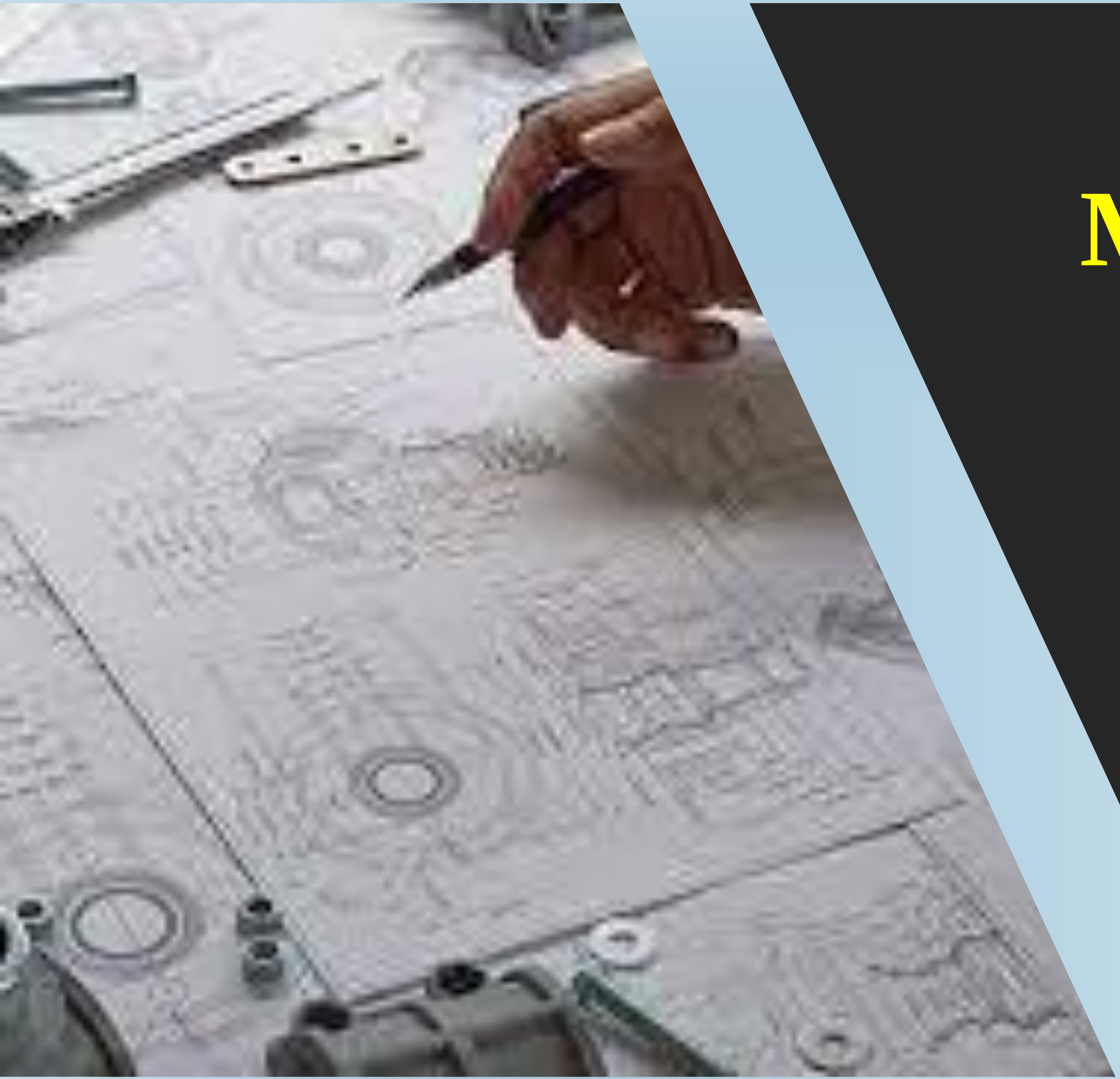


# MECHANICS

## Lecture No.6

د. محمد سعد

# Determine the reaction A and B in the fig.1.

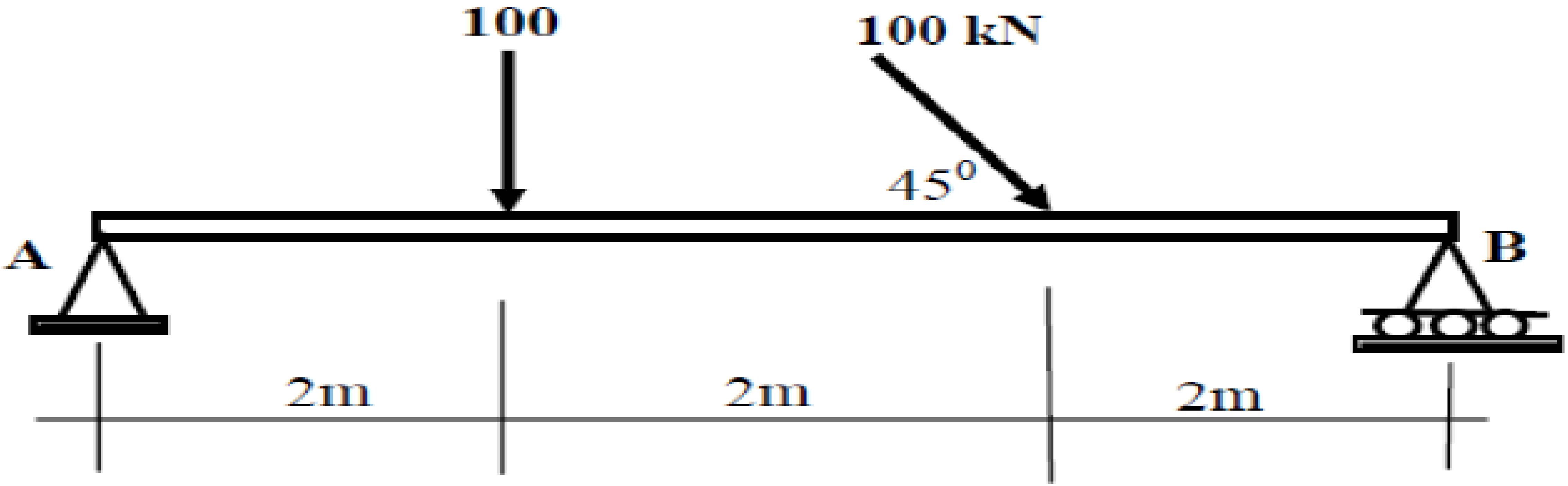
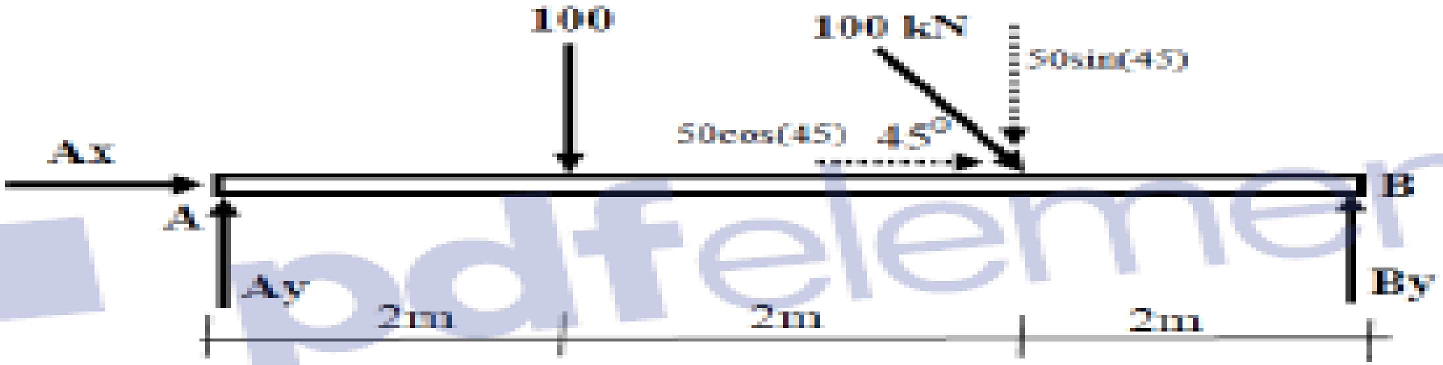



fig. 1




$$\sum F_x = 0$$

$$Ax = -100\ cos45$$

$$Ax = -70.7\ Kn$$

$$\sum M_A = 0$$

$$100 * 2 + 100\ SIN45 * 4 - By * 6 = 0$$

$$By = 80.47\ Kn$$

$$\sum F_y = 0$$

$$-100\ - 100\ sin45\ +\ 80.47 + Ay =\ 0$$

$$Ay =\ 90.24\ Kn$$

Find the reaction A and B and the 50 kN weight body C in the fig.2.

