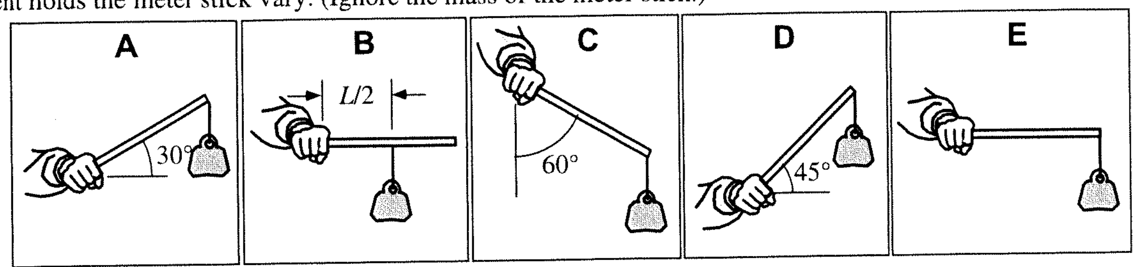
AP Physics - Unit 7

Tippen #2 - Unit 7

#1

B6-RT23: METER STICK WITH HANGING MASS I—DIFFICULTY HOLDING

A student is holding a meter stick by one end. A 1,000 g mass is hung on the meter sticks. All of the meter sticks are identical, but the distance along the meter stick at which the 1,000 g mass is hung and the angles at which the student holds the meter stick vary. (Ignore the mass of the meter stick.)



Rank the difficulty of holding the meter stick from the left end in the position shown.

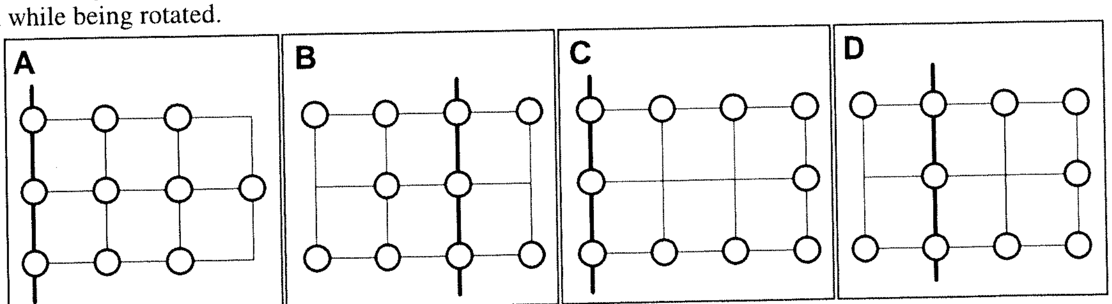
1 Greatest	2	3	4	5 Least	OR	All the same	All zero	Cannot determine

Explain your reasoning.

#2

B6-RT22: SYSTEMS OF POINT MASSES—DIFFICULT TO ROTATE

Each of the ten point masses in each case is identical. The solid line in each figure represents an axis about which the masses are going to be rotated. The point masses are fixed together so that they all maintain the arrangements shown while being rotated.



Rank these arrangements on how hard it will be to start the systems rotating.

1 Greatest	2	3	4 Least	OR	All the same	All zero	Cannot determine

Explain your reasoning.

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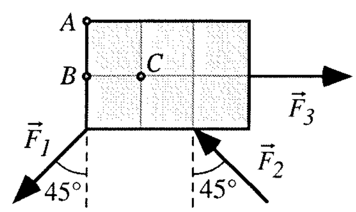
#3 **B6-QRT07: THREE EQUAL FORCES APPLIED TO A RECTANGLE—NET TORQUE DIRECTION**

Three forces of equal magnitude are applied to a 3-m by 2-m rectangle. Forces $\vec{F}_1$ and $\vec{F}_2$ act at 45° angles to the vertical as shown, while $\vec{F}_3$ acts horizontally.



(a) Is the net torque about point *A* (i) *clockwise*, (ii) *counterclockwise*, or (iii) *zero*? _____

Explain your reasoning.

(b) Is the net torque about point *B* (i) *clockwise*, (ii) *counterclockwise*, or (iii) *zero*? _____

Explain your reasoning.

(c) Is the net torque about point *C* (i) *clockwise*, (ii) *counterclockwise*, or (iii) *zero*? _____

Explain how you determined your answer.

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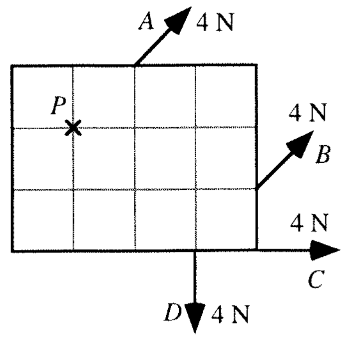
#4

B6-QRT26: FOUR FORCES ACTING ON A PIECE OF PLYWOOD—ROTATION DIRECTION

Four 4-Newton forces *(A–D)* act on a 3 m by 4 m piece of plywood that has a pivot point at *P*.



