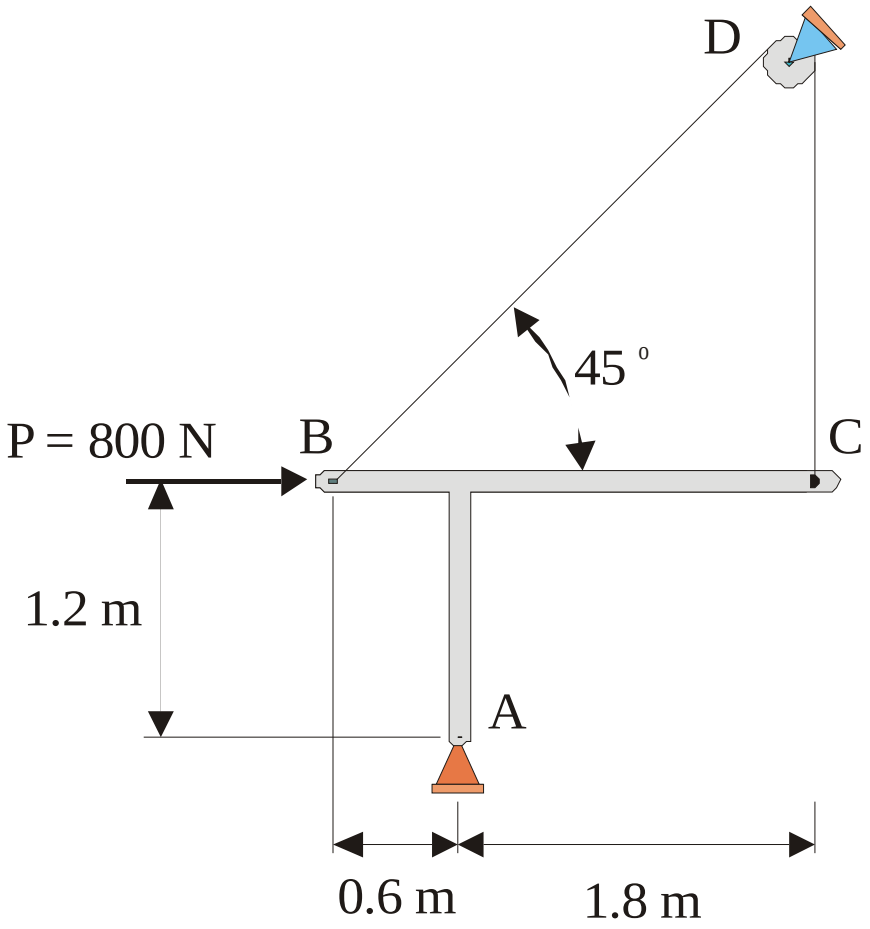
Example 3.11

J. Frye

Determine the tension in the cable BDC and the reaction at A. (Neglect the radius of the pulley.)



For FBDs of rigid bodies involving cables, we **"CUT"** the cables and indicate a tension force, **T**, directed from the point of attachment to the rigid body toward the centre of the cable as shown in Figure (b) below.

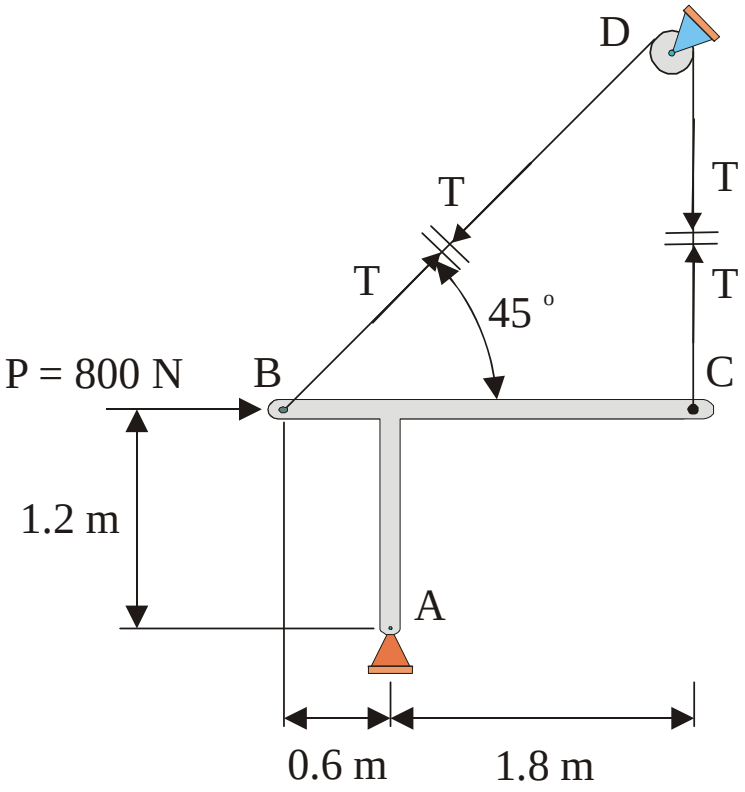


Figure (a)

