The T-shaped bracket shown is supported by a small wheel at \( E \) and pegs at \( C \) and \( D \). Neglecting the effect of friction, determine the reactions at \( C \), \( D \), and \( E \) when \( \theta = 30^\circ \).

1. Draw a free-body diagram of the body. This diagram shows the body and all the forces acting on it.
2. Write equilibrium equations and solve for the unknowns.
For two-dimensional structure the three equations might be:
\[ \sum F_x = 0 \quad \sum F_y = 0 \quad \sum M_O = 0 \]
where \( O \) is an arbitrary point in the plane of the structure
or
\[ \sum F_x = 0 \quad \sum M_A = 0 \quad \sum M_B = 0 \]
where point \( B \) is such that line \( AB \) is not parallel to the \( y \) axis
or
\[ \sum M_A = 0 \quad \sum M_B = 0 \quad \sum M_C = 0 \]
where the points \( A, B, \) and \( C \) do not lie in a straight line.
Write equilibrium equations and solve for the unknowns.

\[ \sum F_y = 0: \quad E \cos 30^\circ - 20 - 40 = 0 \]

\[ E = \frac{60 \text{ lb}}{\cos 30^\circ} = 69.28 \text{ lb} \]

\[ E = 69.3 \text{ lb} \Delta 60^\circ \]

\[ \sum M_D = 0: \]

\[ (20 \text{ lb})(4 \text{ in}) - (40 \text{ lb})(4 \text{ in}) - C(3 \text{ in}) + E \sin 30^\circ (3 \text{ in}) = 0 \]

\[ -80 - 3C + 69.28(0.5)(3) = 0 \]

\[ C = 7.974 \text{ lb} \]

\[ C = 7.97 \text{ lb} \rightarrow \]
\[ \sum F_x = 0: \]

\[ E \sin 30^\circ + C - D = 0 \]

\[ (69.28 \text{ lb})(0.5) + 7.974 \text{ lb} - D = 0 \]

\[ D = 42.6 \text{ lb} \]