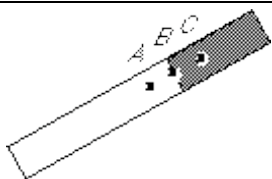
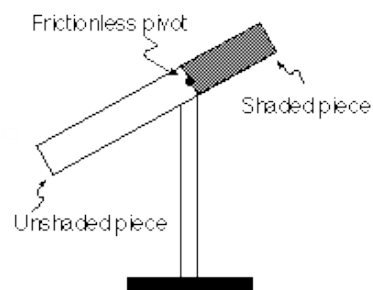


A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is equal to the mass of the shaded piece.
Explain. If it was not equal, the unshaded piece would have fallen to the bottom.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point B

Explain. This is how the board is staying balanced. If it were not the center of mass, one side would have more mass than the other and fall.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? Yes.
The board will remain at rest.
Explain. If the pivot is indeed at the center of mass, then it would stay still

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 2

Explain. If it doesn't move then it will stay at that position

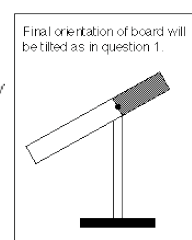
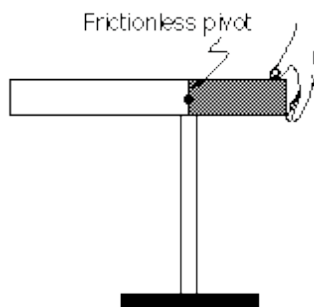


Figure 1.

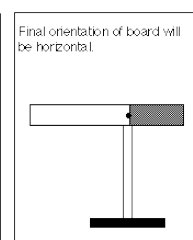


Figure 2.

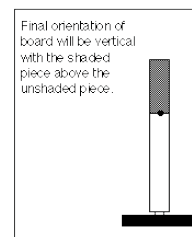


Figure 3.

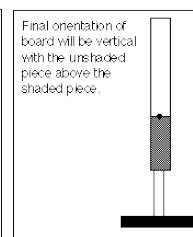


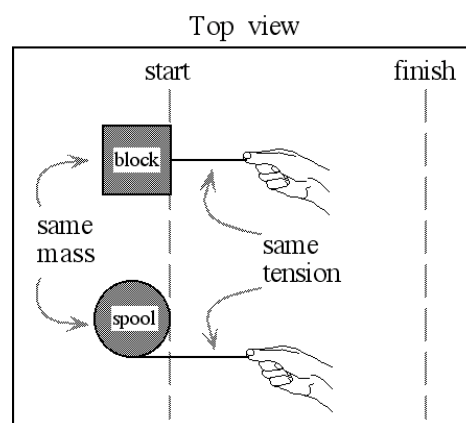
Figure 4.

Part II. A block and a spool, are each pulled across a level, frictionless surface. The string pulling the block is tied to a small hook at the center of the front face of the block. The string pulling the spool is wrapped many times around the spool and may unwind as it is pulled. The block and the spool have the same mass. The strings are pulled with the same constant tension and start pulling at the same time. (Assume the strings and the hook are massless.)

Will the spool begin to rotate? Yes. The spool will begin to rotate.
Explain. The tension of the string is directed at a distance r from the center of mass, which is torque. Torque causes an angular acceleration

Which of the following options best describes when the spool crosses the finish line? The center of the spool stays in the same place, and the spool does not cross the finish line.

Explain. There is no friction to give the spool translational motion, so the spool stays in place.



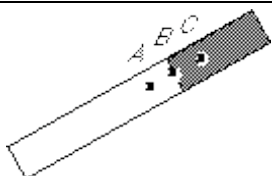
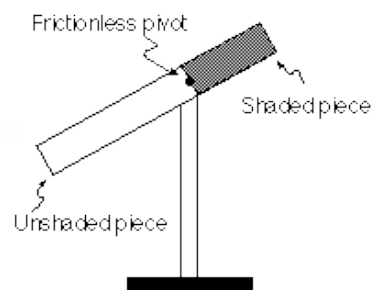
END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is equal to the mass of the shaded piece.

Explain. The mass of the unshaded piece is equal to the mass of the shaded piece. The only difference is the Radius at which it is placed from the axis (pivot). Therefore, the unshaded side has a greater torque and tilted downward.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. Since the board is tilted down in the left side, the center of mass has to be closer to that end due to the existence of the moment of inertia.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released.

Explain. From question one, the masses are the same, but the radius from axis is not. There will be a torque in the left direction because it has a greater radius.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board. Figure 3

Explain. The board will not rotating when there is no torque. This happens when the board is vertically line up with the shaded side on top of the unshaded side. No torque because the radius from the axis is parallel and therefore zero.

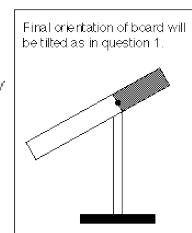
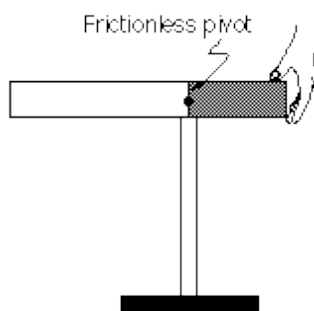


Figure 1.

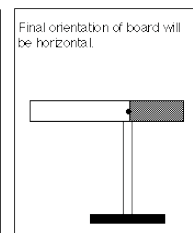


Figure 2.

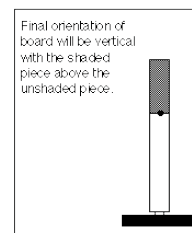


Figure 3.

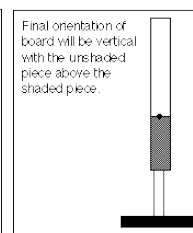


Figure 4.

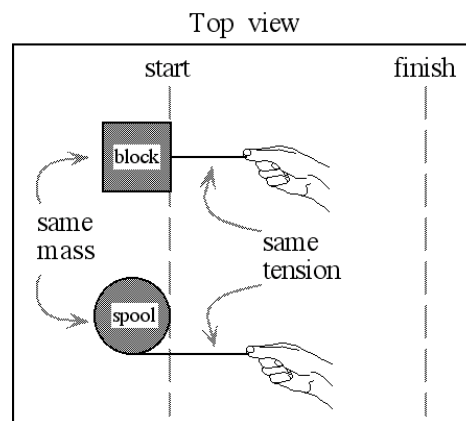
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Will the spool begin to rotate? No. The spool will not begin to rotate.

Explain. The spool will not rotate because there is no torque in the experiment.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line at the same time as the block.

Explain. Since we know that the spool will not rotate from question 13, it is moving at the same speed as the block. Therefore, both will get to the finish line at the same time.



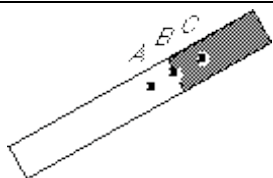
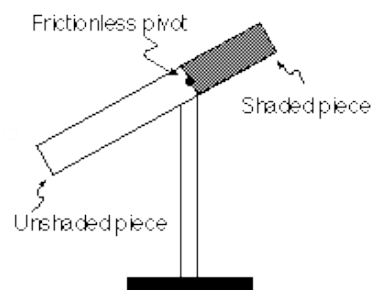
END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? There is not enough information to tell which has a greater mass.

Explain. The board is at rest so the mass of the two sides must be equal. (there is no acceleration and hence no net force)



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point B

Explain. Since the masses were previously determined to be equal, the point B must be the center of mass.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? Yes.

The board will remain at rest.

Explain. Both masses are equal so the board should stay stationary.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 2

Explain. If the masses of both sides are equal then there will be no movement of the board.

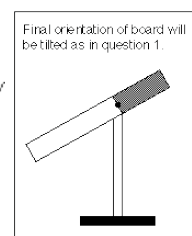
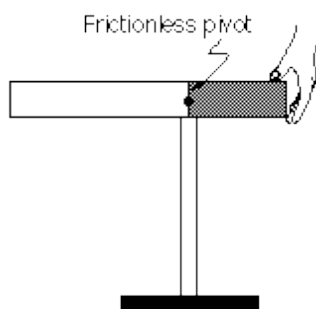


Figure 1.

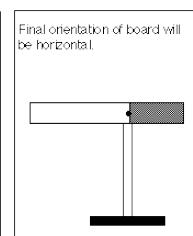


Figure 2.

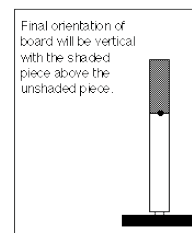


Figure 3.

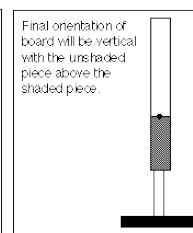


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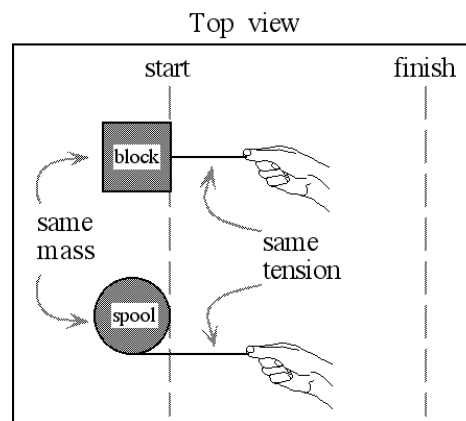
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Will the spool begin to rotate? No. The spool will not begin to rotate.

Explain. If the surface is frictionless then there is no frictional force to induce rotation.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line at the same time as the block.

Explain. If they are the same mass, and on a frictionless surface and have the same force applied then the change in time till the finishline should be the same.



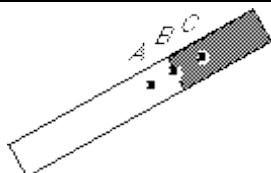
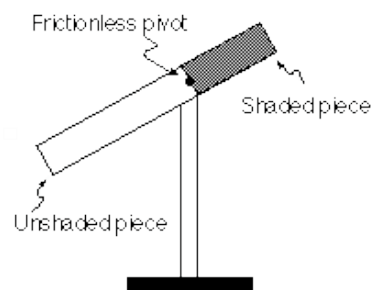
END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is greater than the mass of the shaded piece.

Explain. The mass of the unshaded piece is greater because the unshaded piece is rotating the entire board towards the right. Because both pieces are connected, they both have the same angular acceleration. The piece on the left must have greater torque to rotate the wood and so it must have greater mass.



point A.

The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. None of these points could represent the location of the center of mass.

Explain. If the unshaded board has more mass than the shaded board then the center of mass should be less than halfway towards the shaded piece from the left. Meaning, the center of mass should be left of

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released.

Explain. No because the hand is holding the board in position with an amount of torque that is equal to the amount needed to hold the block up. As soon as the hand lets go the board is going to fall to the original position because the mass of the unshaded side is greater than the shaded side.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board. Figure 1

Explain. Figure one because this is the position the board was in originally and in this case, when the hand lets go the same forces are acting on the board as before.

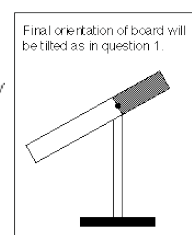
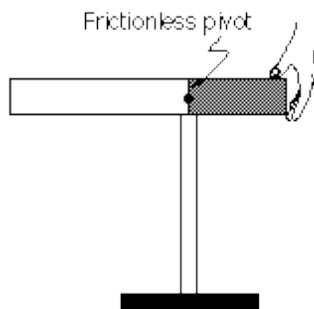


Figure 1.

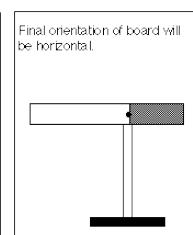


Figure 2.

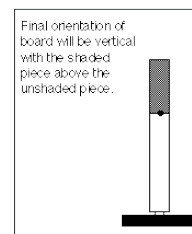


Figure 3.

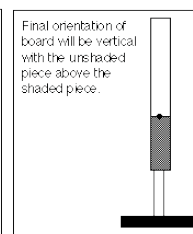


Figure 4.

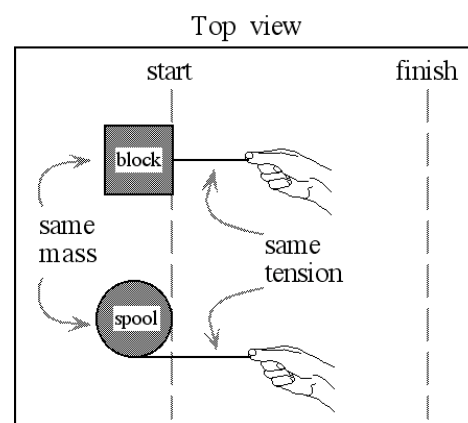
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Will the spool begin to rotate? No. The spool will not begin to rotate.

Explain. No because the spool is being pulled across a frictionless surface.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line at the same time as the block.

Explain. The spool and the block will cross the finish line at the same time because they are the same mass and they are both only undergoing translational motion.

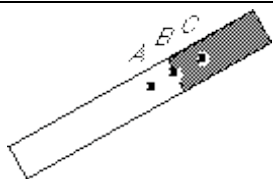
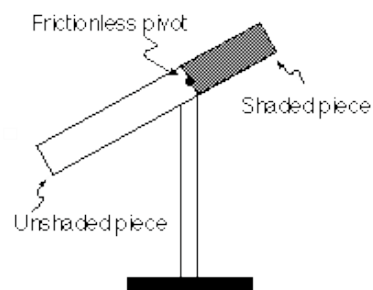


A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is less than the mass of the shaded piece.