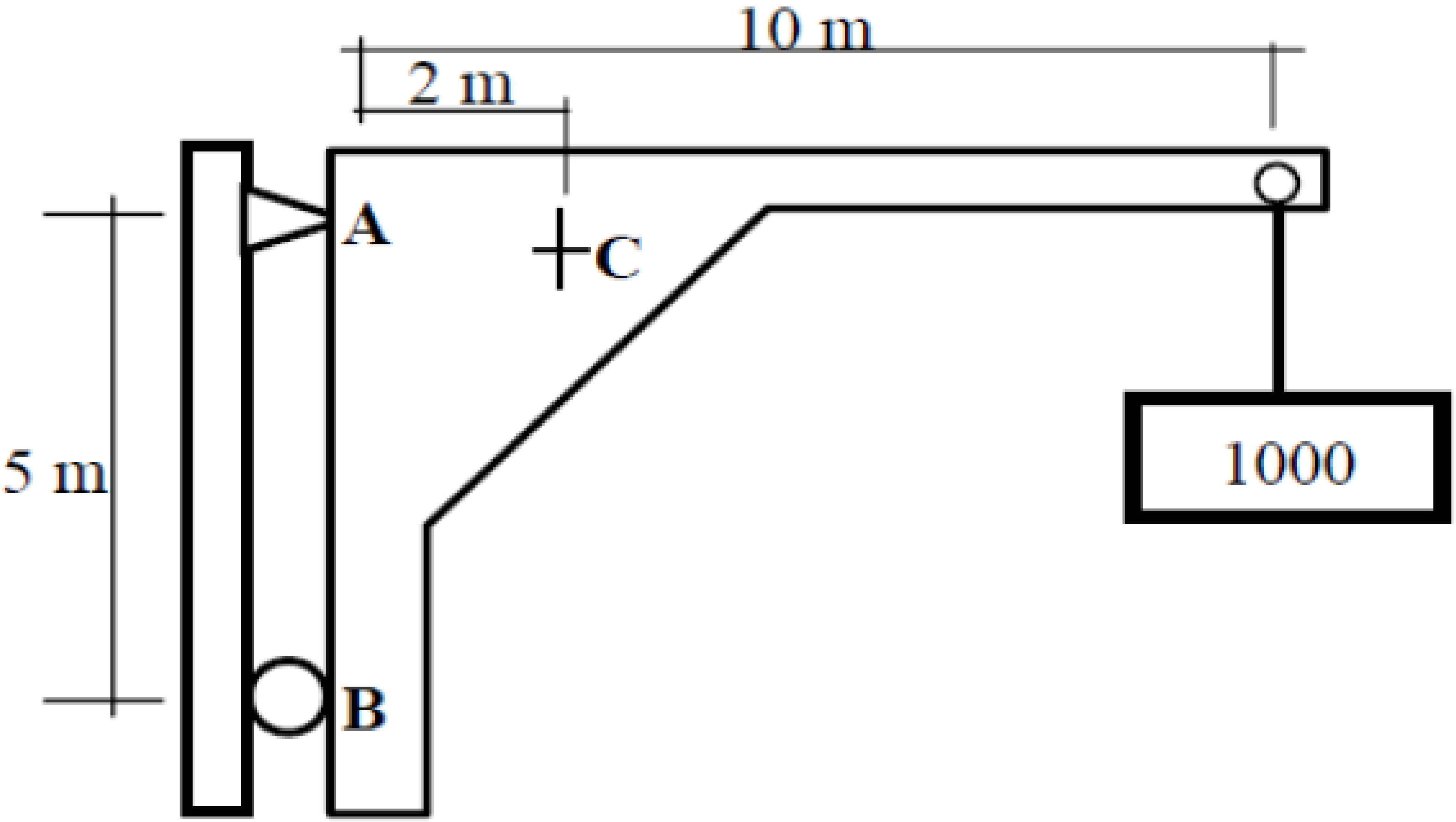
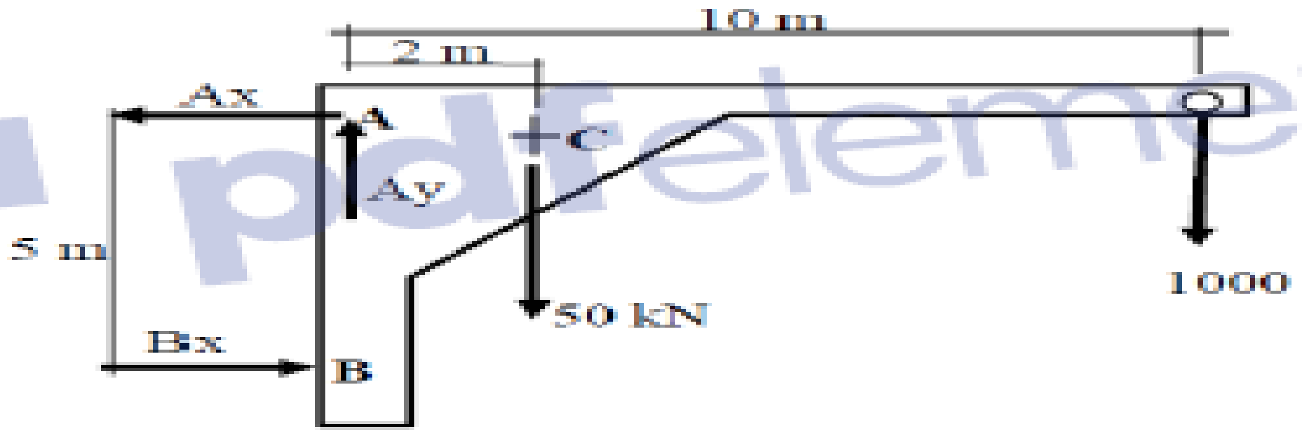