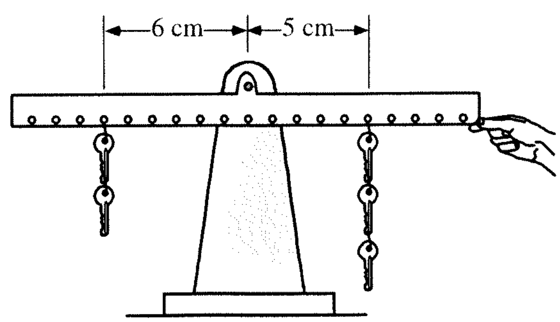
Will the plywood rotate about the pivot point *P* (i) *clockwise*, (ii) *counterclockwise*, or (iii) *not at all*? _____

Explain your reasoning.

#5

B6-QRT13: BALANCE BEAM—MOTION AFTER RELEASE

Five identical keys are suspended from a balance, which is held horizontally as shown. The two keys on the left are attached to the balance 6 cm from the pivot and the three keys on the right are attached 5 cm from the pivot.



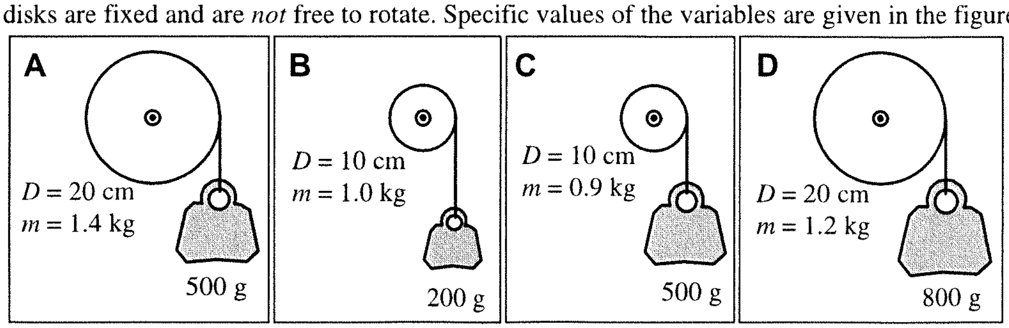
What will happen when the person lets go of the balance beam?

Explain.

#6

B6-RT21: HANGING WEIGHTS ON FIXED DISKS—TORQUE

Vertically oriented circular disks have strings wrapped around them. The other ends of the strings are attached to hanging masses. The diameters of the disks, the masses of the disks, and the masses of the hanging masses are given. The disks are fixed and are *not* free to rotate. Specific values of the variables are given in the figures.



Rank the magnitudes of the torques exerted by the strings about the center of the disks.

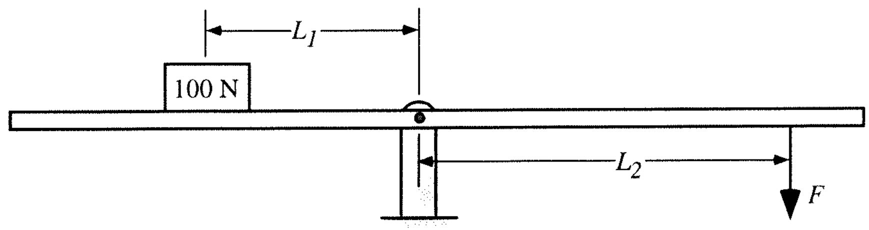
☐	☐	☐	☐	OR	☐	☐	☐
1 Greatest	2	3	4 Least		All the same	All zero	Cannot determine

Explain your reasoning.

#7

B6-LMCT20: HORIZONTAL PIVOTED BOARD WITH LOAD II—FORCE TO HOLD BOARD

A 100-N weight is placed on a massless board a distance L_1 to the left of frictionless pin. A vertical downward force F is applied to the other side of the board a distance of L_2 from the pin as shown. The system is at rest.



Identify from choices (i)–(v) how each change described below will affect the magnitude of the applied force (*F*) on the right side of the board needed to keep the system in equilibrium.

Compared to the case above, this change will:

(i) ***increase*** the magnitude of the support force (*F*) on the board.
(ii) ***decrease*** the magnitude of the support force (*F*) on the board but not to zero.
(iii) ***decrease*** the magnitude of the support force (*F*) on the board **to zero.**
(iv) ***have no effect*** on the magnitude of the support force (*F*) on the board.
(v) *have an* ***indeterminate*** effect on the magnitude of the support force (*F*) on the board.

Each of these modifications is the only change to the initial situation shown in the diagram above.

(a) The 100-N weight is moved to a position closer to the pin. _____
Explain your reasoning.