Explain. The unshaded piece is experiencing a larger force from gravity



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. This is the middle of the board, which should be the center of mass if the weight of the board is uniform

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No.

The board will move after it is released.

Explain. it is not balanced at the center of mass

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 1

Explain. it will pivot towards the unshaded side as before b/c its not balanced at its center of mass

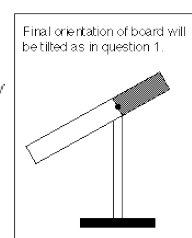
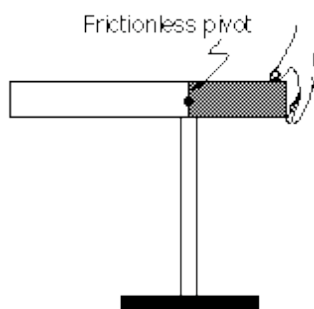


Figure 1.

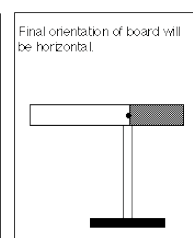


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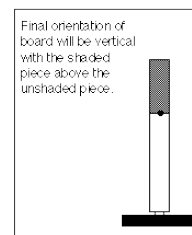


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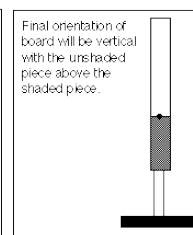


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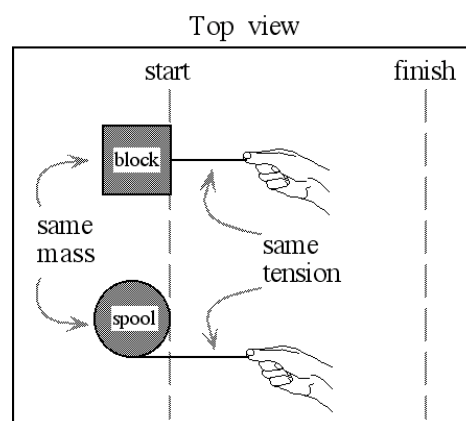
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Will the spool begin to rotate? Yes. The spool will begin to rotate.

Explain. don't know, just seems likely

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line after the block.

Explain. it has to unroll all the string before it will be pulled forward

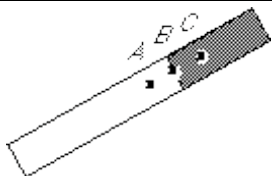
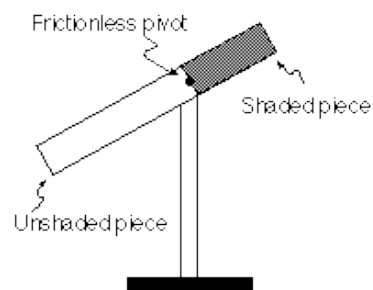


END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is greater than the mass of the shaded piece. Explain. Since the unshaded piece is tilted downward, it means it has greater mass than the shaded piece.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. Since the unshaded piece has a greater mass than the shaded piece,

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released. Explain. Since the board

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 1

Explain. Since Figure 1 most resembles the position of the board when it is at rest, Figure 1 should be the final position of the board.

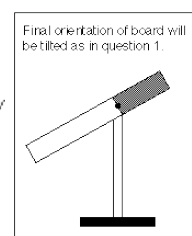
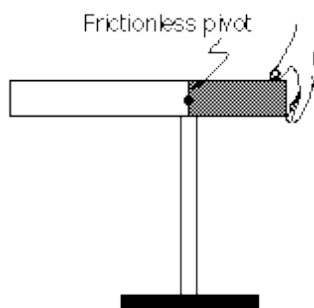


Figure 1.

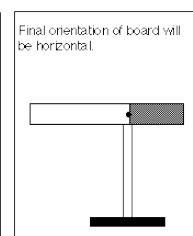


Figure 2.

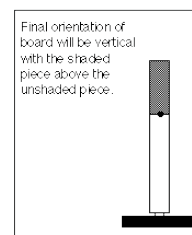


Figure 3.

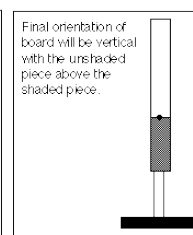


Figure 4.

Part II. A block and a spool, are each pulled across a level, frictionless surface. The string pulling the block is tied to a small hook at the center of the front face of the block. The string pulling the spool is wrapped many times around the spool and may unwind as it is pulled. The block and the spool have the same mass. The strings are pulled with the same constant tension and start pulling at the same time. (Assume the strings and the hook are massless.)

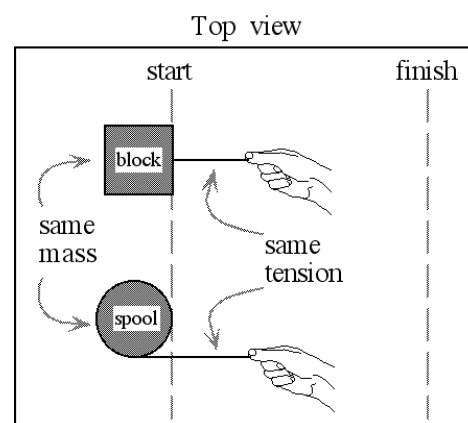
Will the spool begin to rotate? No. The spool will not begin to rotate.

Explain. I don't think it should rotate since the surface is frictionless and the only force that is causing the rotation is the friction force between the spool and the surface.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line after the block.

Explain. In the problem, it stated that the string might unwind as it is pulled.

When it is unwinding, the spool isn't moving toward the finish line as much as it is not unwinding. Since we know that the block is always moving while the spool is 'not always' moving, the spool should cross the finish line after the block.

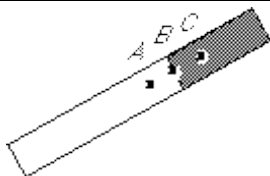
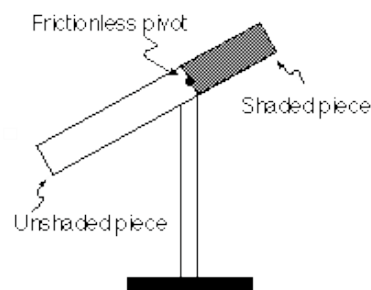


END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is greater than the mass of the shaded piece. Explain. If the board hangs like so, then the heavier part of the board would be closest to the ground.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. The center of mass of an object is closer to the side of greater mass.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released. Explain. Gravity will act on the board and change its orientation back to that of the previous figure.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 1

Explain. As explained in #10 gravity will pull the board to its balanced position.

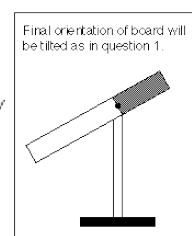
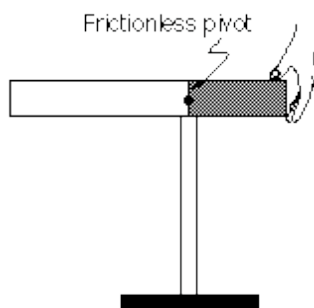


Figure 1.

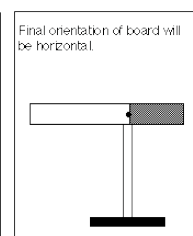


Figure 2.

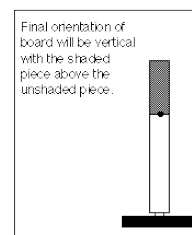


Figure 3.

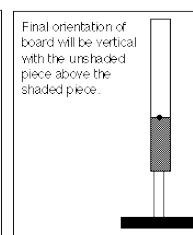


Figure 4.

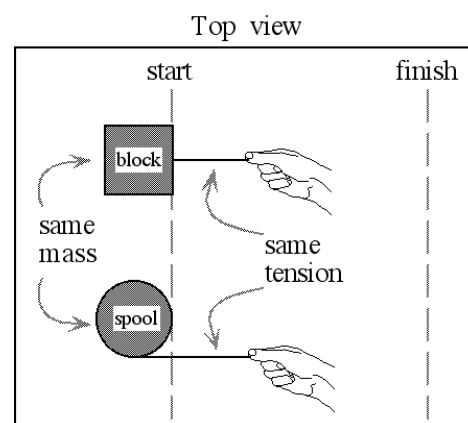
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Will the spool begin to rotate? No. The spool will not begin to rotate.

Explain. There is no friction to put a net torque on the spool; therefore, it will not rotate in any way.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line at the same time as the block.

Explain. There is no friction, and there is a net torque on the spool equal to the net force on the block; therefore they will reach the same distance in the same time.

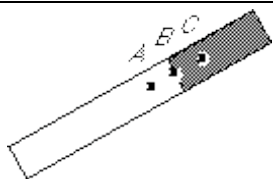
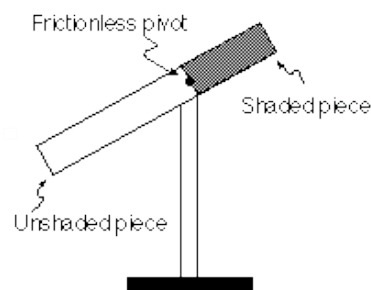


END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is equal to the mass of the shaded piece.
Explain. they have to be equal to reach equilibrium



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point B

Explain. that is the center where the mass of both sides are equal

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? Yes.
The board will remain at rest.
Explain. they're at equilibrium state

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.
Figure 2
Explain.

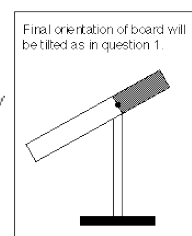
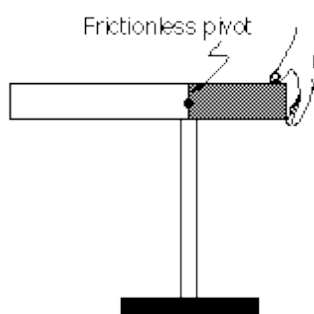


Figure 1.

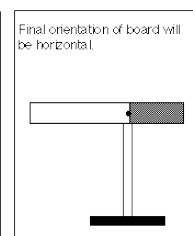


Figure 2.

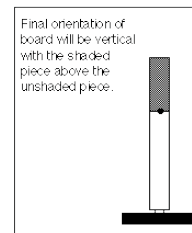


Figure 3.

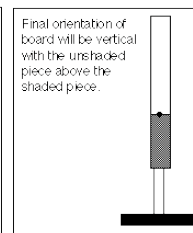
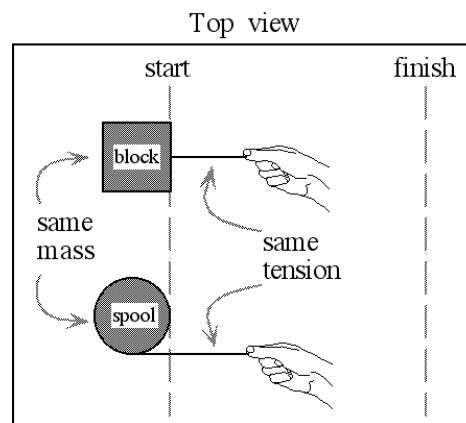


Figure 4.

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Will the spool begin to rotate? Yes. The spool will begin to rotate.
Explain

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line before the block.
Explain. the acceleration of the spool is greater than the block. the net acceleration of the spool is greater than block



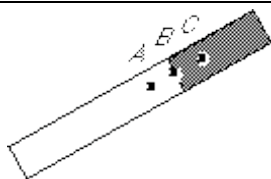
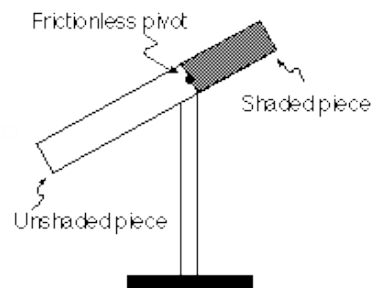
END OF RESPONSE

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The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is less than the mass of the shaded piece.

Explain. I used common sense but for a physics answer it is probably due to the torque.



light area.

The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. Since point B is in the same position as the pivot point yet the board is not level the center of mass must be further down the board in order for the lesser mass of the shaded area to be equal to the

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released.

Explain. Since the board's center of mass is not at the pivot point the board would move.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 1

Explain. Since part 1 shows the board at rest i believe that when the board is released it will return to it's original position.

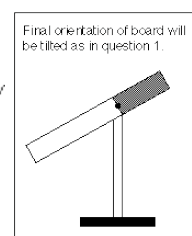
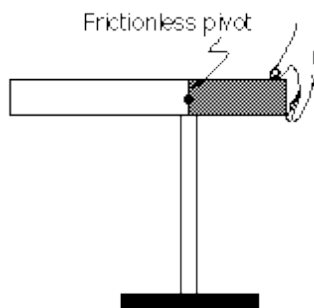


Figure 1.

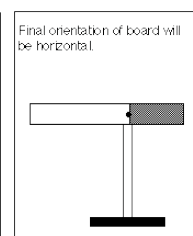


Figure 2.

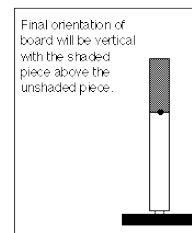


Figure 3.

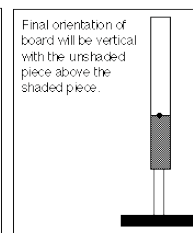


Figure 4.

