Conceptual Question C4.1

Given: A bracket is fixed to a rigid wall at end A. A system of two ideal pulleys are attached to the bracket, with a cable being wrapped around the pulleys. The cable is attached to fixed ground at the top, and a force P acts at the free end of the cable. In System I, the pulleys are pinned to the bracket at vertically-aligned points B and C, whereas in System II the pulleys are pinned at vertically-aligned points D and E.

Find:

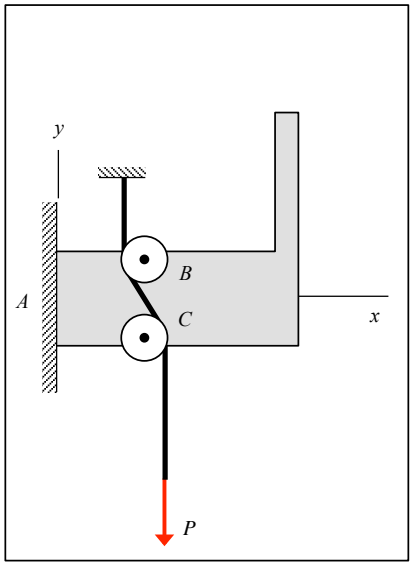
Let A_y be the y-component of the reaction force on the bracket due the wall at end A for System I. Circle the correct response below regarding the relative sizes of $|A_y|$ and P:

- $|A_y| > P$
- $|A_y| = P$
- $|A_y| < P$

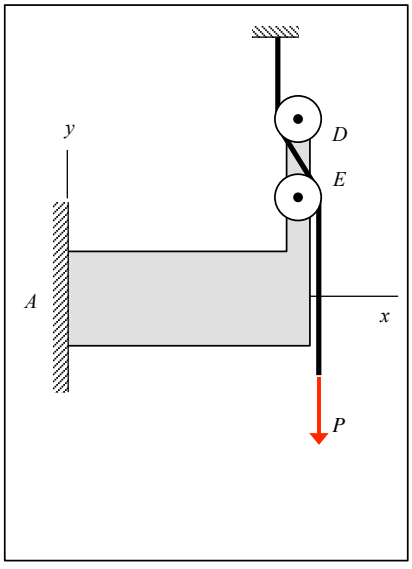
Let $(M_A)_I$ and $(M_A)_{II}$ be the reaction couples on the bracket due to the wall at A on Systems I and II, respectively. Circle the correct response below regarding the relative sizes of $(M_A)_I$ and $(M_A)_{II}$:

- $|(M_A)_I| > |(M_A)_{II}|$
- $|(M_A)_I| = |(M_A)_{II}|$
- $|(M_A)_I| < |(M_A)_{II}|$

Provide explanations for your answers.



System I



System II

Conceptual Question C4.2

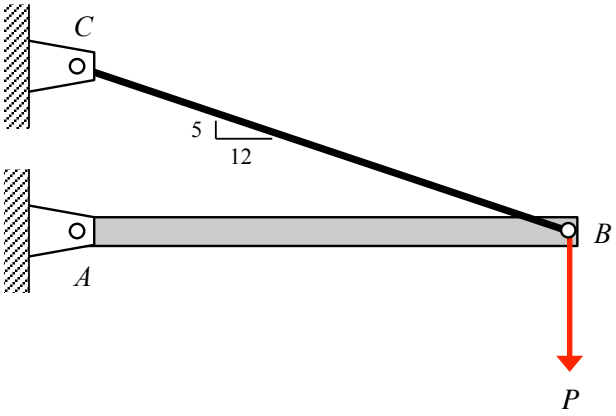
Given: Bar AB is supported by a pin joint at end A and by cable BC at end B. A vertical force P acts on the bar at end B. The weight of the bar is negligible compared to the applied force P. Let T_{BC} represent the tension in the cable.

Find:

Circle the correct response below regarding the relative sizes of T_{BC} and P:

- $0 \leq T_{BC} < P$
- $T_{BC} = P$
- $P < T_{BC} \leq 2P$
- $2P < T_{BC} \leq 3P$
- $3P < T_{BC}$

Provide an explanation for your answer.



