Georgia Institute of Technology

Introduction to Engineering Mechanics

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This course is an introduction to learning and applying the principles required to solve engineering mechanics problems.

Module 4 Learning Outcomes

- Express a three-dimensional (3D) force in terms of rectangular components.
- Make use of the dot product to find the projection of a force vector

3D Force Representation

1. Determine the position vector

   "Walk" from TAIL to HEAD to find $\overline{AB}$

2. Determine the unit vector along the position vector

$$\hat{e}_{AB} = \frac{\overline{AB}}{\left|\overline{AB}\right|}$$

3. Determine the force vector

$$\overline{F}_{AB} = \left|F\right|\hat{e}_{AB}$$

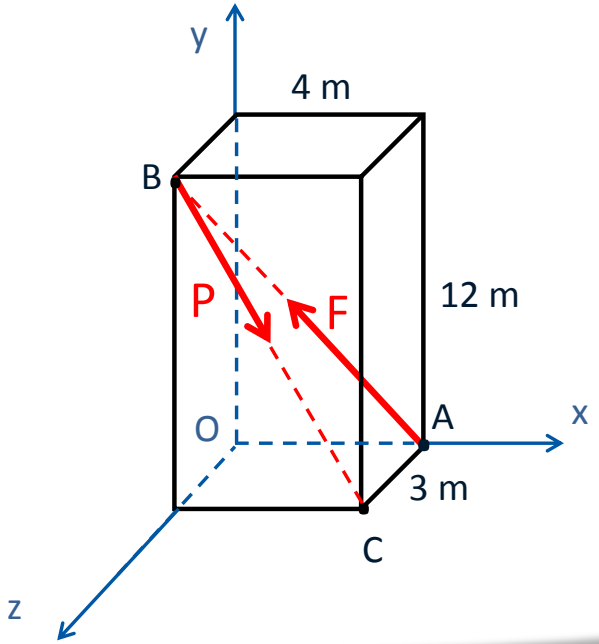
Worksheet – 3D Forces

Given:

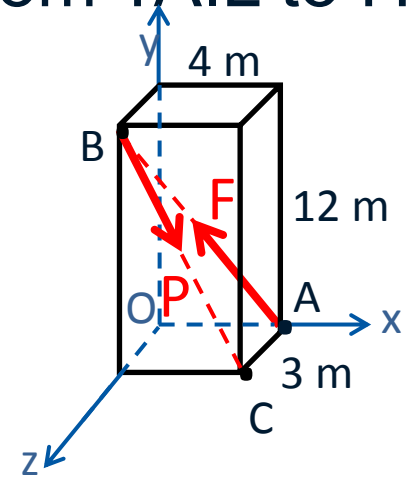
$|F|$ = 260 N

$|P|$ = 100 N

Find the resultant of the two forces $\overline{F}$ *and* $\overline{P}$

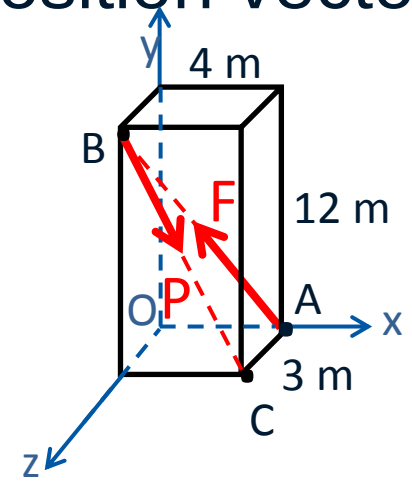


1. Determine the position vector “Walk” from TAIL to HEAD



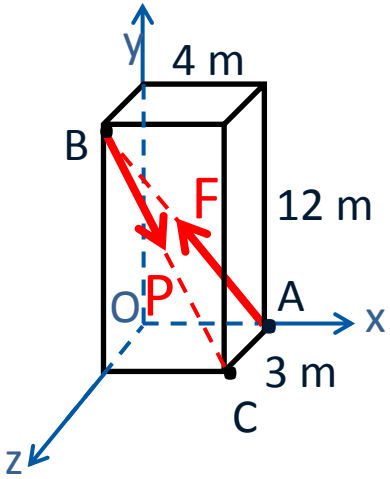
2. Determine the unit vector along the position vector

$$\overline{AB} = -4\hat{i} + 12\,\hat{j} + 3\hat{k}$$



3. Determine the force vector

$$\hat{e}_{AB} = -\frac{4}{13}\hat{i} + \frac{12}{13}\hat{j} + \frac{3}{13}\hat{k}$$



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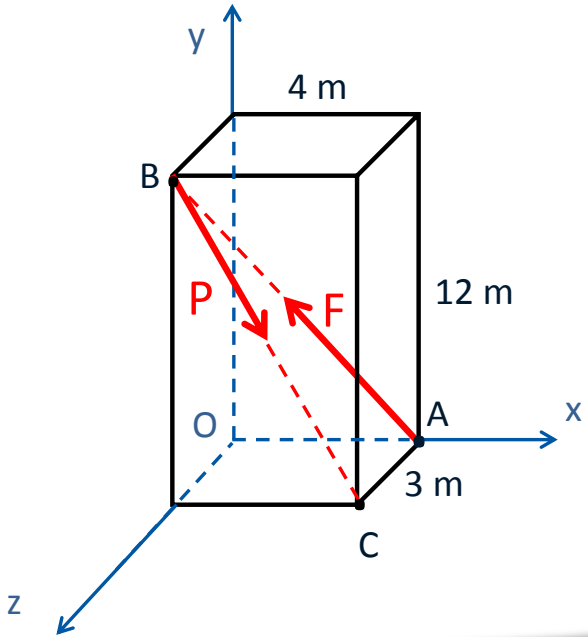

Dot Product to Find Components (Projection)