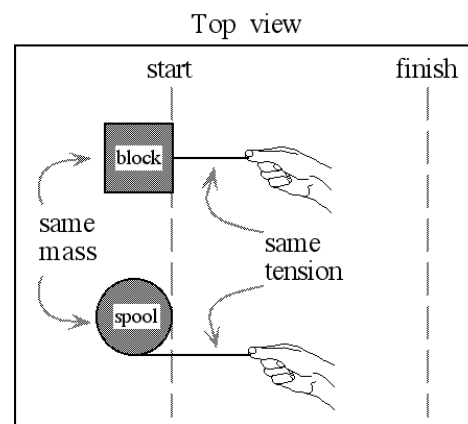
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Will the spool begin to rotate? No. The spool will not begin to rotate.

Explain. The spool will probably slip for awhile on the frictionless surface and then begin unraveling.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line after the block.

Explain. Because it will slip for awhile and then begin to rotate the spool it will not be as fast as the block.



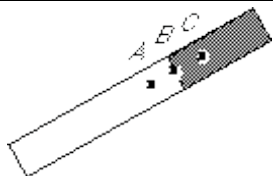
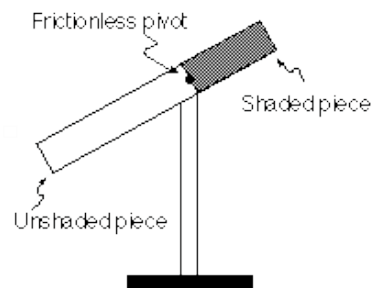
END OF RESPONSE

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The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is greater than the mass of the shaded piece.

Explain. Since it is lower than the pivot and the shaded piece is higher, the unshaded piece must have a higher mass than the shaded piece.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. The center of mass is not B because it does not balance on that point, therefore it cannot be C either since it would be even more unbalanced, therefore A best approximates the CM of the 3 points.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released.

Explain. If the board is rotated about the pivot, the board will not remain at rest once it is let go, because the CM has not changed in relation to the pivot.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board. Figure 1

Explain. Since the board is balanced on the same point, the center of mass should be relatively the same when compared to the pivot point, and therefore the board will tilt in the same manner.

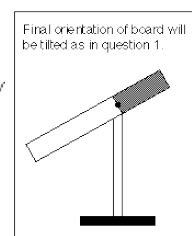
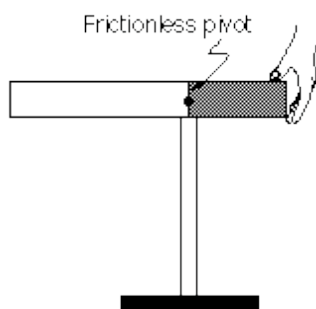


Figure 1.

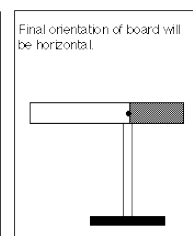


Figure 2.

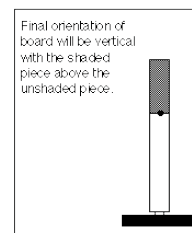


Figure 3.

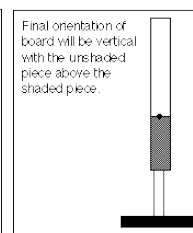


Figure 4.

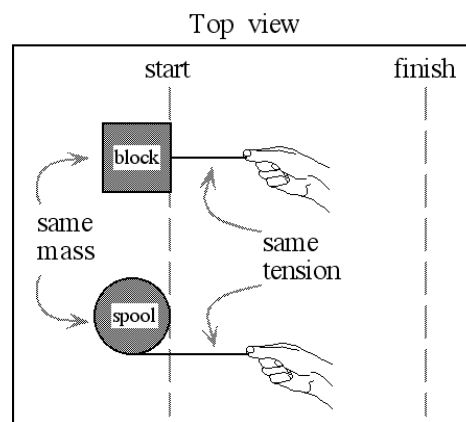
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Will the spool begin to rotate? Yes. The spool will begin to rotate.

Explain. The tension of the string will cause rotational motion in the spool instead of just translational.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line after the block.

Explain.

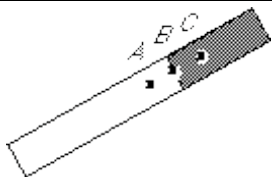
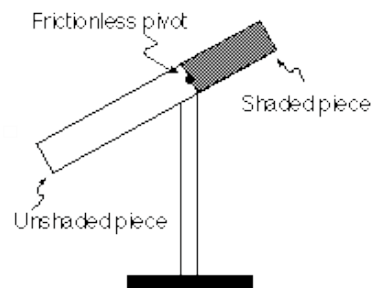


END OF RESPONSE

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The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is less than the mass of the shaded piece. Explain. the board is tipping towards the unshaded pieces side so it's heavier.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. the center of mass is at point a because it is past the point of rotation and that is why the board is tipping to that side.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released. Explain. because the unshaded side is heavier.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 1

Explain. because in the beginning that's how it was at rest.

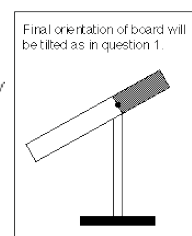
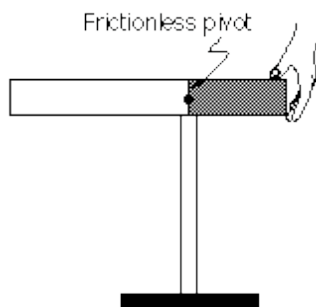


Figure 1.

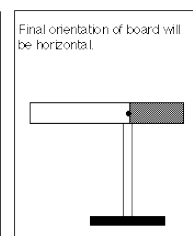


Figure 2.

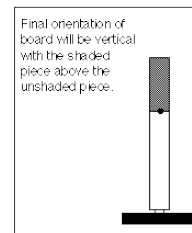


Figure 3.

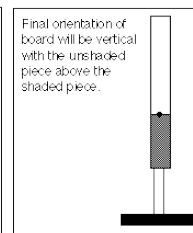


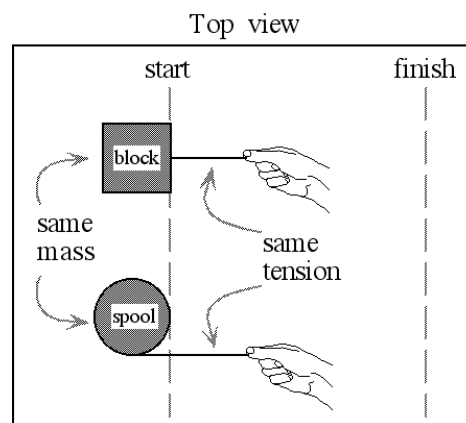
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Will the spool begin to rotate? Yes. The spool will begin to rotate. Explain there is friction acting in the opposite direction as the rotational force.

Which of the following options best describes when the spool crosses the finish line? The center of the spool stays in the same place, and the spool does not cross the finish line.

Explain. the rotational acceleration of the spool is transferred to the linear acceleration of the string, so the friction keeps the spool in place.



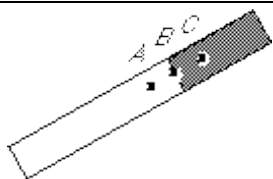
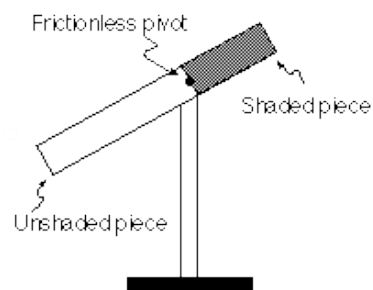
END OF RESPONSE

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The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? There is not enough information to tell which has a greater mass.

Explain. It is hard to tell because, the location of the center of mass is unknown.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. The center of mass cannot be determined from the information given.

Explain. The density of the material that is shaded and unshaded are not known.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No.

The board will move after it is released.

Explain. It did not remain at rest in the previous situation.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 1

Explain. That is what happened in the previous figure.

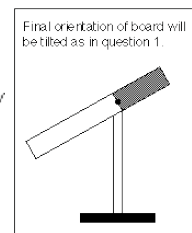
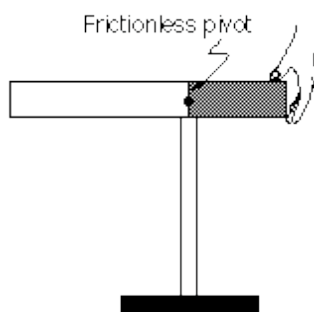


Figure 1.

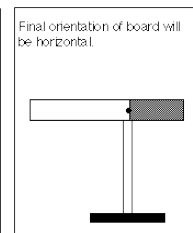


Figure 2.

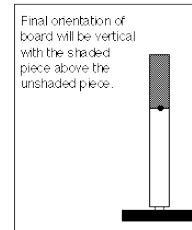


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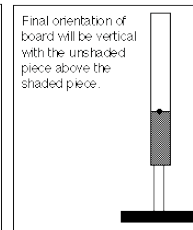


Figure 4.

Part II. A block and a spool, are each pulled across a level, frictionless surface. The string pulling the block is tied to a small hook at the center of the front face of the block. The string pulling the spool is wrapped many times around the spool and may unwind as it is pulled. The block and the spool have the same mass. The strings are pulled with the same constant tension and start pulling at the same time. (Assume the strings and the hook are massless.)

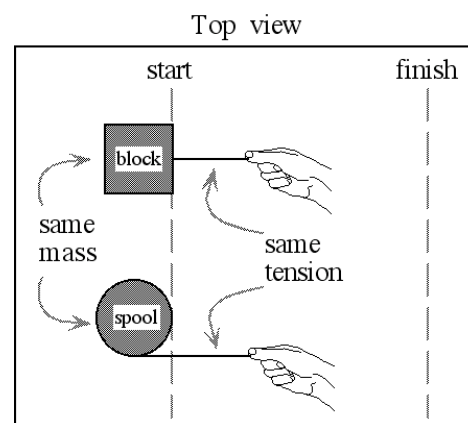
Will the spool begin to rotate? Yes. The spool will begin to rotate.

Explain. There is torque. Thus there will be rotation.

Which of the following options best describes when the spool crosses the finish line?

The spool crosses the finish line after the block.

Explain. The spool undergoes translational and rotational movement.



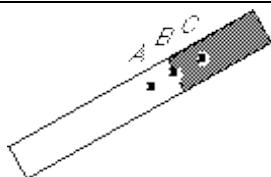
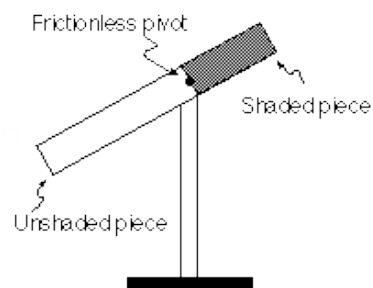
END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is less than the mass of the shaded piece.

Explain. more unshaded on the unshaded side



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point B

Explain. there was no movement above where its resting at B

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? Yes.

The board will remain at rest.

Explain. its on its center of mass. no acceleration therefore

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 2

Explain. didnt move. Booyah

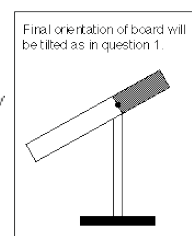
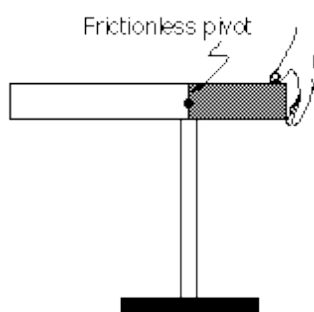


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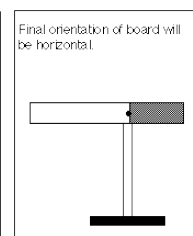


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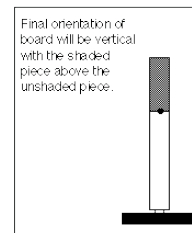


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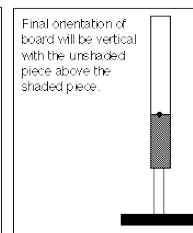


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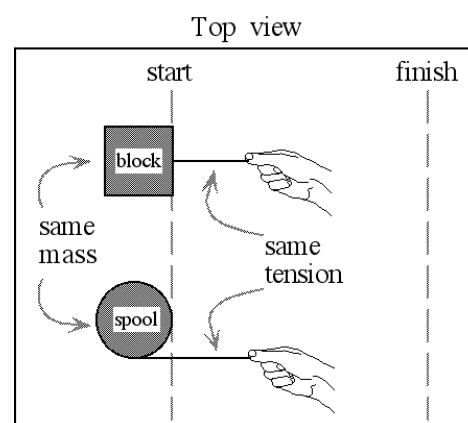
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Will the spool begin to rotate? Yes. The spool will begin to rotate.

Explain. the force is not applied to the center of mass of the spool so there will be a net torque in the system.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line after the block.

Explain. They are both pulled with the same tension so the net work on both are the same. The spool will cross later because some of its translational work is transferred to the rotational work while for the block all the work is in the translational.