Conceptual Question C4.3

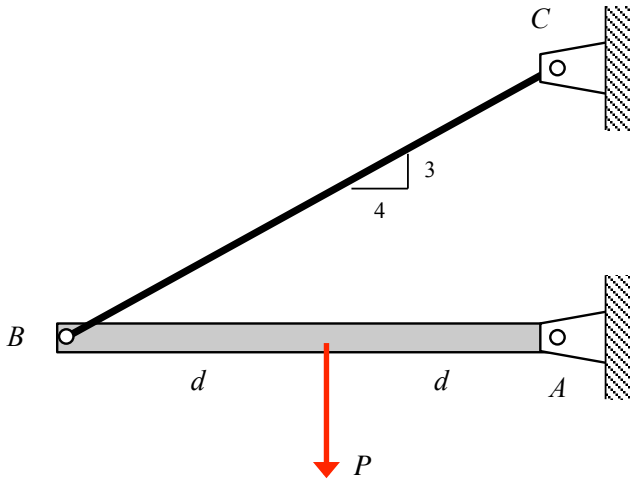
Given: Bar AB is supported by a pin joint at end A and by cable BC at end B. A vertical force P acts on the bar at its midpoiont. The weight of the bar is negligible compared to the applied force P. Let T_{BC} represent the tension in the cable.

Find:

Circle the correct response below regarding the relative sizes of T_{BC} and P:

- $T_{BC} < P$
- $T_{BC} = P$
- $T_{BC} > P$

Provide an explanation for your answer.



Conceptual Question C4.4

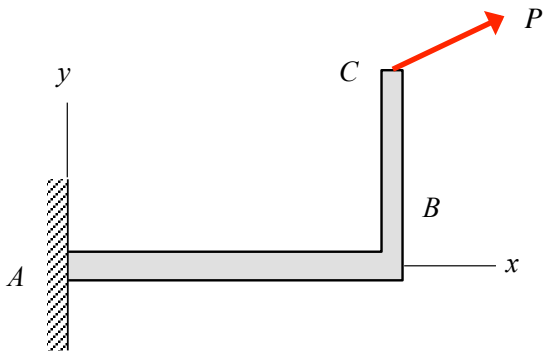
Given: An L-shaped bar is fixed to a rigid wall at end A. A force P acts at end C. The figure of the bar is drawn to scale, and the direction of P is shown at the correct angle in the figure. Let $\vec{M}_A$ represent the reaction couple acting on the bar at end A.

Find:

Circle the correct response below regarding the direction of M_A:

- $\vec{M}_A$ is clockwise
- $\vec{M}_A = \vec{0}$
- $\vec{M}_A$ is counterclockwise

Provide an explanation for your answer.



Conceptual Question C4.5

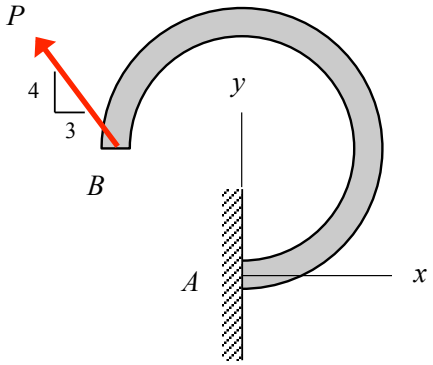
Given: A curved bar representing 3/4 of a circular arc is fixed to a rigid wall at end A. A force P is applied to the bar at end B. Let $\vec{M}_A$ represent the reaction couple acting on the bar at end A.

Find:

Circle the correct response below regarding the direction of $\vec{M}_A$:

- $\vec{M}_A$ is clockwise
- $\vec{M}_A = \vec{0}$
- $\vec{M}_A$ is counterclockwise

Provide an explanation for your answer.



Conceptual Question C4.6

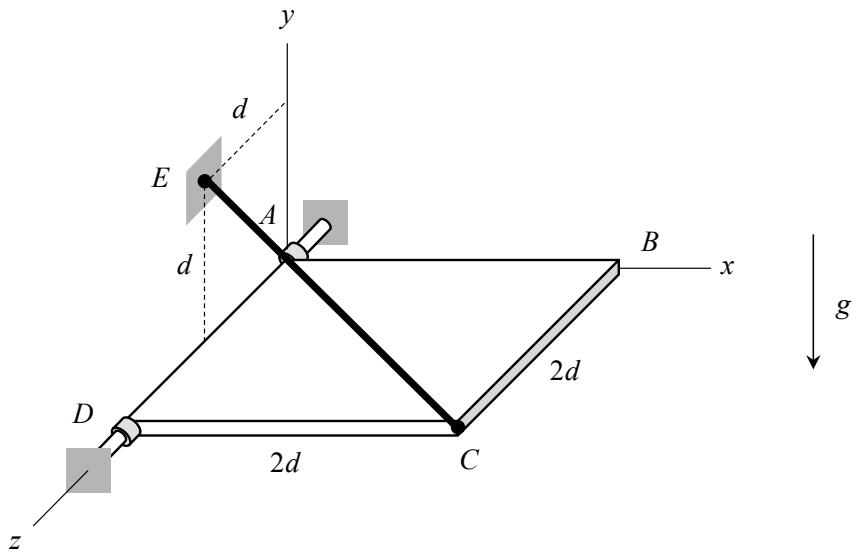
Given: A homogeneous plate having a weight of W is supported by a hinge joint along edge AD and by cable CE. Cable CE carries a tension of F_{CE} as a result of the weight of the plate.

