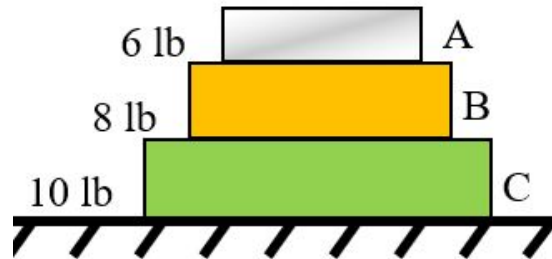


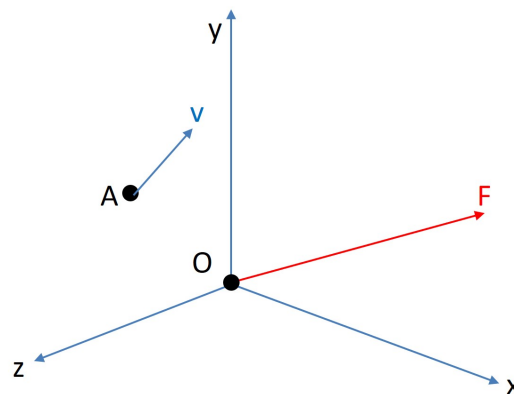
You may only use a simple calculator that does not communicate in any wireless manner. Pagers, cell phones, and all other communications devices must be turned off during the quiz. All work (free body diagrams, algebra, etc) is required to receive full credit.

1. (10 points) Three blocks  $A$ ,  $B$ , and  $C$  sit on a table. Draw the free body diagram for block  $B$ .

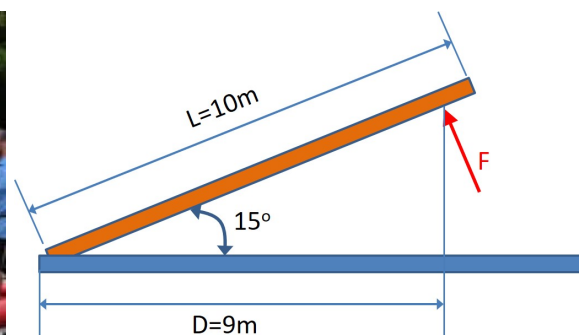


2. (20 points) A force  $\mathbf{F} = 3\mathbf{i} + 3\mathbf{j} - \mathbf{k}$  is applied at the origin  $O$ .

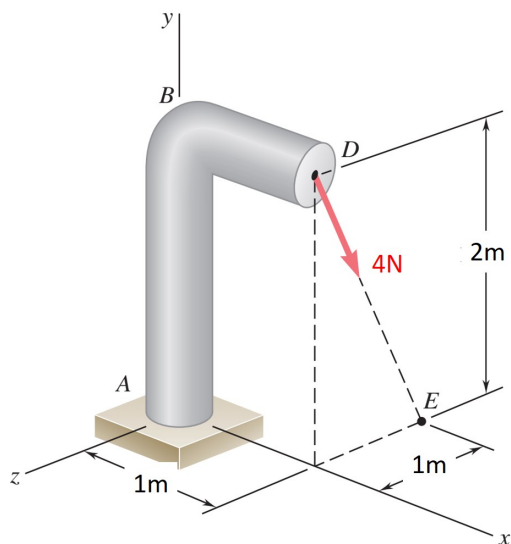
- (a) What is the moment  $\mathbf{M}_A$  caused by the force  $\mathbf{F}$  about the point  $A$  at  $\mathbf{r}_A = 2\mathbf{j} + 2\mathbf{k}$ ?  
 (b) What is the component of the moment  $\mathbf{M}_A$  about an axis passing through  $A$  in the direction of  $\mathbf{v} = \mathbf{j} - \mathbf{k}$ ?



3. (25 Points) A man holds a pole as shown in the figure below. The mass of the pole is 300 kg and the center of gravity of the pole is at its midpoint. The force  $F$  applied by the man acts perpendicular to the pole. What is the force  $F$  required by the man to maintain this position?



4. (25 points) A  $4N$  force is applied at point  $D$  of the post shown below. Replace the force with an equivalent force and couple at the point  $A$ .



5. (20 points) A beam (shown as a rectangle) is supported by two rods (shown as circles) in a vertical plane in four different configurations below. Gravitational force acts at the center of the beam (tiny dot). Determine for each configuration if it is possible for the beam to be in static equilibrium. Briefly justify your answer.