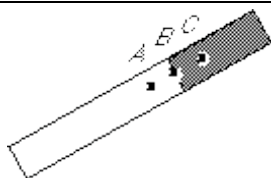
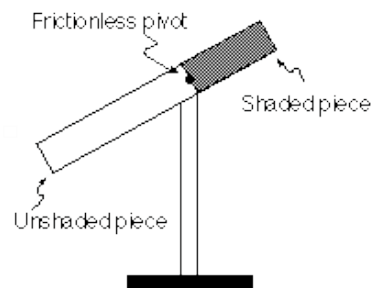


END OF RESPONSE

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The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is less than the mass of the shaded piece. Explain. if it would be bigger it would overweight the other part the whole thing would be in a vertical position



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point C

Explain. not sure but if the board would be in the horizontal position when the B would be the CM and it is not A for sure, than the unshaded part would be heavier.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released. Explain. it would move to the left because the CM is not in the center

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 1

Explain.

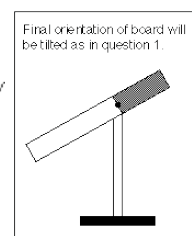
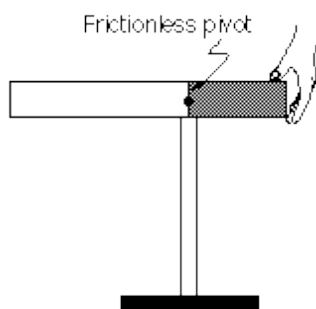


Figure 1.

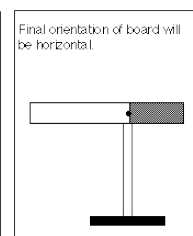


Figure 2.

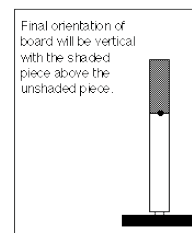


Figure 3.

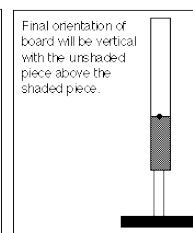


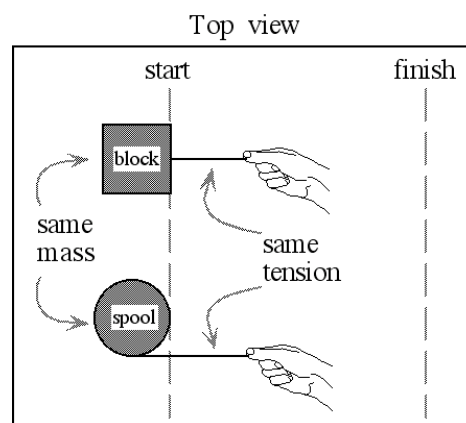
Figure 4.

Part II. A block and a spool, are each pulled across a level, frictionless surface. The string pulling the block is tied to a small hook at the center of the front face of the block. The string pulling the spool is wrapped many times around the spool and may unwind as it is pulled. The block and the spool have the same mass. The strings are pulled with the same constant tension and start pulling at the same time. (Assume the strings and the hook are massless.)

Will the spool begin to rotate? Yes. The spool will begin to rotate. Explain there is a perpendicular force acting on the side of the spool

Which of the following options best describes when the spool crosses the finish line? The center of the spool stays in the same place, and the spool does not cross the finish line.

Explain. it rotates instead, so all force is going into rotational motion, but not translational



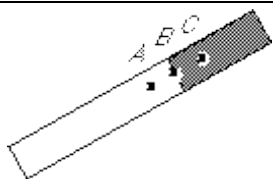
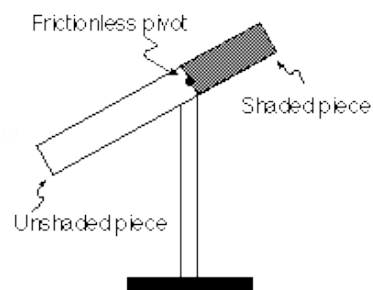
END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is equal to the mass of the shaded piece.

Explain. Because the board remains at rest so the mass has to be equal.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point B

Explain. Because the board remains at rest, so the center of mass must be between the two pieces.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? Yes.

The board will remain at rest.

Explain. Because it is centered at the center of mass and the mass of the shaded and the unshaded part is equal.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 2

Explain. because the board remains at rest and that point (center of mass).

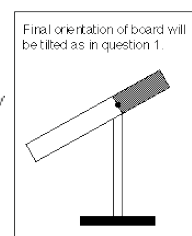
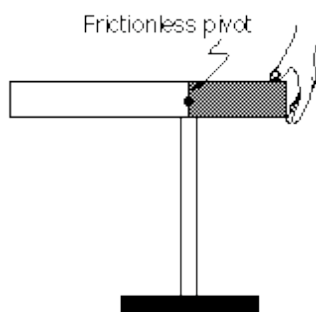


Figure 1.

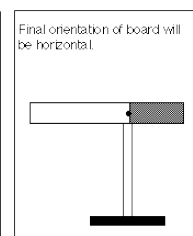


Figure 2.

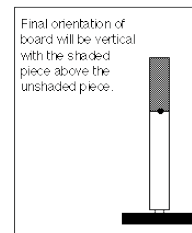


Figure 3.

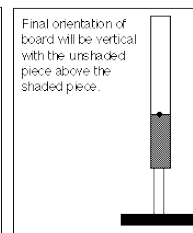


Figure 4.

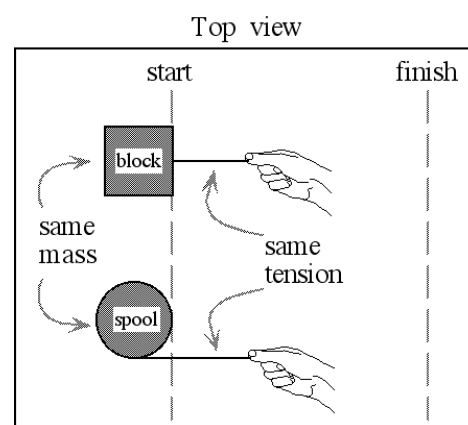
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Will the spool begin to rotate? Yes. The spool will begin to rotate.

Explain because it has the same mass as the block and also have the same tension as the block.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line before the block.

Explain. Because the block and the spool has different mass of inertia.



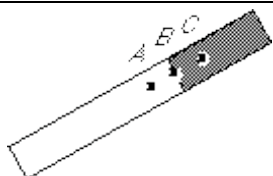
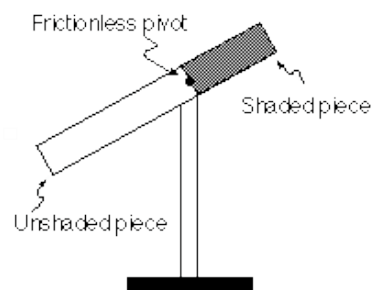
END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is less than the mass of the shaded piece.

Explain. because the pieces both have uniform distribution of mass, their centers of mass are in the middle of the bar. As well, because nothing is rotating, the torq of both shaded and unshaded are teh same, so the one with the shorter distance much have a larger mass.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point B

Explain. if it's not rotating anywhere, the CM must be at the pivot

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? Yes.

The board will remain at rest.

Explain. not sure.....

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 2

Explain. it follows from the answer above.

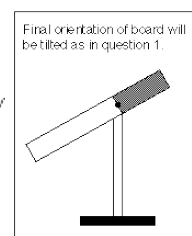
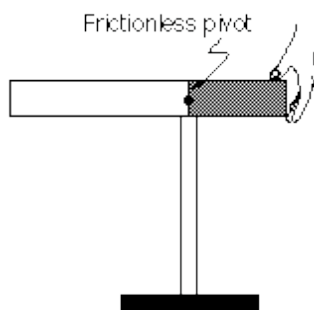


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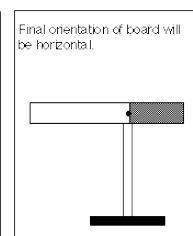


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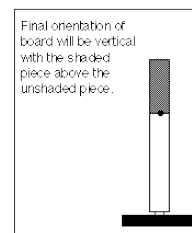


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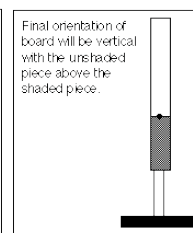


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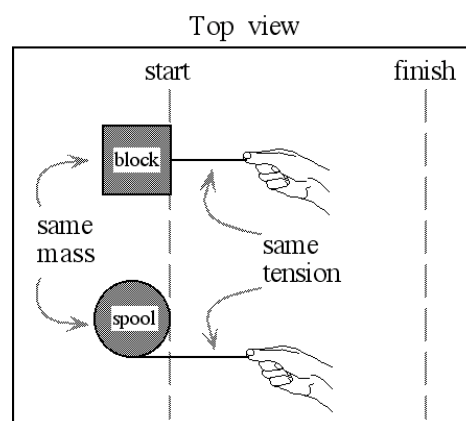
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Will the spool begin to rotate? Yes. The spool will begin to rotate.

Explain. it's kinda obvious.... donno know to explain it.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line after the block.

Explain. energy is spend to rotate the thing so less goes into translational motion

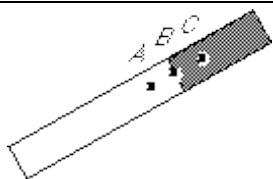
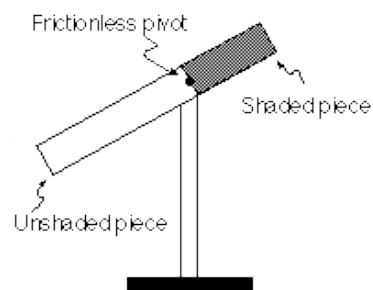


END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is greater than the mass of the shaded piece.
Explain. its like a balance



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. if dark is lighter we will need the most of it we can get to balance out the heavy part.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No.
The board will move after it is released.
Explain. just like the first example the heavier part will fall.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 3

Explain. the angular accelration moves toward o

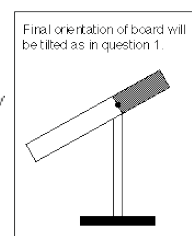
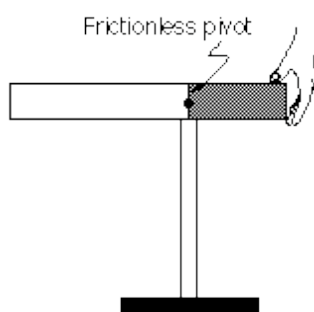


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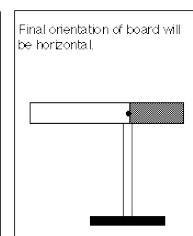


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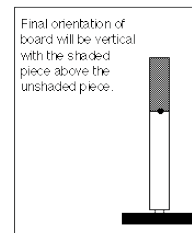


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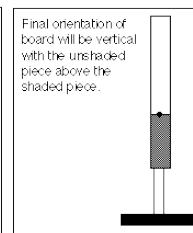
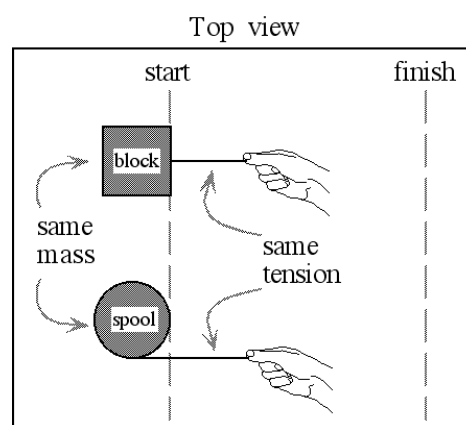


Figure 4.

Part II. A block and a spool, are each pulled across a level, frictionless surface. The string pulling the block is tied to a small hook at the center of the front face of the block. The string pulling the spool is wrapped many times around the spool and may unwind as it is pulled. The block and the spool have the same mass. The strings are pulled with the same constant tension and start pulling at the same time. (Assume the strings and the hook are massless.)

Will the spool begin to rotate? Yes. The spool will begin to rotate.
Explain their is torque becasue of force perpendicular

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line after the block.
Explain. the spool will lose energy to rotational

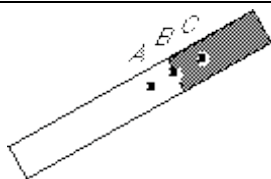
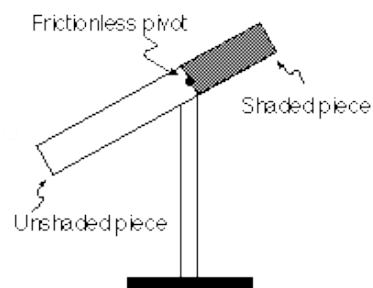


END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? There is not enough information to tell which has a greater mass.
Explain. because the area can be not heavier but the distant is longer



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. because we know that b is not the cm from questions above and we know it is not point c because it could not be any closer to the shaded area. So a is the best guess

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No.
The board will move after it is released.
Explain. because the pivot point is not the cm so the board will move

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 1

Explain. because it is how the initial picture is like

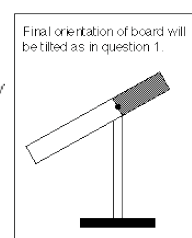
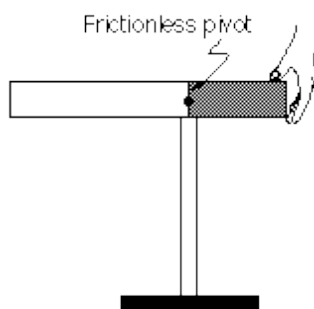


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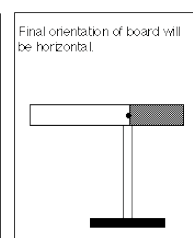


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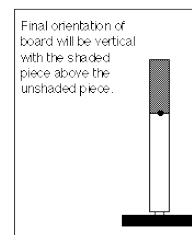


Figure 3.