Find:

Circle the correct response below regarding the relative sizes of F_{CE} and W:

- $0 \leq T_{CE} < W$
- $T_{CE} = W$
- $W < T_{CE} < 2W$
- $T_{CE} = 2W$
- $2W < T_{CE} < 3W$
- $3W \leq T_{CE}$

Provide an explanation for your answer.



Conceptual Question C4.7

Given: Rod OA is connected to a fixed wall with a ball-and-socket joint at end O. Two cables, BD and BC also provide support for the rod. A vertical load P acts at end A of the rod. The weight of the rod is negligible compared to the rod. Let T_{BD} and T_{BC} represent the tensions in cables BD and BC, respectively.

Find:

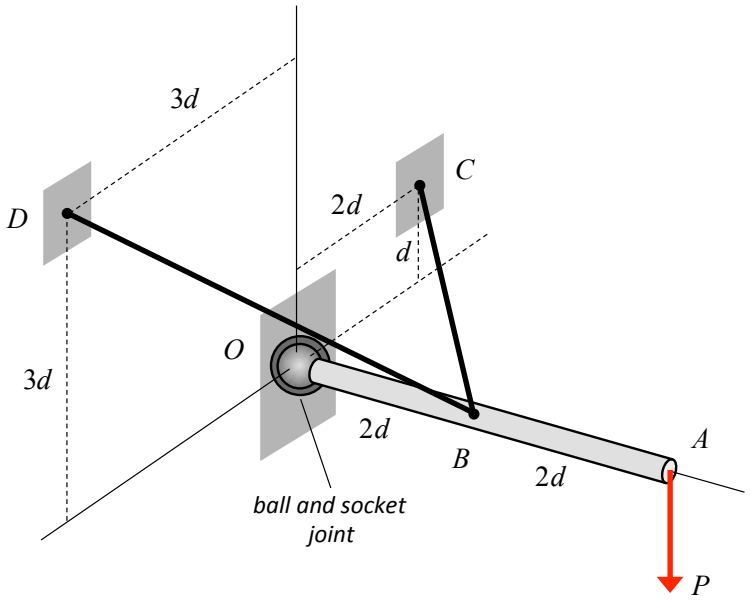
Circle the correct response below regarding the relative sizes of T_{BD} and T_{BC}:

- $T_{BD} < T_{BC}$
- $T_{BD} = T_{BC}$
- $T_{BD} > T_{BC}$

Circle the correct response below regarding the relative sizes of T_{BD} and P:

- $T_{BD} < P$
- $T_{BD} = P$
- $T_{BD} > P$

Provide explanations for your answers.



Conceptual Question C4.8

Given: Rod OA is connected to a fixed wall with a ball-and-socket joint at end O. Two cables, BD and AC also support the rod. A vertical load P acts at midpoint B of the rod. The weight of the rod is negligible compared to the rod. Let T_{BD} and T_{AC} represent the tensions in cables BD and AC, respectively.

