Example 2.8

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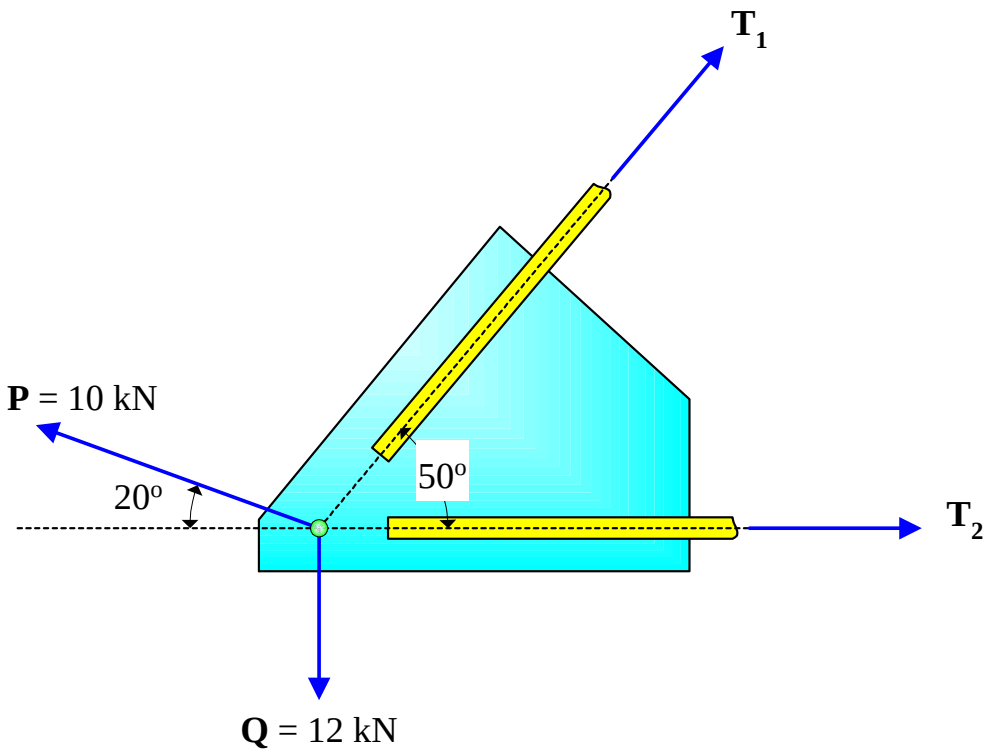
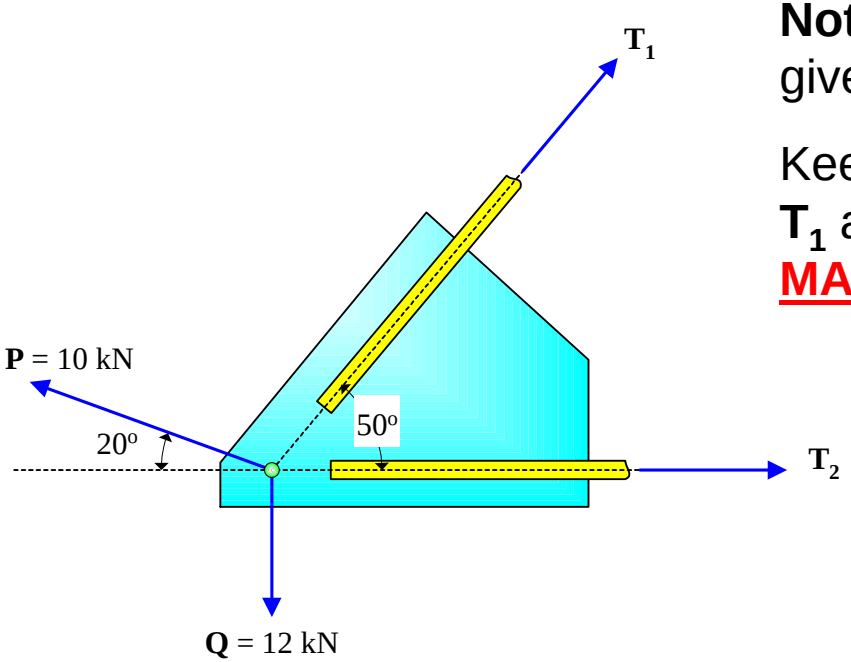
Two forces **P** and **Q** of magnitude 10 kN and 12 kN respectively are applied to the truss connection as shown. Knowing that the connection is in equilibrium and given the Free Body Diagram (FBD) as shown, determine the forces $\mathbf{T_1}$ and $\mathbf{T_2}$.





Note: In this problem you are given a FBD to start.

Keep in mind that the senses of $\mathbf{T_1}$ and $\mathbf{T_2}$ are assumed. (They **MAY BE INCORRECT!!!!**

$$\sum F_x = 0 \rightarrow$$

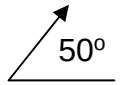
$$T_2 + T_1 \cos 50^o - 10 \cos 20^o = 0 \qquad (1)$$

$$\sum F_y = 0 \uparrow$$

$$T_1 \sin 50^o + 10 \sin 20^o - 12 = 0 \qquad (2)$$

$$0.766 T_1 = 8.58$$

From(2)

$$T_1 = \frac{8.58}{0.766} = +11.2\text{kN}$$ 

$\therefore$ Direction of T_1 in the FBD assumed correctly!

$\therefore \mathbf{T_1} = 11.2\text{kN}$

Substitute in (2):

$$T_2 + (+11.2)\text{Cos}50^o = 9.397$$

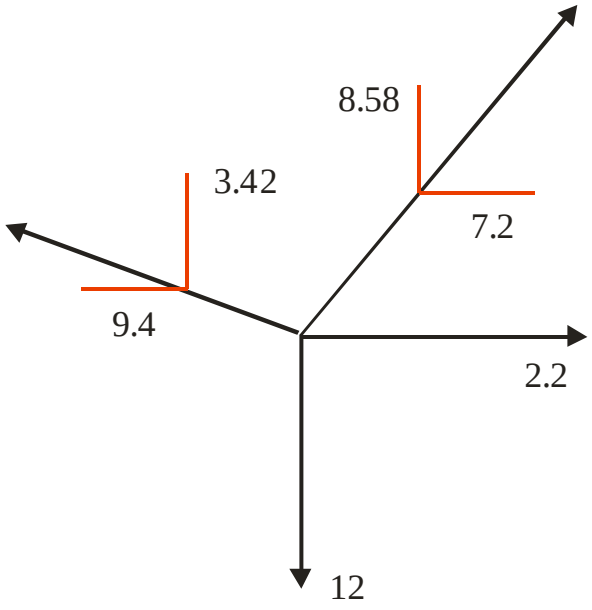
$$T_2 = +2.2\text{kN}$$

$\therefore$ Direction of T_2 in the FBD assumed correctly!

$\therefore \mathbf{T_2} = 2.2\text{kN} \rightarrow$

A positive sign indicates your original assumption of the sense was CORRECT!!!

RECOMMENDED: Resolve all “sloping” forces into their horizontal and vertical components and check equilibrium.



$$\sum F_x = 0 \rightarrow$$

$$-9.4 + 7.2 + 2.2 = 0$$

$$0 = 0$$

$$\sum F_y = 0 \uparrow$$

$$3.42 + 8.58 - 12 = 0$$

$$0 = 0$$

WE ARE CORRECT!!!!!!!!