fig. 2

# Find the reaction A and B and the 50 kN weight body C in the fig.2.




$$\sum F_y = 0$$

$$Ay - 50 - 1000 = 0$$

$$Ay = 1050\ Kn$$

$$\sum M_A = 0$$

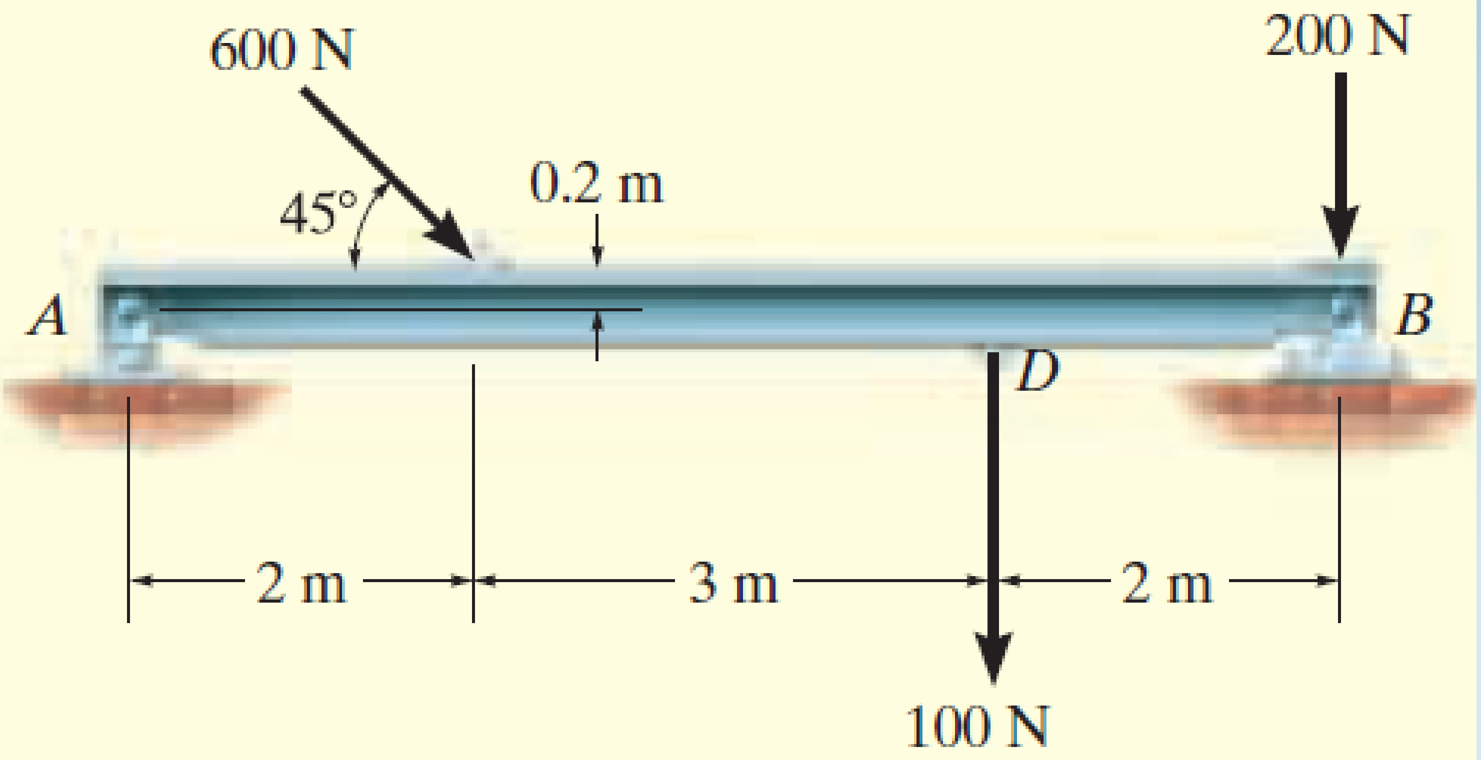
$$50 * 2 + 1000 * 10 - By * 5 = 0$$

$$By = 2020\ Kn$$

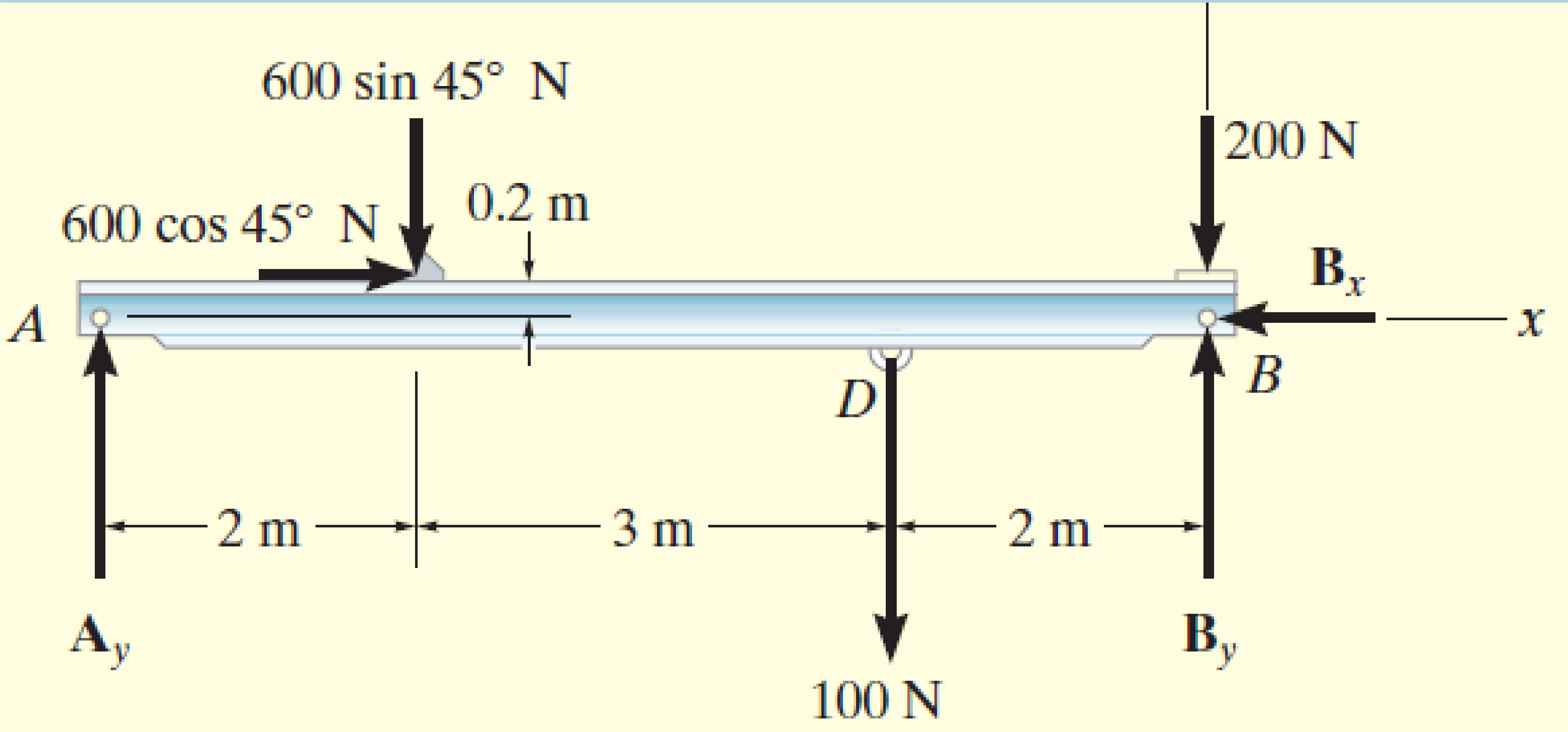
$$\sum F_x = 0$$

$$Ax = Bx = 2020\ kn$$

Determine the horizontal and vertical components of reaction on the beam caused by the pin at *B* and the rocker at *A* as shown in Fig. below. Neglect the weight of the beam.




(a)



(b)

**Equations of Equilibrium.** Summing forces in the $x$ direction yields

$$\xrightarrow{+} \Sigma F_x = 0; \qquad 600 \cos 45^\circ \text{ N} - B_x = 0$$

$$B_x = 424 \text{ N} \qquad \textit{Ans.}$$

A direct solution for $\mathbf{A}_y$ can be obtained by applying the moment equation $\Sigma M_B = 0$ about point $B$.

$$\circlearrowleft + \Sigma M_B = 0; \qquad 100 \text{ N}(2 \text{ m}) + (600 \sin 45^\circ \text{ N})(5 \text{ m})$$