Find:

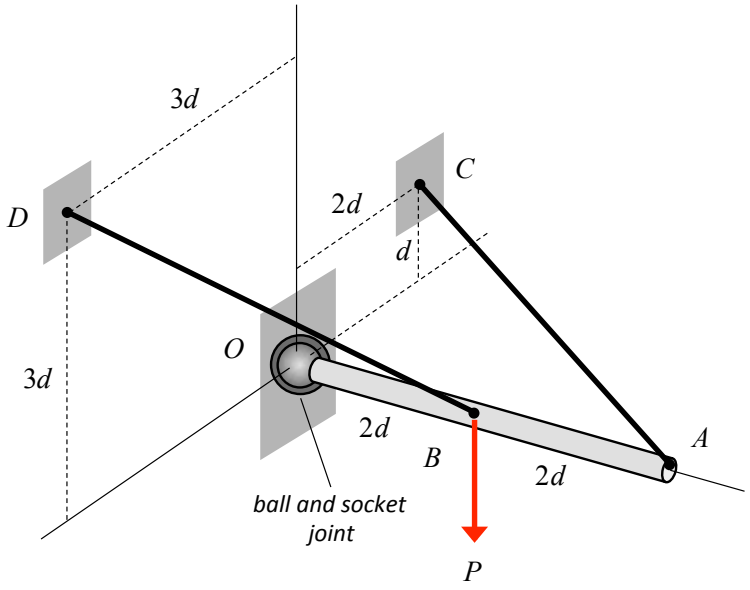
Circle the correct response below regarding the relative sizes of T_{BD} and T_{AC}:

- $T_{BD} < T_{AC}$
- $T_{BD} = T_{AC}$
- $T_{BD} > T_{AC}$

Circle the correct response below regarding the relative sizes of T_{AC} and P:

- $T_{AC} < P$
- $T_{AC} = P$
- $T_{AC} > P$

Provide explanations for your answers.



Conceptual Question C4.9

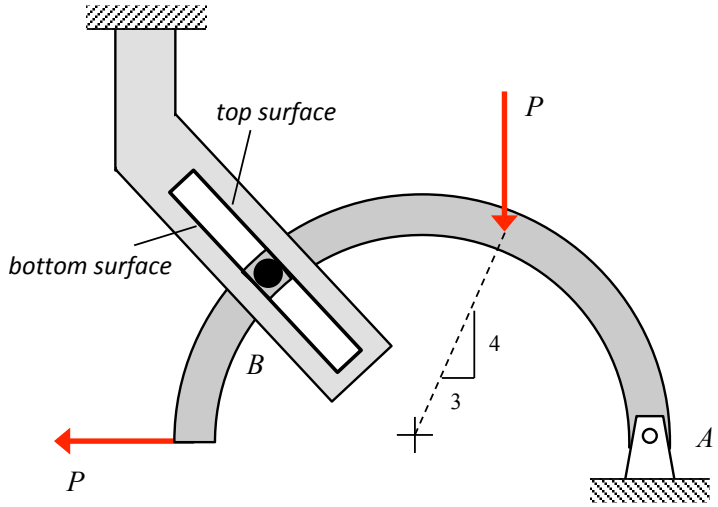
Given: A semi-circular bar is pinned to ground at A. A pin B attached to the bar is constrained by a smooth, straight slot in a fixed bracket. A vertical force P acts on the curved bar as shown in the figure. The weight of the bar is negligible compared to the applied force.

Find:

Circle the correct response below regarding the contact of pin B with the slot in the fixed bracket:

- Pin B is in contact with the top surface of the slot.
- Pin B is in contact with the bottom surface of the slot.
- Pin B is in contact with neither surface of the slot.

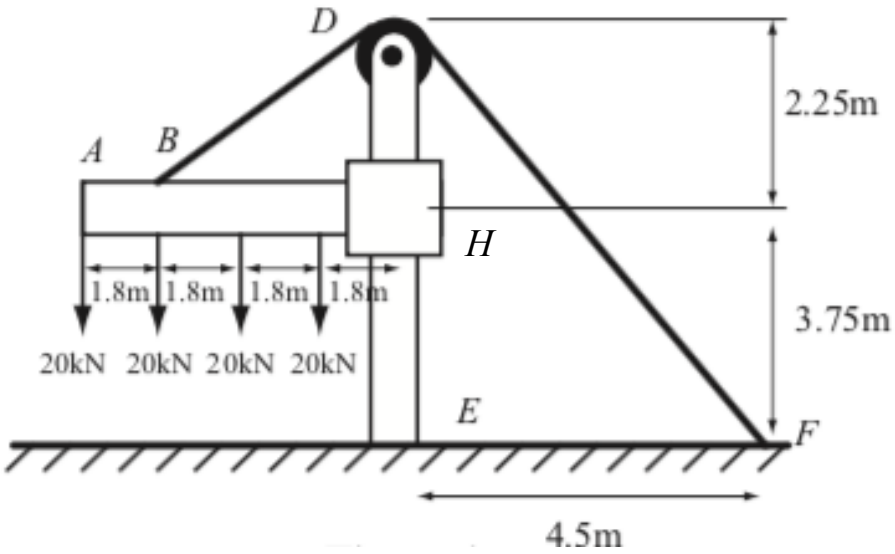
Provide an explanation for your answer.