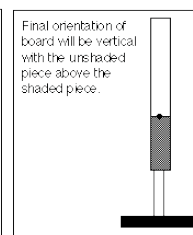
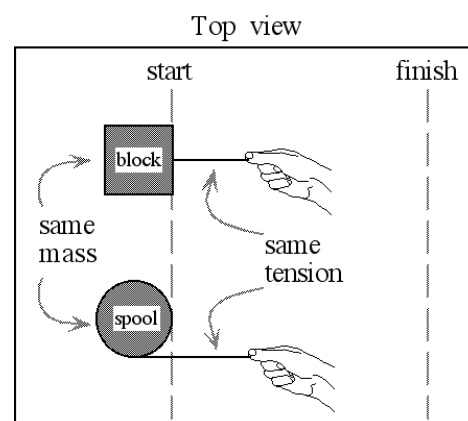


Figure 4.

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Will the spool begin to rotate? Yes. The spool will begin to rotate.
Explain. because the tension has cause the rotational acceleration

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line after the block.
Explain. because the tension of the spool is doing both translational and rotational movements so it will go slower than the block



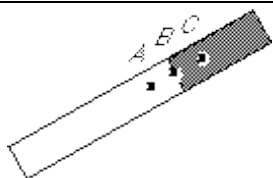
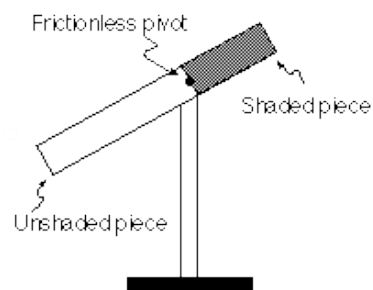
END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? There is not enough information to tell which has a greater mass.

Explain. The longer piece could be the same weight as the shorter piece and still cause the board to pivot in that direction.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. The center of mass cannot be determined from the information given.

Explain. The center of mass would be dependent on the masses of the two sections. We don't know the masses of these sections and therefore cannot determine the center of mass.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released.

Explain. It's still on the frictionless pivot so it will assume the first orientation when it is at rest.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 1

Explain. Because this is the orientation the rectangle had when it was at rest.

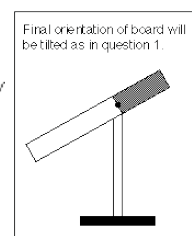
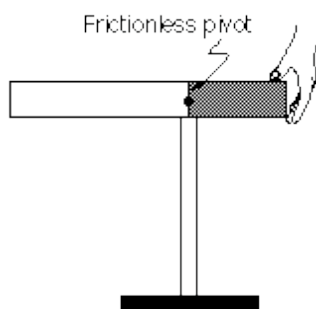


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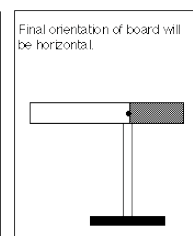


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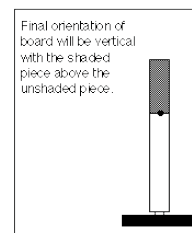


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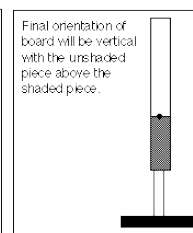


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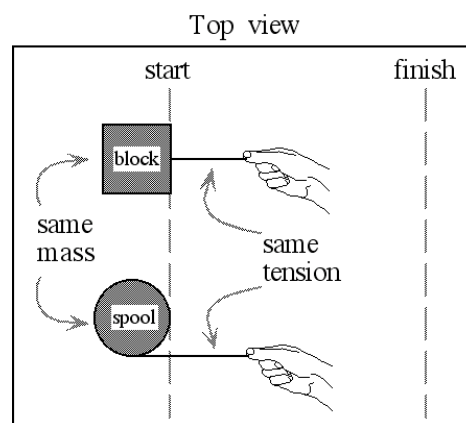
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Will the spool begin to rotate? No. The spool will not begin to rotate.

Explain. Because it is a frictionless surface, the spool will not rotate. There must be resistance for the spool to unravel.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line at the same time as the block.

Explain. The spool and the block are both of the same mass and they are being pulled with the same tension across a frictionless surface. The spool will not unravel therefore it will have to be pulled the same distance and with the same speed as the block.



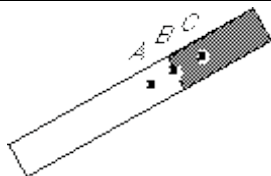
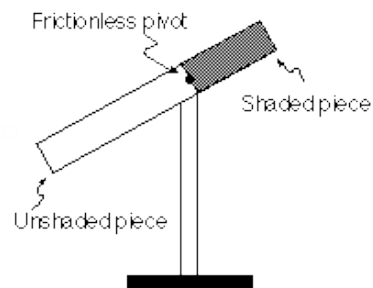
END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? There is not enough information to tell which has a greater mass.

Explain. density is different from mass, the unshaded could be more dense and have less mass



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. a point mostlikey balance the stick was choosen

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No.
The board will move after it is released.

Explain. because it moved in the other pictures

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 1

Explain. because in previous events it was like that

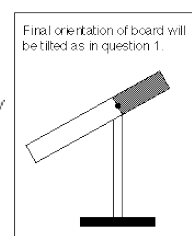
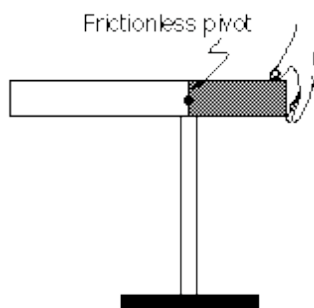


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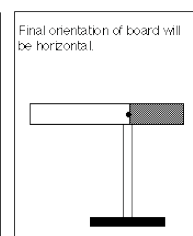


Figure 2.

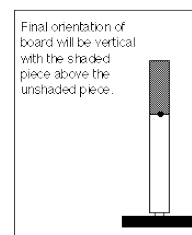


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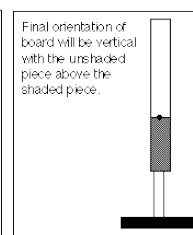


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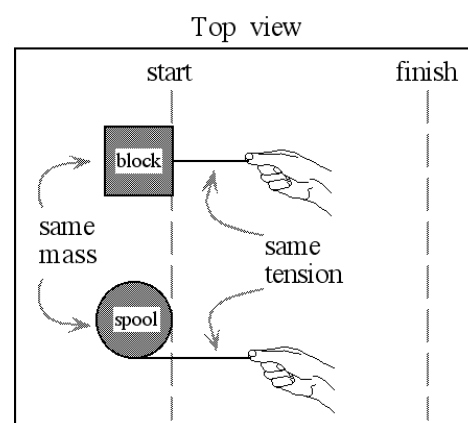
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Will the spool begin to rotate? No. The spool will not begin to rotate.

Explain. you need friction to produce a torque to begin rotation

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line at the same time as the block.

Explain. same mass

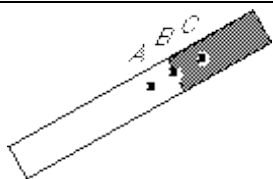
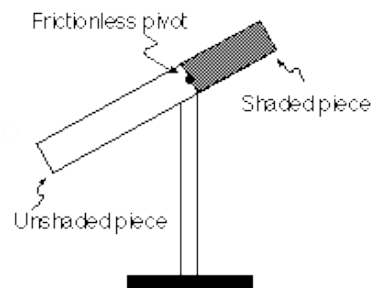


END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is greater than the mass of the shaded piece. Explain. The mass of the unshaded piece is leaning down.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. The weight will then be distributed equally throughout the board and it would be level on the pivot.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released. Explain. Because it is not at the center of mass, the board will fall to the left b/c it is more massive on the side.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board. Figure 1
Explain.

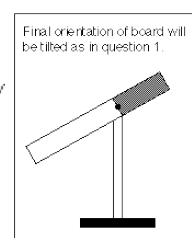
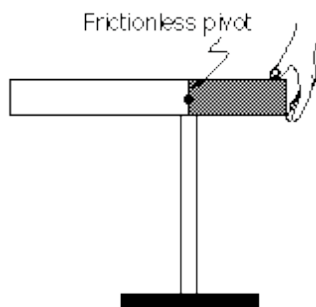


Figure 1.

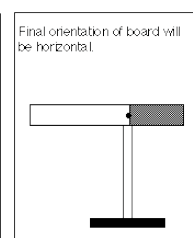


Figure 2.

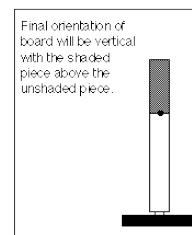


Figure 3.

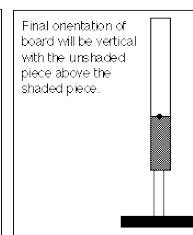
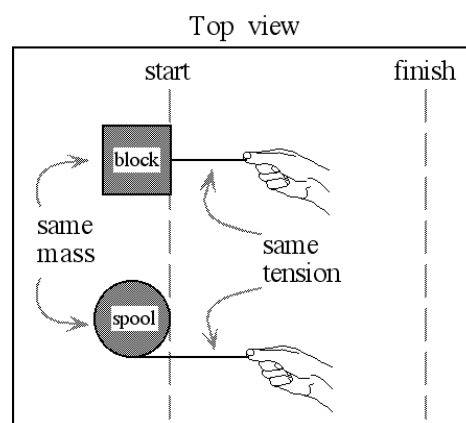


Figure 4.

Part II. A block and a spool, are each pulled across a level, frictionless surface. The string pulling the block is tied to a small hook at the center of the front face of the block. The string pulling the spool is wrapped many times around the spool and may unwind as it is pulled. The block and the spool have the same mass. The strings are pulled with the same constant tension and start pulling at the same time. (Assume the strings and the hook are massless.)

Will the spool begin to rotate? Yes. The spool will begin to rotate. Explain since the surface is frictionless, the tension on the string will cause the spool to unwind.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line after the block.
Explain. Even though the spool rotates, it still has a forward velocity, but it is much smaller than the block.



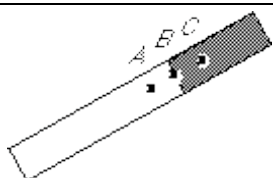
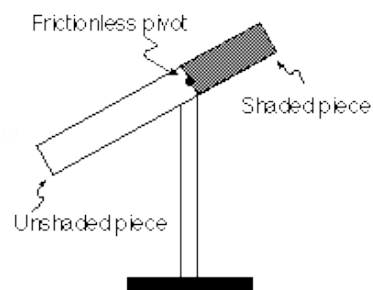
END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is less than the mass of the shaded piece.

Explain. since it is balanced at its center of mass, the shaded part length is smaller so its weight should be more and the non shaded part has a distance more so its weight should be less



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point B

Explain. from the diagram above it shows that it balances at b, therefor that should be its center of mass

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No.
The board will move after it is released.
Explain.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.
unanswered
Explain.

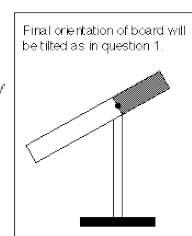
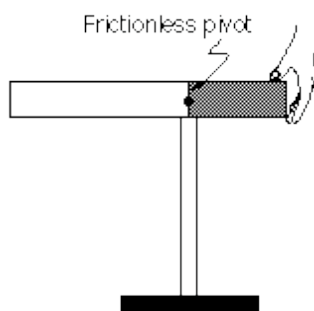


Figure 1.

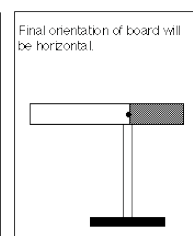


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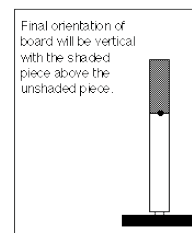


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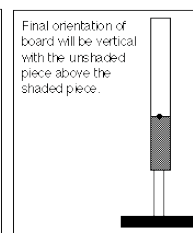
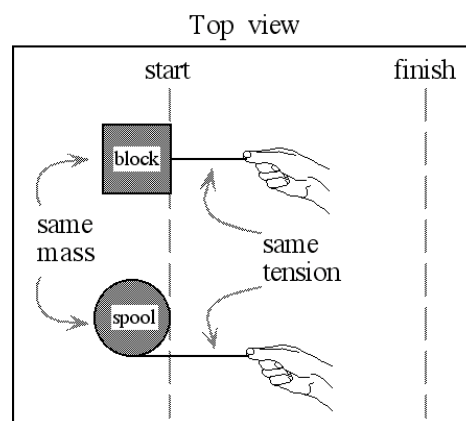


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Will the spool begin to rotate? Yes. The spool will begin to rotate.
Explain the tension in the string

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line after the block.
Explain. some of the kinetic energy it lost to rotation



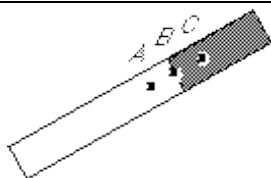
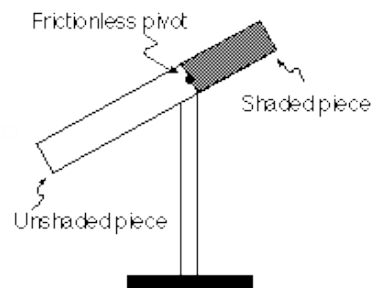
END OF RESPONSE

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The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is less than the mass of the shaded piece.