$$- (600 \cos 45^\circ \text{ N})(0.2 \text{ m}) - A_y(7 \text{ m}) = 0$$

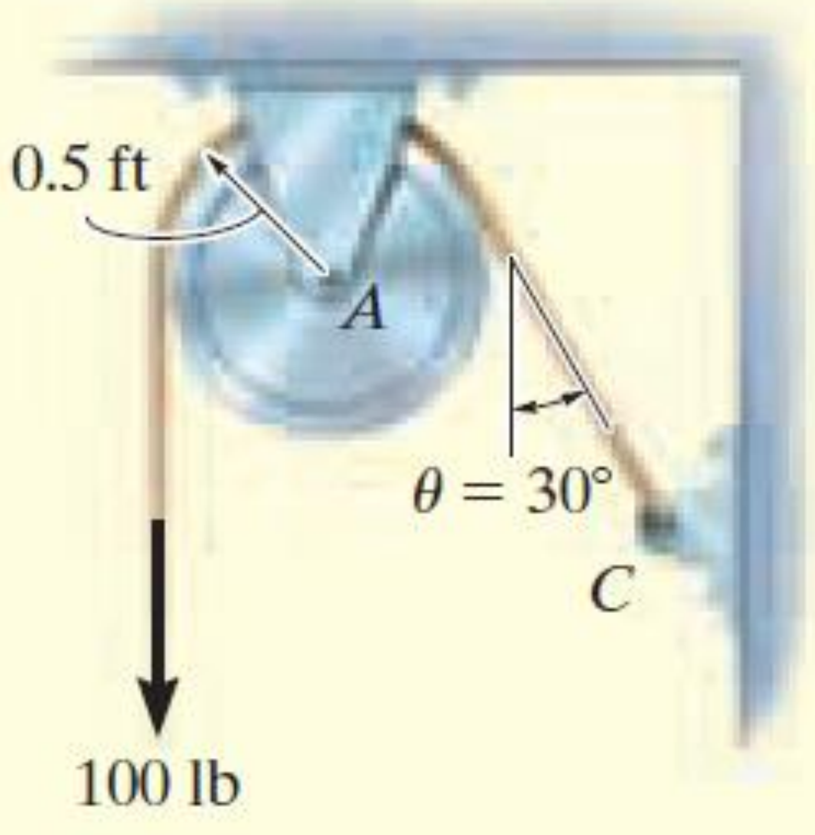
$$A_y = 319 \text{ N} \qquad \textit{Ans.}$$

Summing forces in the $y$ direction, using this result, gives

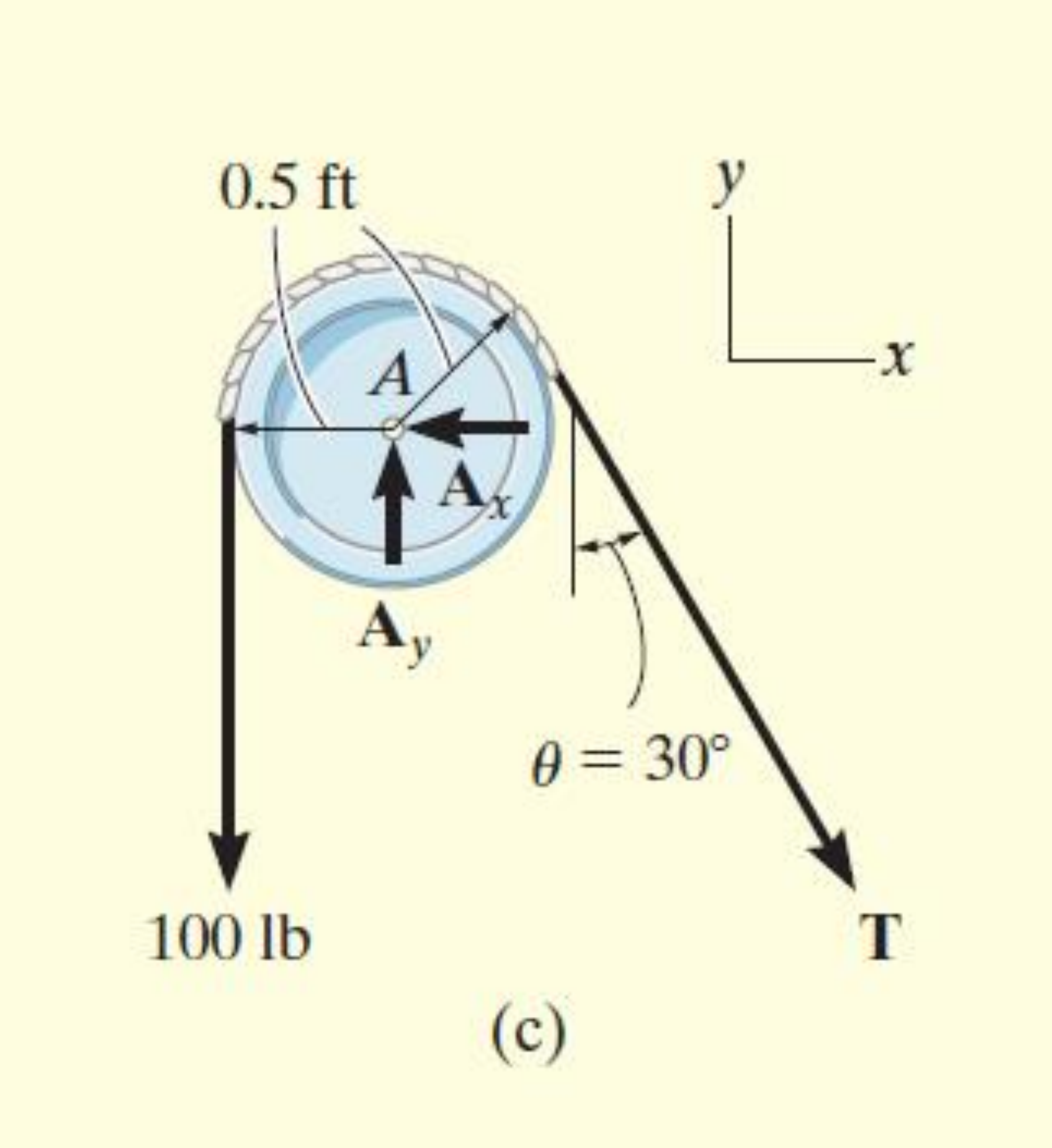
$$+\uparrow \Sigma F_y = 0; \qquad 319 \text{ N} - 600 \sin 45^\circ \text{ N} - 100 \text{ N} - 200 \text{ N} + B_y = 0$$