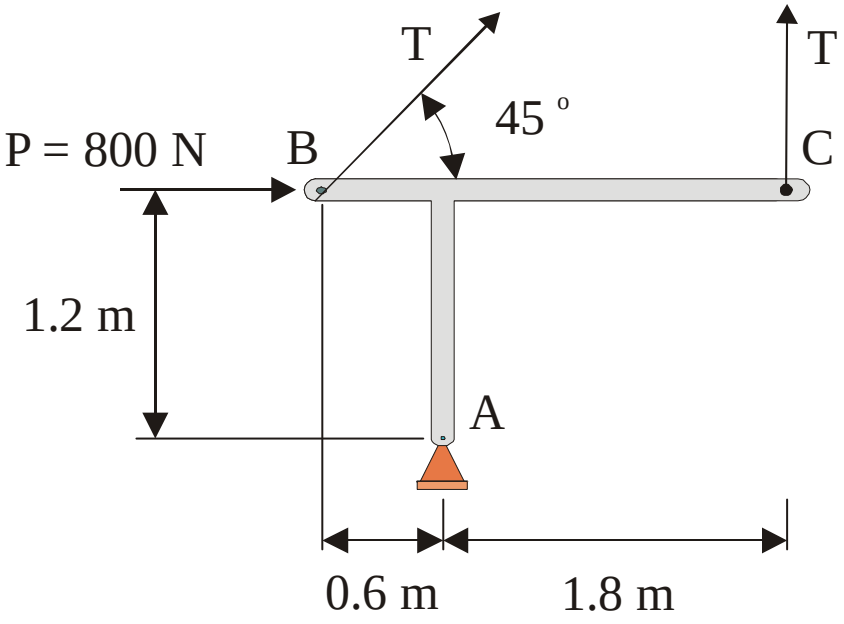
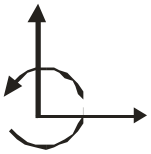
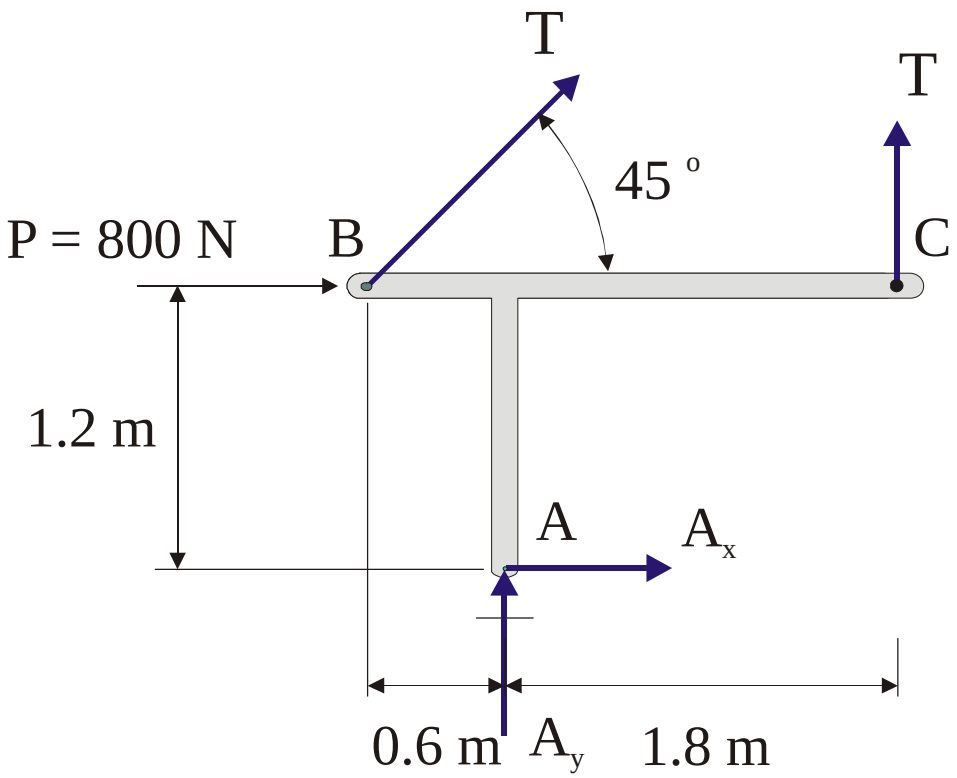


