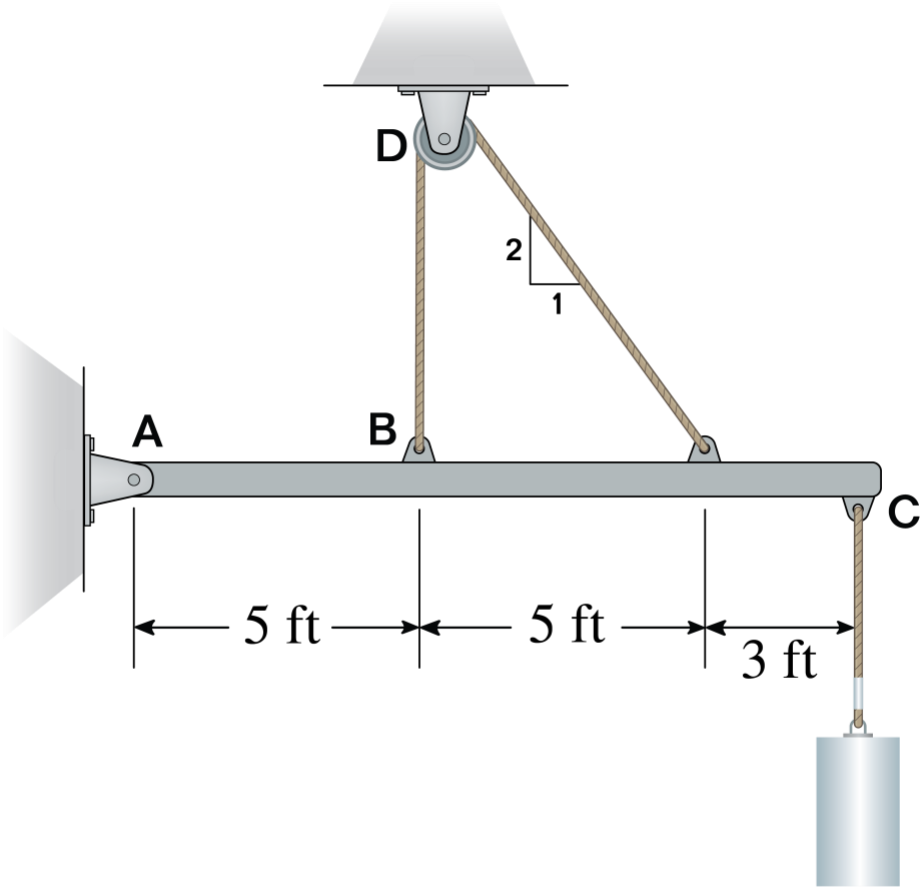
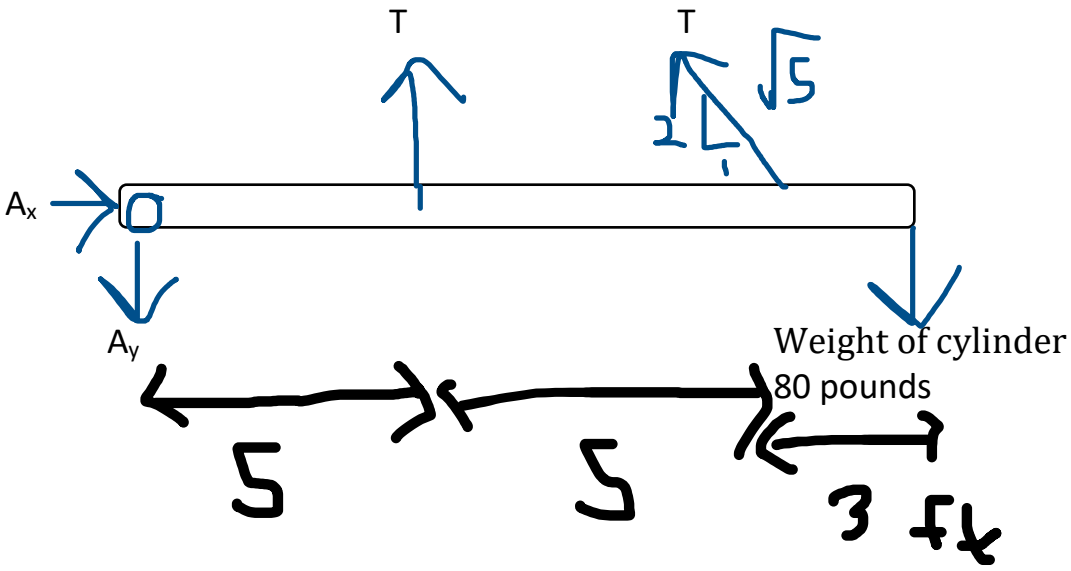
Chapter 5 Equilibrium

What is the tension in the cable?
What are the horizontal and vertical components of the reaction at pin A?

The system is in equilibrium.
The pulley at D is frictionless.
Ignore the mass and thickness of the beam.
You must draw a clear free body or force diagram for full marks.



d1 = 5.00 feet
d2 = 5.00 ft
d3 = 3.00 ft
The suspended cylinder weight is 80.0 lb



The tension in the cable is the same through the whole cable, so the tension at B is the same as tension where it attaches to the beam. So the tension can be found by summing the moments around A.

Sum of the moments around A = 0

$+\Sigma\ M_A = 0$ lb-ft

$$T(5) + T\left(\frac{2}{\sqrt{5}}\right)(10) - 80(13) = 0$$

T = 74.583 lb = 74.6 lb

Sum of the forces in the horizontal or x direction is zero.

$\rightarrow +\Sigma\ F_x = 0$ lb

$$A_x - T\left(\frac{1}{\sqrt{5}}\right) = 0$$

$A_x - 74.583(1/5^{0.5}) = 0$

A_x = 33.4 lb

Sum of the forces in the vertical or y direction is zero.

Up is positive

Assume that the reaction force at A is down. If the guess is wrong then you will get a negative number.

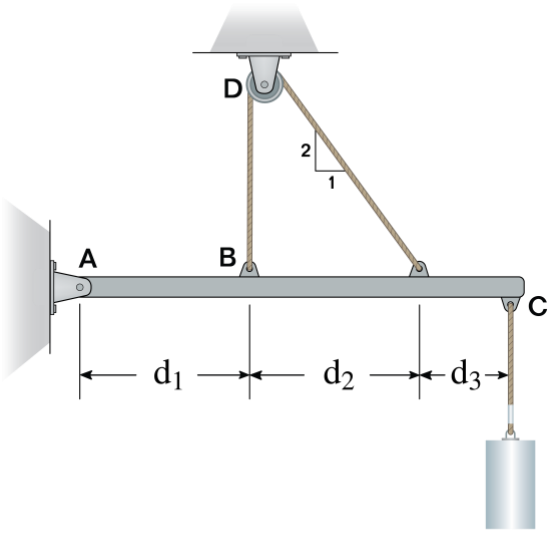
$+\uparrow \Sigma F_y = 0$ lb

T + T $(2/5^{0.5})$ – (weight of cylinder) $-A_y = 0$

$$T - T\left(\frac{2}{\sqrt{5}}\right) - 80 - A_y = 0$$

A_y = 61.3 lb

Similar to Problem 5-16 from H
Solution by Jennifer Kirkey, Douglas College, November 2021. CC0
Image from UBC MECH OER



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