$$B_y = 405 \text{ N} \qquad \textit{Ans.}$$

The cord shown in Fig. below supports a force of 100 lb and wraps over the frictionless pulley. Determine the tension in the cord at *C* and the horizontal and vertical components of reaction at pin *A*.




(a)


0.5 ft
y
x
A
$\mathbf{A}_x$
$\mathbf{A}_y$
$\theta = 30°$
100 lb
T
(c)

**Equations of Equilibrium.** Summing moments about point $A$ to eliminate $\mathbf{A}_x$ and $\mathbf{A}_y$, Fig. 5–13$c$, we have

$$\circlearrowleft + \Sigma M_A = 0; \qquad 100 \text{ lb } (0.5 \text{ ft}) - T(0.5 \text{ ft}) = 0$$

$$T = 100 \text{ lb} \qquad \textit{Ans.}$$

Using this result,

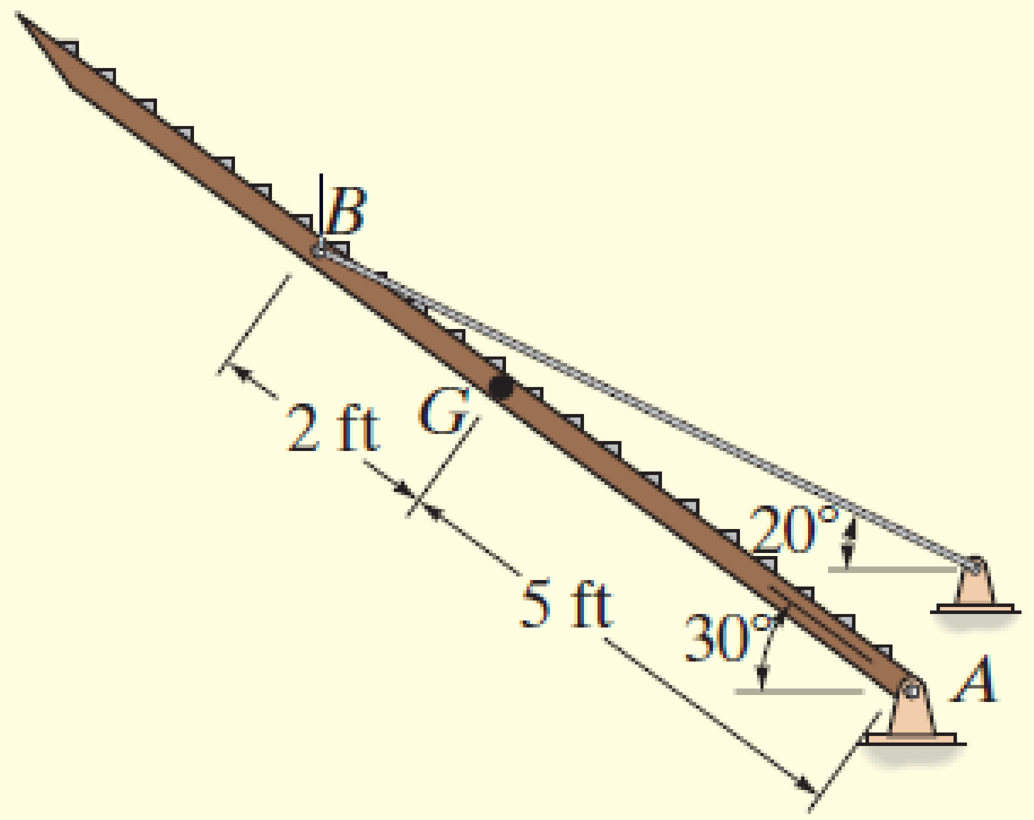
$$\overset{+}{\rightarrow} \Sigma F_x = 0; \qquad -A_x + 100 \sin 30^\circ \text{ lb} = 0$$