Explain. Pivot is bent toward the unshaded area which means the area of the unshaded area is greater in terms of the mass



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. We know that the unshaded area is massive so the Center of Mass will lie on the unshaded area.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released.

Explain. The board will again lean toward the unshaded area because that area is greater

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 1

Explain. The unshaded area is more massive but it does not have the force to make it all the way to the bottom

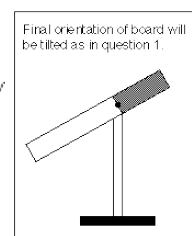
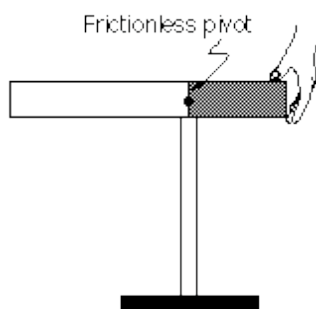


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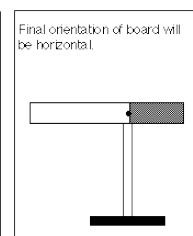


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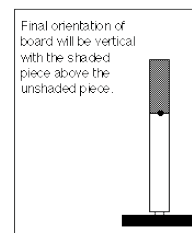


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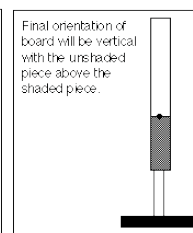


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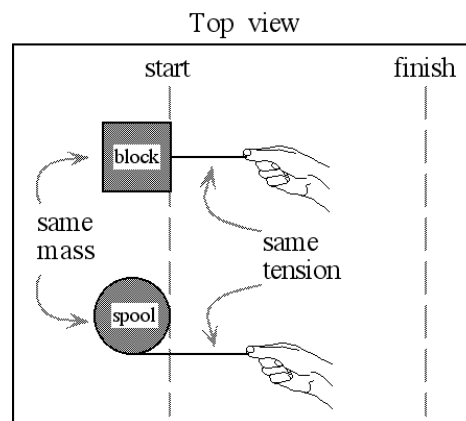
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Will the spool begin to rotate? Yes. The spool will begin to rotate.

Explain the spool is a sphere object and has angular velocity and acceleration

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line after the block.

Explain. lots of the force is converse into angular velocities and acceleration.



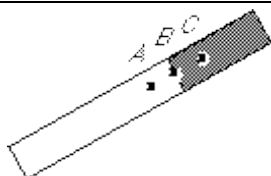
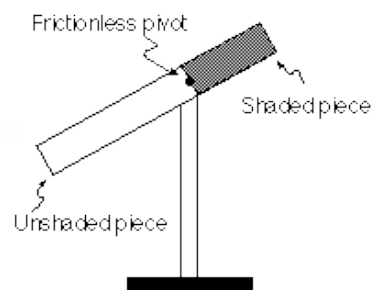
END OF RESPONSE

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The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? There is not enough information to tell which has a greater mass.

Explain. You can't tell in this case, because they are both of different lengths, and you cannot tell if they are the same mass or of different, due to a greater torque the unshaded one has.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. because we can see that in the first picture it is balancing on B and it is tilting towards the left, so if we put it a little more towards the left then maybe it will balance out.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released.

Explain. Since it was already tilted, but just moved back to another position, it will return to its original position after the hand lets go.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board. Figure 1

Explain. I don't think this object has enough torque to go all the way down or up (vertical).

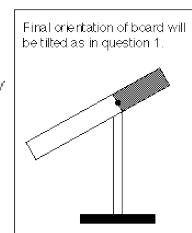
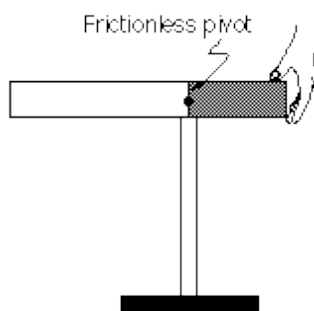


Figure 1.

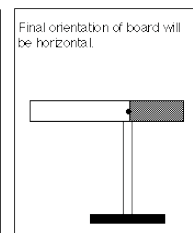


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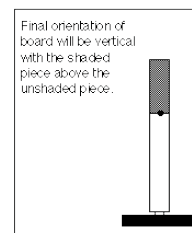


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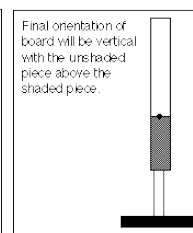


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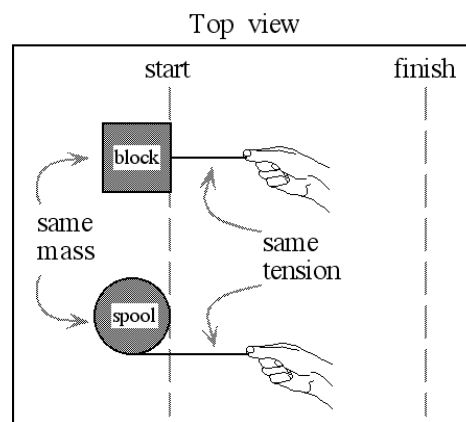
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Will the spool begin to rotate? No. The spool will not begin to rotate.

Explain. If there is no friction, then the spool should just slide? I'm not sure

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line after the block.

Explain. Because the spool has to convert its energy not only into translational energy, but also rotational energy.



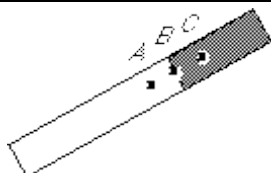
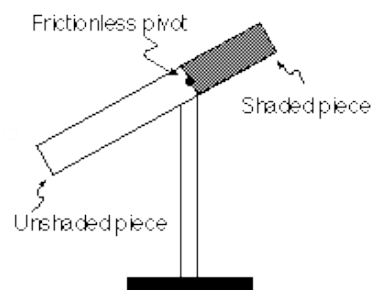
END OF RESPONSE

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The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is less than the mass of the shaded piece.

Explain. The mass of the shaded region must be greater. The pivot point is not located in the center of the board. If the masses were equal than the side of the pivot which was longer would point straight down. This is not the case, so the mass of the shaded region must be larger than the unshaded region which prevents the unshaded region from pointing straight down.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. The center of mass cannot be determined from the information given.

Explain. Center of mass location depends on the masses of the two m

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released.

Explain. The board will move since there are uneven forces acting on the two different sides of the pivot.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 1

Explain. The board will return to the position described earlier when the board was at rest.

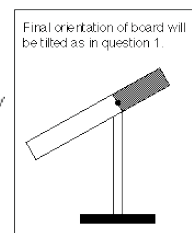
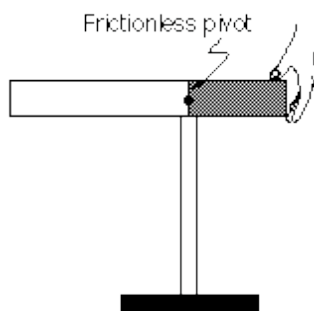


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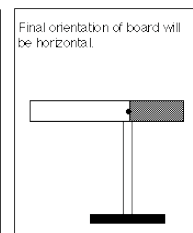


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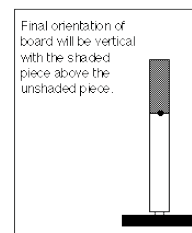


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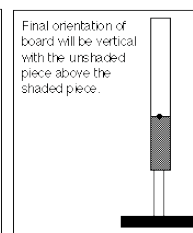


Figure 4.

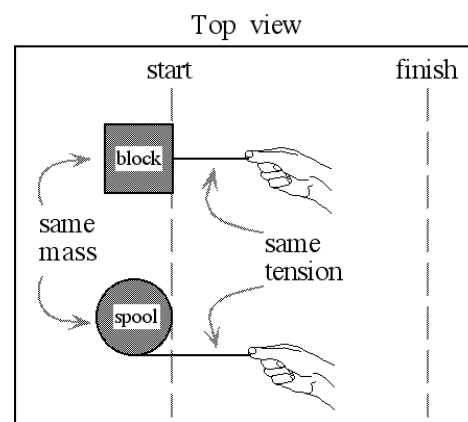
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Will the spool begin to rotate? Yes. The spool will begin to rotate.

Explain. Torque is being applied to the spool causing it to rotate

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line after the block.

Explain. Some of the energy applied goes into rotating the spool causing it to move slower than the block.

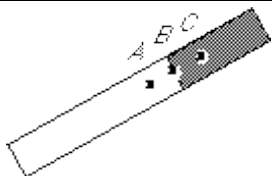
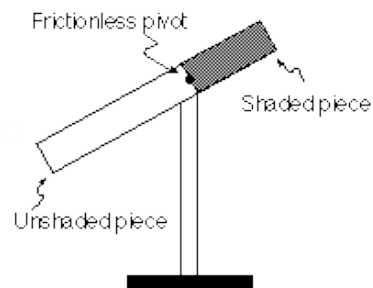


END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is greater than the mass of the shaded piece. Explain. The unshaded piece is greater in mass because the board leans in the direction of the unshaded piece.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. Point A is the center of mass since the unshaded piece is heavier than the shaded piece.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released. Explain. The board will once again move in the direction of the unshaded piece because it has a greater mass than the shaded piece.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board. Figure 1
Explain. The variables remain the same. The board will be in the same position tilted similar to the first position.

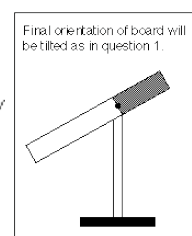
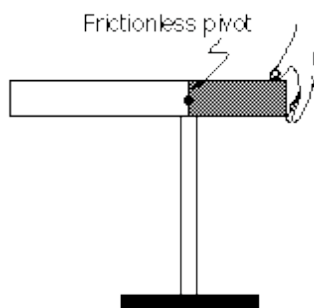


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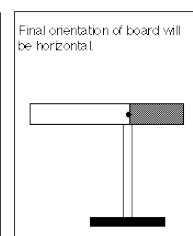


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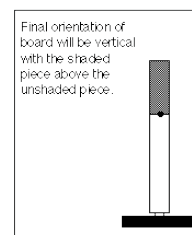


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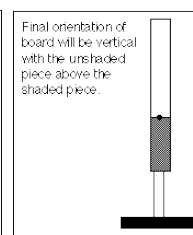
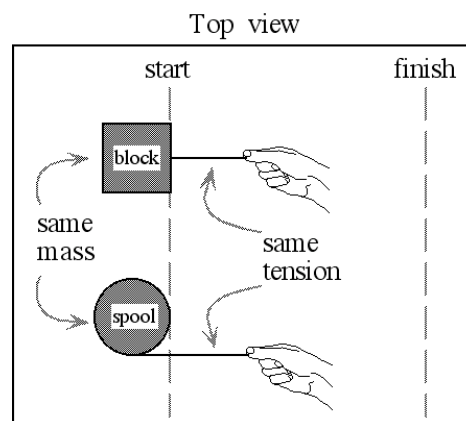


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Will the spool begin to rotate? Yes. The spool will begin to rotate. Explain. Because the string unwinds as it is being pulled, this indicates that the spool will be rotating in order for the string to unwind.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line after the block. Explain. Because the string is unwinding, it causes the spool to move counterclockwise, thus resulting in the spool crossing the finish line after the block.



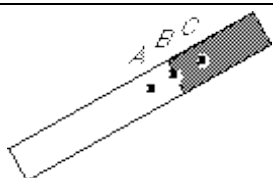
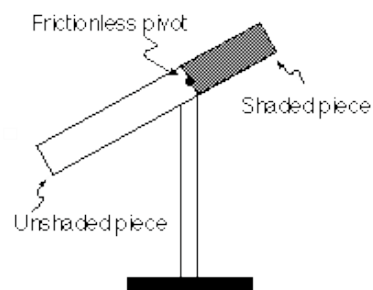
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A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is greater than the mass of the shaded piece.

Explain. the mass of the unshaded is greater because for it to balance, the unshaded is below the horizontal axis. If the pieces were of equal mass, when balance, the piece would be horizontal



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. Point A is the center of mass because at point B, the mass of the unshaded is greater than the shaded. Since the mass of the unshaded is greater than the shaded, the center of mass needs to be more towards the unshaded region.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released.

Explain. The board will not remain at rest because the unshaded region is heavier than the shaded and the pivot point is not in the same place as the point of center of mass.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board. Figure 3

Explain. The shaded piece will be above the unshaded because it has lighter mass than the unshaded.