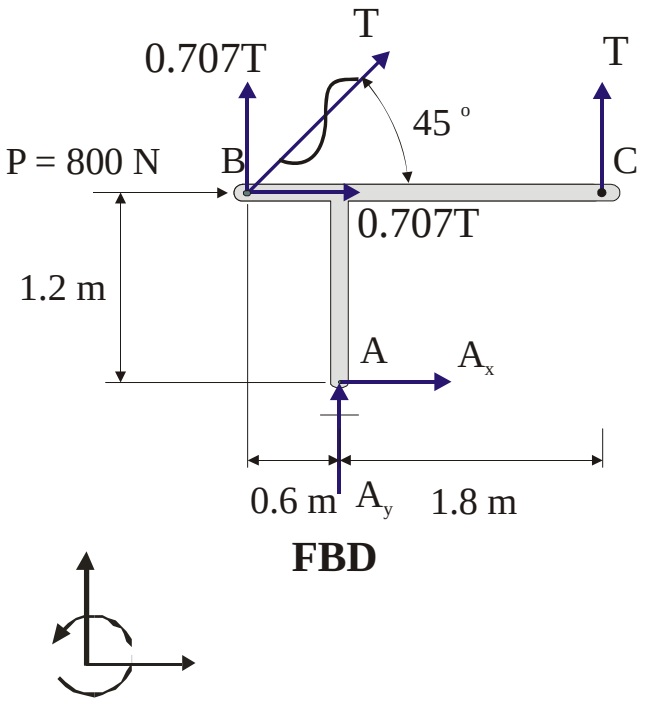
Figure (b)

We Draw the FBD!!!!





FBD



FBD

$$\sum F_x = 0 \rightarrow$$

$$800 + 0.707T + A_x = 0 \quad (1)$$

$$\sum F_y = 0 \uparrow$$

$$0.707T + A_y + T = 0 \quad (2)$$

$$\sum M_A = 0$$

$$-0.707T(0.6) - 0.707T(1.2) + T(1.8) - 800(1.2) = 0 \quad (3)$$

$$0.574T = 960$$

$T = +1820.3\text{N}$ (Direction of T in FBD is assumed correctly)

Substitute in (1):

$$800 + 0.707(1820.3) + A_x = 0$$

$A_x = -2086.92\text{N}$ (Direction of A_x in FBD is assumed incorrectly)

$\therefore \mathbf{A_x} = 2086.92\text{N} \leftarrow$

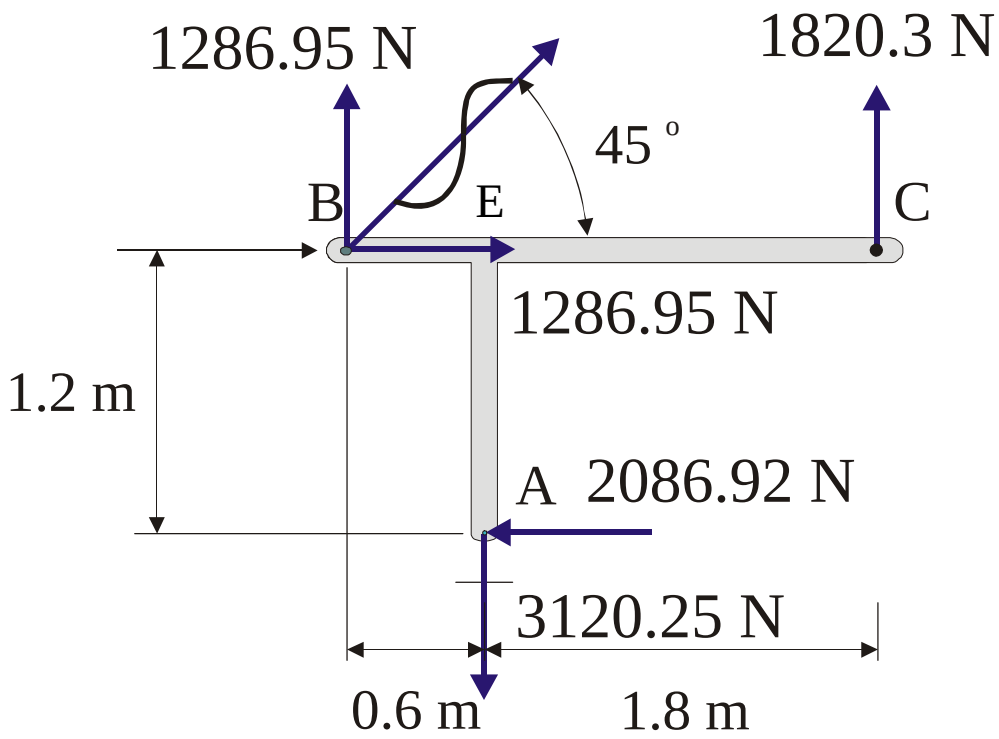
Sibstitute in (2):

$$0.707(1820.3) + A_y + 1820.3 = 0$$

$A_y = -3107.25\text{N}$ (Direction of A_y in FBD is assumed incorrectly)

$\therefore \mathbf{A_y} = 3107.25\text{N} \downarrow$

CHECK – We take moments about E



FBD

$$\sum M_E = 0 \quad \circlearrowleft$$

$$-1286.95(0.6) - 2086.92(1.2) + 1820.3(1.8) = 0$$

$$0.066 \approx 0$$