(b) The support force (*F*) is moved to a position closer to the pin. _____
Explain your reasoning.

(c) The weight is decreased to 50 N. _____
Explain your reasoning.

(d) The support force (F) is moved to the right end of the board. _____
Explain your reasoning.

(e) The board is made longer but the support force (F) remains at the same location. _____
Explain your reasoning.

(f) The 100-N weight and the support force (F) are both moved to positions closer to the pin. _____
Explain your reasoning.

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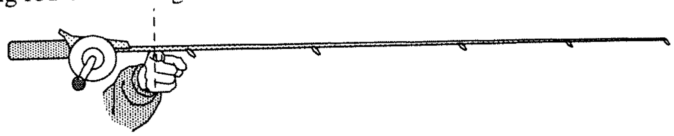
#8

B6-CT10: Fishing Rod—Weight of Two Pieces

An angler balances a fishing rod on her finger as shown.



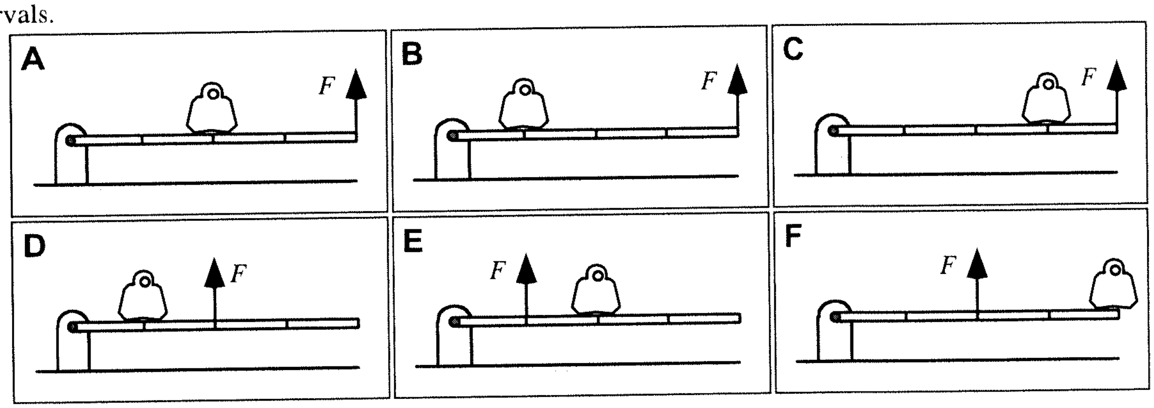
If she were to cut the rod along the dashed line, would the weight of the piece on the left-hand side be (i) *greater than*, (ii) *less than*, or (iii) *equal to* the weight of the piece on the right-hand side? _____

Explain your reasoning.

#9

B6-RT19: Horizontal Pivoted Rods with Loads I—Force to Hold

A 2-m long massless rod supports a 12-Newton weight. The left end of each rod is held in place by a frictionless pin. In each case, a vertical force F is holding the rods and the weights at rest. The rods are marked at half-meter intervals.



Rank the magnitude of the vertical force F applied to the rods.

____	____	____	____	____	____	OR	☐	☐
1 Greatest	2	3	4	5	6 Least		All the same	Cannot determine

Explain your reasoning.

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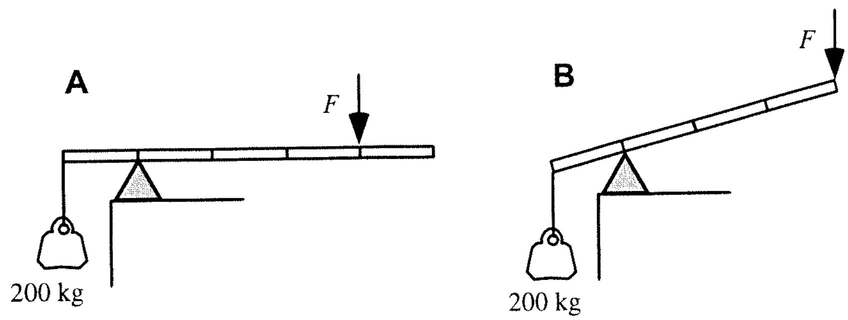
#10

B6-CT18: TILTED PIVOTED RODS WITH VARIOUS LOADS—FORCE TO HOLD RODS

In both cases, a massless rod is supported by a fulcrum, and a 200-kg hanging mass is suspended from the left end of the rod by a cable. A downward force *F* keeps the rod at rest. The rod in Case A is 50 cm long, and the rod in Case B is 40 cm long. (Each rod is marked at 10-cm intervals.)



Will the magnitude of the vertical force *F* exerted on the rod be (i) *greater* in Case A, (ii) *greater* in Case B, or (iii) *the same* in both cases? _____

Explain your reasoning.