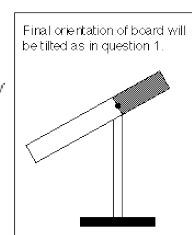
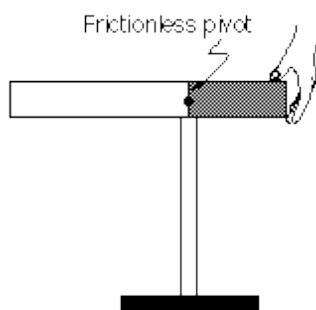


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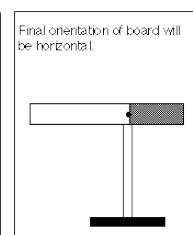


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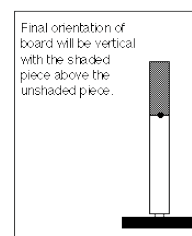


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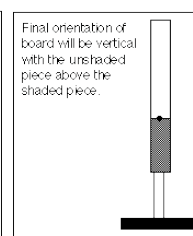


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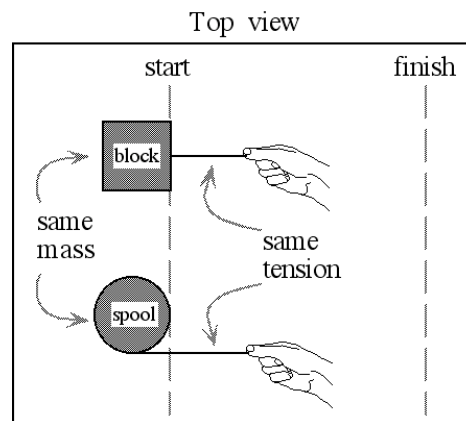
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Will the spool begin to rotate? Yes. The spool will begin to rotate.

Explain. The spool will begin to rotate because the string is wrapped around it, when the string is pulled, it will unwind and cause the spool to rotate.

Which of the following options best describes when the spool crosses the finish line? The center of the spool stays in the same place, and the spool does not cross the finish line.

Explain. The spool will rotate in place because the surface is frictionless.

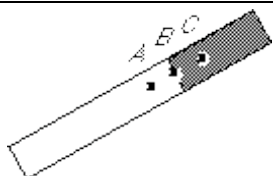
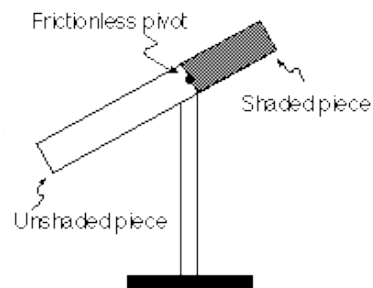


A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is less than the mass of the shaded piece.

Explain. The center of mass for the unshaded piece is further from the center of mass of the board than that of the shaded piece. To remain balanced, the unshaded piece must have less mass



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point B

Explain. the center of mass and center rotation are same, if point A or C were the center, the block would rotate until oriented vertically.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released.

Explain. the board will rotate until the mass-distance(horizontal) products are equal for the two portions

Choose the figure from the choices at far right that most accurately shows the final orientation of the board. unanswered
Explain.

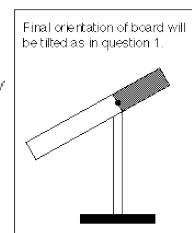
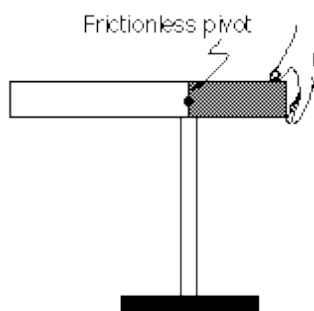


Figure 1.

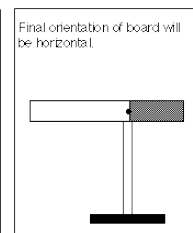


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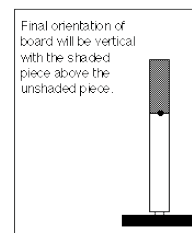


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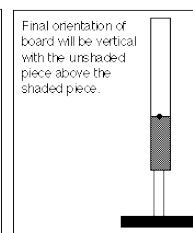
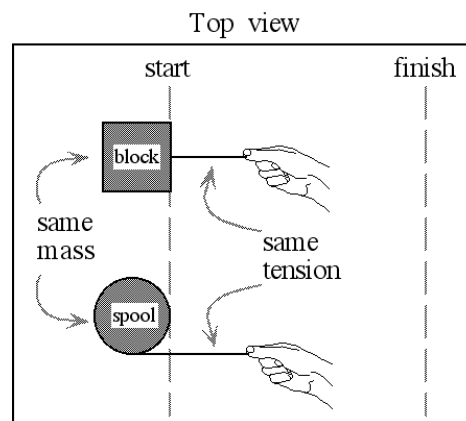


Figure 4.

Part II. A block and a spool, are each pulled across a level, frictionless surface. The string pulling the block is tied to a small hook at the center of the front face of the block. The string pulling the spool is wrapped many times around the spool and may unwind as it is pulled. The block and the spool have the same mass. The strings are pulled with the same constant tension and start pulling at the same time. (Assume the strings and the hook are massless.)

Will the spool begin to rotate? unanswered
Explain

Which of the following options best describes when the spool crosses the finish line? unanswered
Explain.



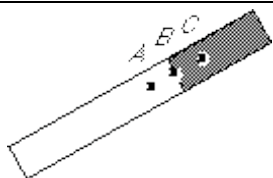
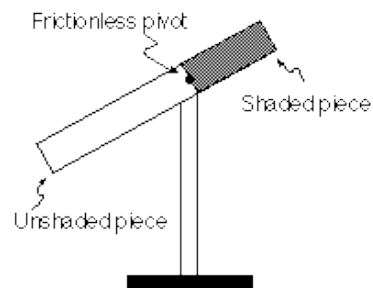
END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? There is not enough information to tell which has a greater mass.

Explain. the comparison shows the torque, which is the force (ie mass*gravity) times the length, the length isn't given though



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point

A

Explain. the earlier diagram showed that at point B the stick was unbalanced to the shaded side.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released.

Explain. the board would revert to it's earlier position because the torque of the hand is removed.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 1

Explain. all original torques are now acting, so it is the same as it was initially.

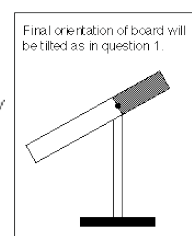
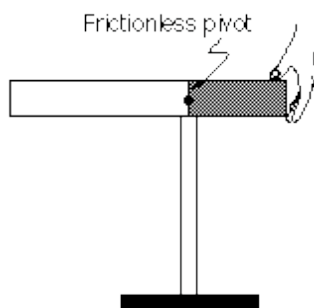


Figure 1.

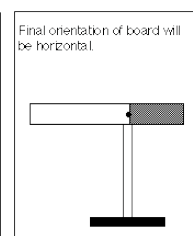


Figure 2.

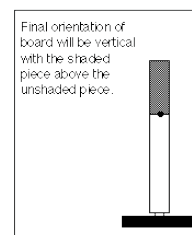


Figure 3.

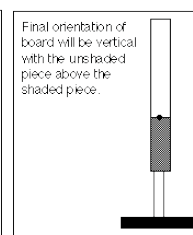


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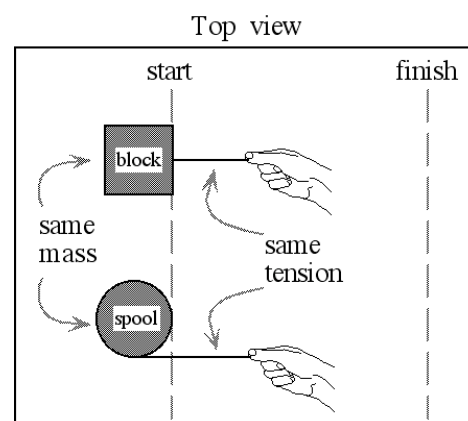
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Will the spool begin to rotate? Yes. The spool will begin to rotate.

Explain. it certainly rotates when it unwinds, it may also rotate depending on friction and tension.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line after the block.

Explain. it has rotational velocity as well as translational, but the same force is being applied, so it is moving slower.



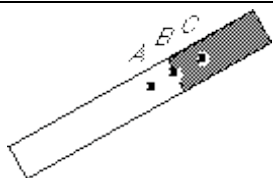
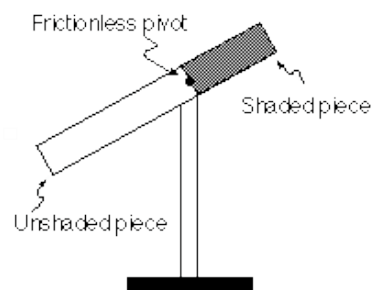
END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is less than the mass of the shaded piece.

Explain. Because for the board to be able to stay in place, the unshaded has to be less in mass due to it being much longer than the shaded.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point B

Explain. It is the point where the whole system pivots upon.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? Yes. The board will remain at rest.

Explain. Since the board is able to stay at rest before, it will still.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 2

Explain. The force that pulls both sides down would be the same, thus making them stay at rest at any position directed.

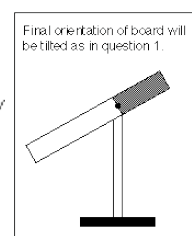
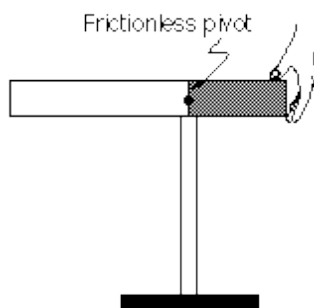


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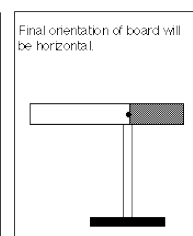


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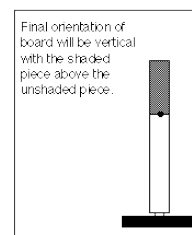


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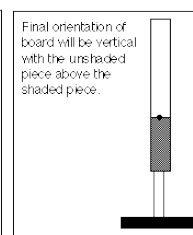


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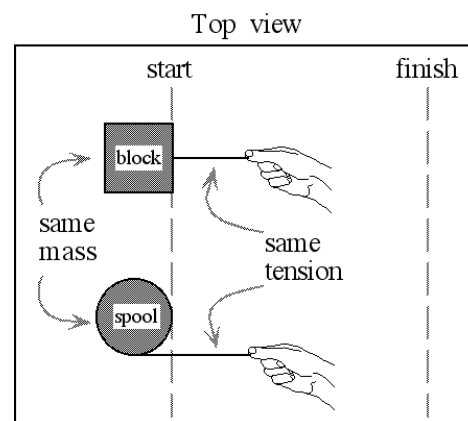
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Will the spool begin to rotate? Yes. The spool will begin to rotate.

Explain. The way the string is tied onto the spool makes the spool spin instead of going all straight.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line after the block.

Explain. Due to the way the string is tied to the spool, when the person pulls the string the spool will only move a little of its center of mass.

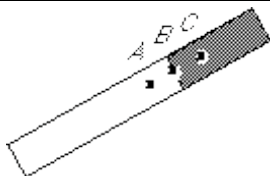
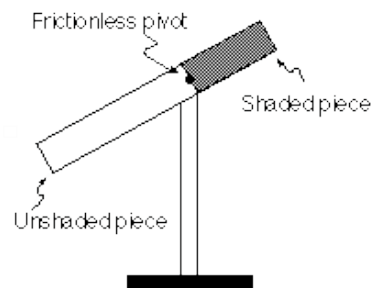


END OF RESPONSE

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The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is greater than the mass of the shaded piece. Explain. The board is tilted to the left. Meaning the unshaded piece is heavier than the shaded.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. Because the board tilts when the center is at B. The center of mass must be at A to redistribute the mass.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released. Explain. The board will tilt to the left because the left side is more massive.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 3

Explain. The mass would be up and down because gravity will act on it to result in Figure 3.

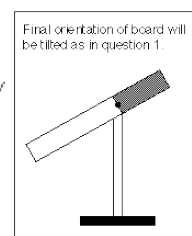
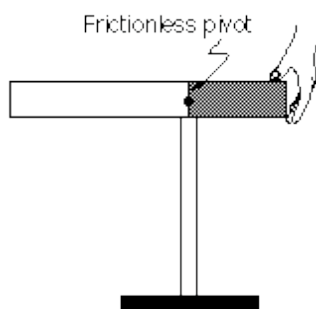


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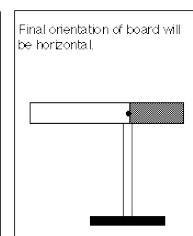


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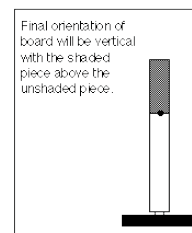


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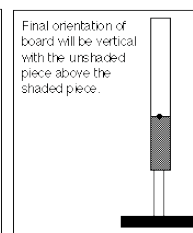


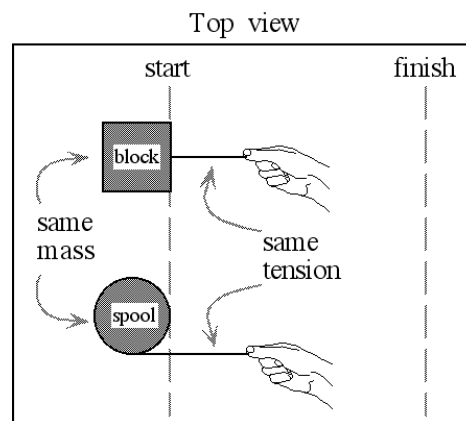
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Will the spool begin to rotate? No. The spool will not begin to rotate. Explain. The string is tied to the bottom. Therefore it will not rotate.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line at the same time as the block.

Explain. Because they are the same mass and are being pulled with the same force. They will pass the finish line at the same time.



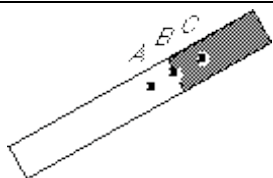
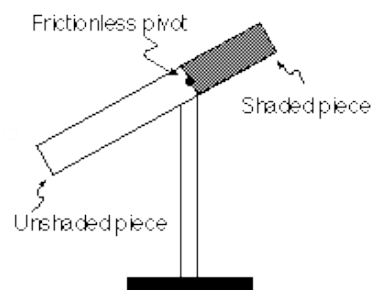
END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is equal to the mass of the shaded piece.