Conceptual Question C4.10

Given: The frame shown below provides support for a portion of the roof for a small building. The tension in the cable is known to be 150 kN.

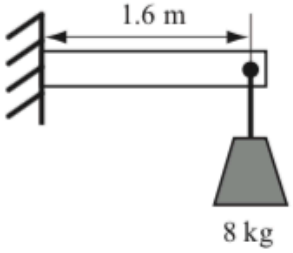
Find: Determine the reaction on the frame at the support point E.



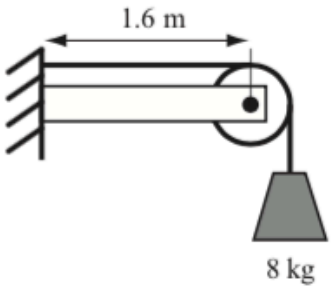
Conceptual Question C4.11

Given: Consider the three different Supports A, B and C for the 8 kg block, as shown below.

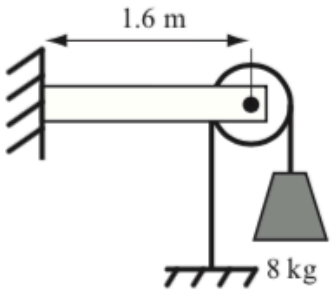
Find: For each support, determine the reactions acting on the beam at the wall. Compare your results.



Support A



Support B



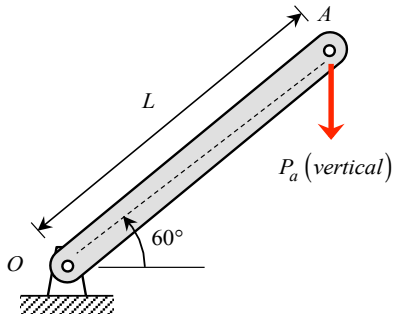
Support C

Conceptual Question C4.12

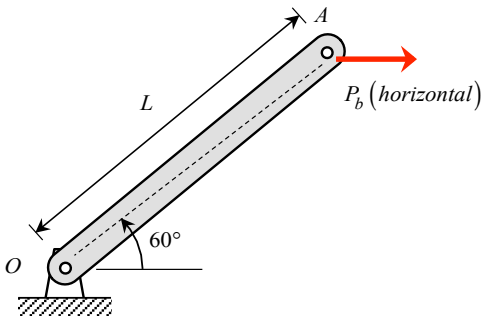
Given: Consider the four Loadings (a)-(d) acting on member OA, as shown below.

Find: For this problem:

- For Loading (a), determine the moment of the vertical force P_a about point O. Express your answer in terms of P_a and L.
- For Loading (b), determine the moment of the horizontal force P_b about point O. For what value of P_b will this moment be the same as the moment found in (a) for loading P_a?
- For Loading (c), determine the smallest value of the loading P_c such that the moment of P_c about O is the same as the moment found in (a) for loading P_a.
- For Loading (d), determine the point of application d for the load P_d such that the moment of P_d about O is the same as the moment found in (a) for loading P_a.



Loading (a)



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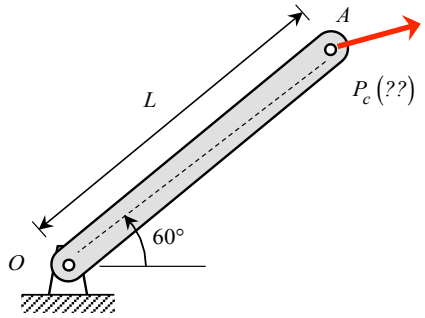

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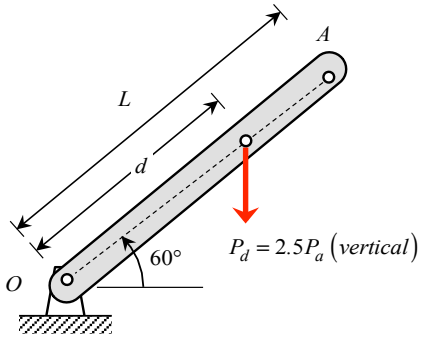

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