$$A_x = 50.0 \text{ lb} \qquad \textit{Ans.}$$

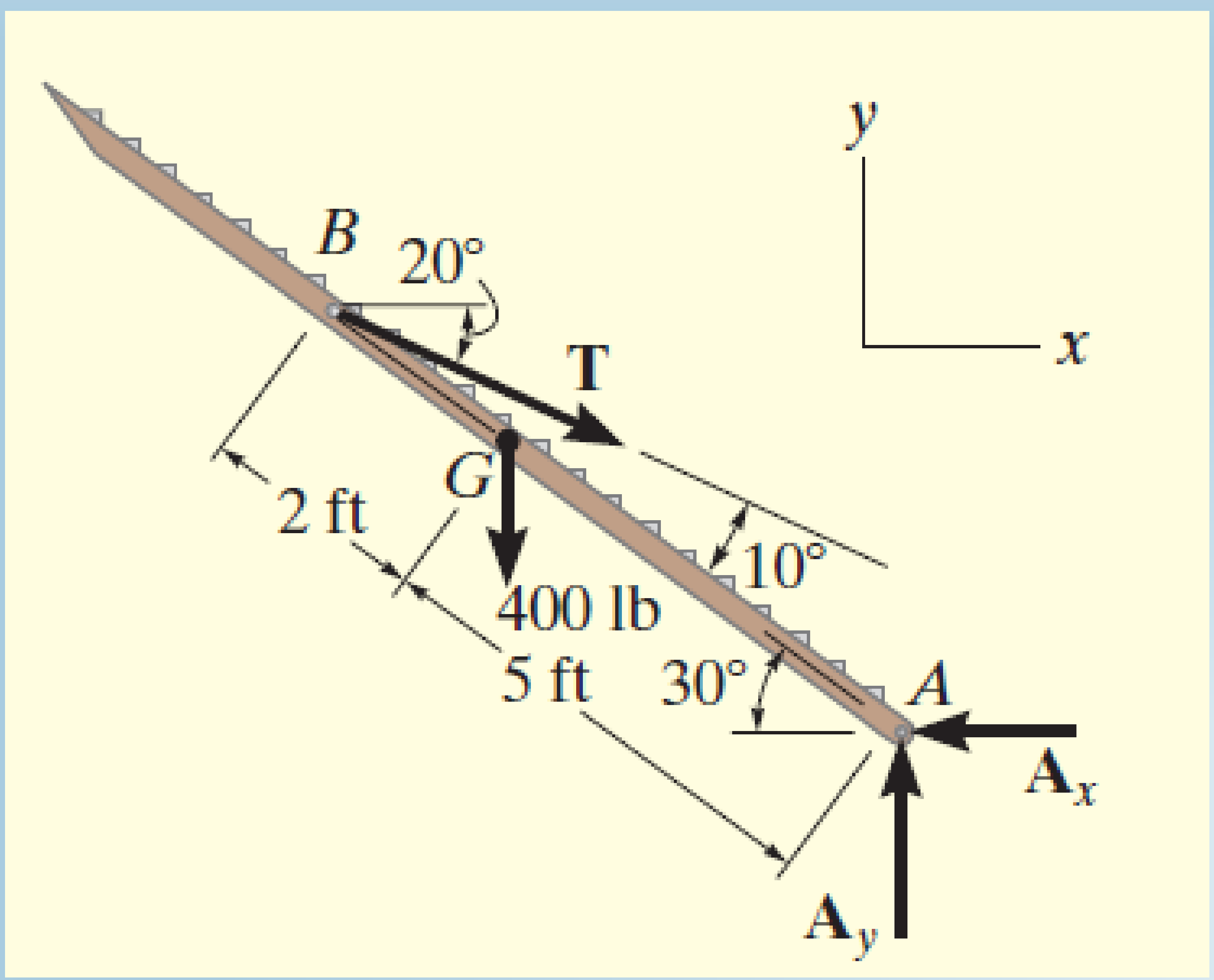
$$+\uparrow \Sigma F_y = 0; \qquad A_y - 100 \text{ lb} - 100 \cos 30^\circ \text{ lb} = 0$$

$$A_y = 187 \text{ lb} \qquad \textit{Ans.}$$

The uniform truck ramp shown in Fig. below has a weight of 400 lb and is pinned to the body of the truck at each side and held in the position shown by the two side cables. Determine the tension in the cables.



(b)



B
20°
T
y
x
G
2 ft
10°
400 lb
5 ft
30°
A
$\mathbf{A}_x$
$\mathbf{A}_y$

$$\circlearrowleft +\Sigma M_A = 0; \qquad -T\cos 20°(7\sin 30° \text{ ft}) + T\sin 20°(7\cos 30° \text{ ft})$$

$$+ 400 \text{ lb } (5\cos 30° \text{ ft}) = 0$$

$$T = 1425 \text{ lb}$$

We can also determine the moment of **T** about *A* by resolving it into components along and perpendicular to the ramp at *B*. Then the moment of the component along the ramp will be zero about *A*, so that

$$\circlearrowleft +\Sigma M_A = 0; \qquad -T\sin 10°(7 \text{ ft}) + 400 \text{ lb } (5\cos 30° \text{ ft}) = 0$$

$$T = 1425 \text{ lb}$$

Since there are two cables supporting the ramp,

$$T' = \frac{T}{2} = 712 \text{ lb} \qquad \textit{Ans.}$$

# Thank you for listening