Explain. If the mass of U were less than S, then it would be level. If the mass of U were equal to S, then it wouldn't be able to balance and it would spin further.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point B

Explain. The center of mass is where the board is balanced, its center of gravity.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released.

Explain. The downward force of gravity will pull one of the sides downward and cause the board to spin.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 3

Explain. It'll pass the balanced orientation of 1 when there is a force applied downward. Since the shaded portion has more mass than an equal portion of the unshaded the gravitational force will have a greater effect in rotating the board. It'll end up in position 3 when the rotation is over

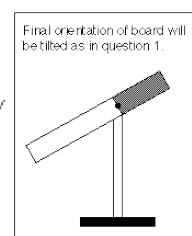
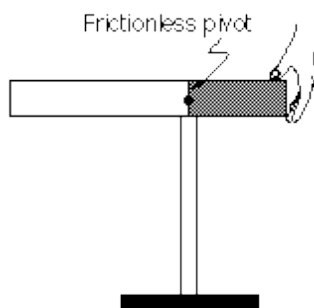


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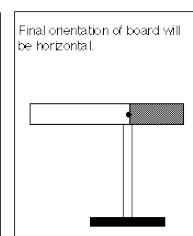


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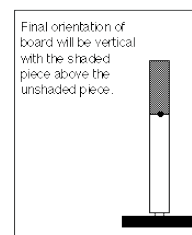


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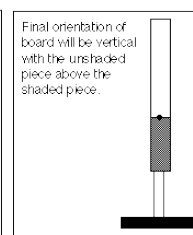


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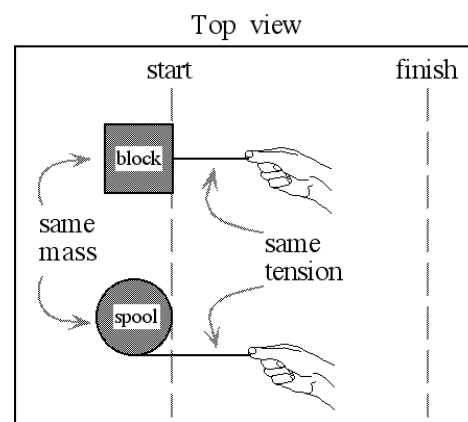
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Will the spool begin to rotate? No. The spool will not begin to rotate.

Explain. Since the surface is frictionless there is no way that the spool can unwind--since friction is needed to cause an object to rotate.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line at the same time as the block.

Explain. There are no forces to change the moving of either the spool or the block. Since they have the same mass and only an equal tension affects both objects they move together and finish together.



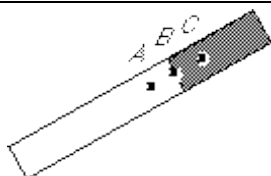
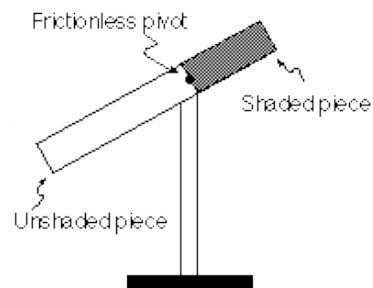
END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is less than the mass of the shaded piece.

Explain. The mass of the shaded piece is greater because the center of mass is closer to it than it is to the unshaded piece, meaning that the shaded piece has greater mass.



choice.

The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. If the center of mass were B then the board would have been level in the first question. Since it slanted to the left instead, then the center of mass must be to the left, thus A is the only possible

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released.

Explain. The board will move to the position where it is perfectly balanced on the pivot. This will be the same position as in the initial question.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board. Figure 1
Explain. The board obtains the position of perfect balance, thus it obtains the position as in the first question. This is the position in figure 1.

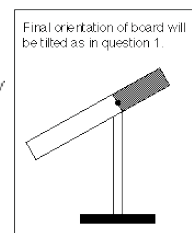
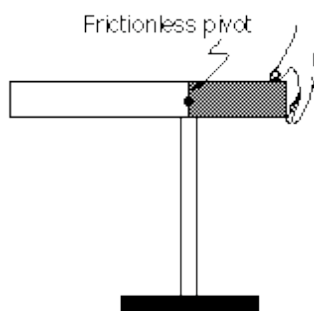


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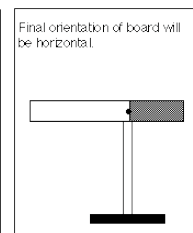


Figure 2.

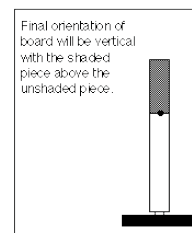


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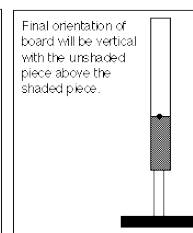


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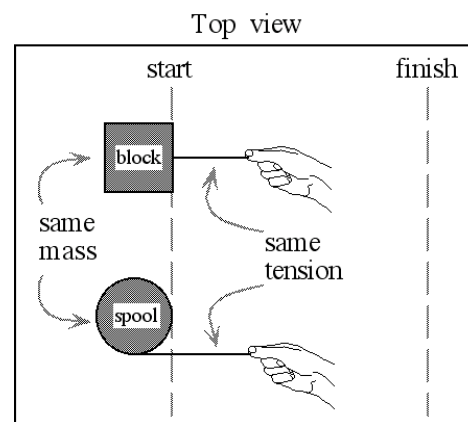
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Will the spool begin to rotate? No. The spool will not begin to rotate.

Explain. The spool will not rotate because there is no friction present. thus there is no reason for the spool to rotate because the only force acting on it is from the string.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line at the same time as the block.

Explain. Since all of the tension in both objects is transferred to translational energy, then both cross the line at the same time. This would not be the case though if the spool were to rotate.

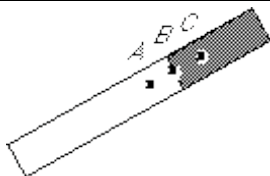
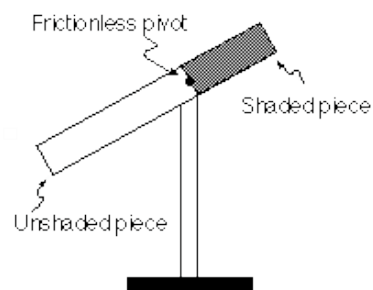


END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is greater than the mass of the shaded piece. Explain. The mass of the unshaded piece is greater than the mass of the shaded piece because the mass of the unshaded piece looks heavier from the diagram shown from up above.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point B

Explain. Point b is the center of the mass because it is inbetween the two other points. The diagram is another reason why point b is considered the center of the mass. It is balanced where point b is placed.

If it were not on point b, the board would tip over.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released. Explain. It will move because it is not placed on the center of the mass, point b.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 3

Explain. Figure 3 will be the final orientation because it was stated that the board will tip if it is not place on the center of the mass. The unshaded region will be on the bottom of the vertical position because the unshaded region was stated greater than the shaded region.

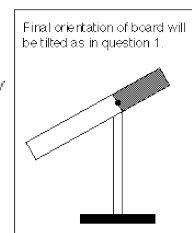
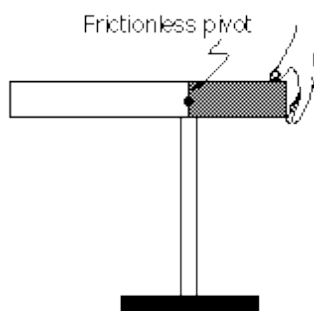


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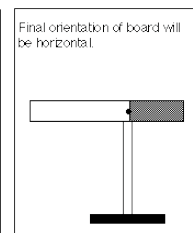


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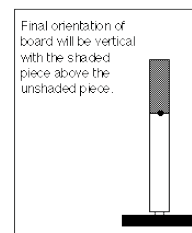


Figure 3.

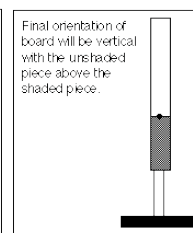


Figure 4.

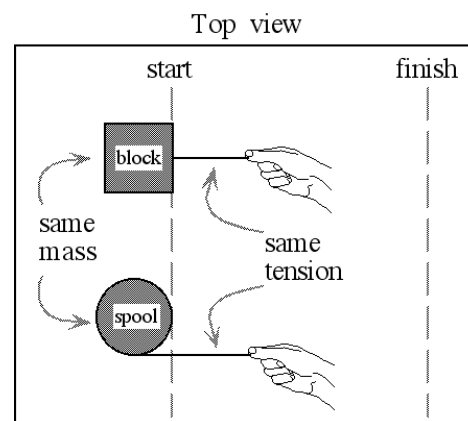
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Will the spool begin to rotate? Yes. The spool will begin to rotate.

Explain. The spool will rotate because once you pull on the string, the hook will pull on the spool, which causes the spool to move in a rotational motion.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line after the block.

Explain. The spool will cross after the block because the spool is in a rotating motion, which makes the spool to move slower. The block will go faster because it does not have to rotate and it directly slides down.

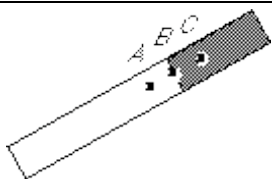
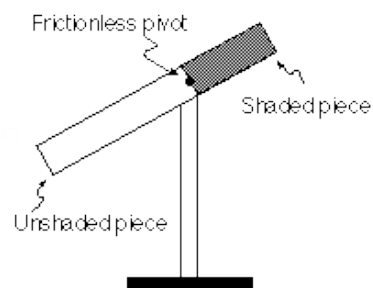


END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is greater than the mass of the shaded piece. Explain. Because the unshaded piece is hanging lower.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. The center of mass is that spot where the board would balance evenly so that must be to the left of where the current pivot point is.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released. Explain. The center of mass is located to the left of the pivot point so the board will swivel to the original location.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board. Figure 1

Explain. The board will move so as to get back to its equilibrium position which is the one illustrated in figure 1.

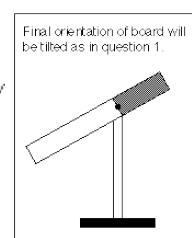
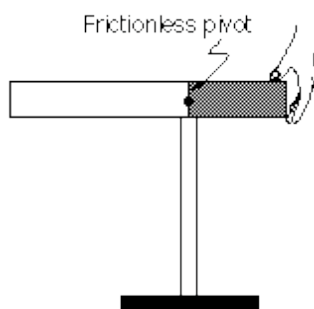


Figure 1.

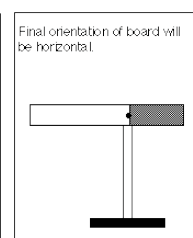


Figure 2.

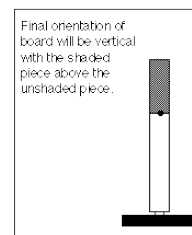


Figure 3.

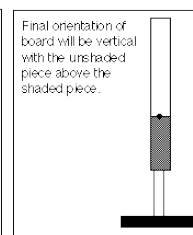


Figure 4.

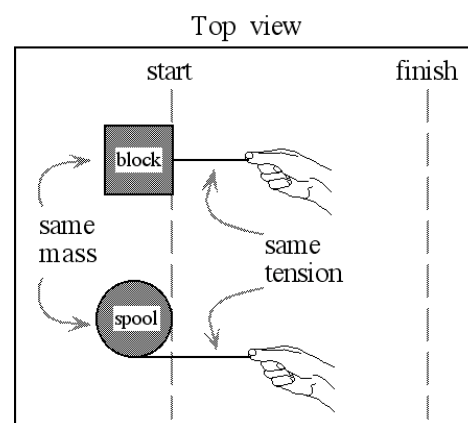
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Will the spool begin to rotate? Yes. The spool will begin to rotate.

Explain. Since there is no friction between the table and the spool, a lot of the energy put into the spool will translate into rotational energy.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line after the block.

Explain. Some of the energy from the string will be translational energy which will pull the spool across the table.



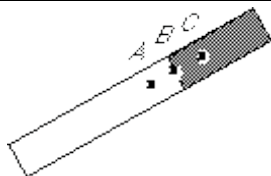
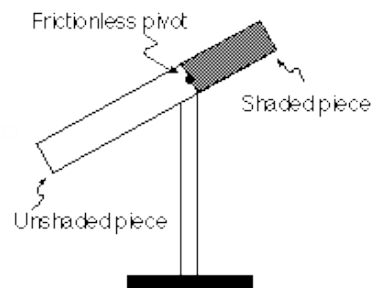
END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? There is not enough information to tell which has a greater mass.

Explain. Depending on the mass density of each of the piece, one could be heavier than the other or vice versa.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. The center of mass cannot be determined from the information given.

Explain. Center of mass depends on the mass of each of the piece and the mass depends on the density, of which we don't know; so we can't determine the center of mass just by the given information.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released?
There is not enough information to tell whether the board will move after being released.

Explain. The board remaining at rest or moving after its release again depends on the mass of each of the piece, which depends on the unknown mass density. We can't tell whether it will move if we do not know which piece is heavier or has higher mass density.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board. Figure 3

Explain. If the unshaded piece is heavier, this orientation would be the most logical for the given situation.

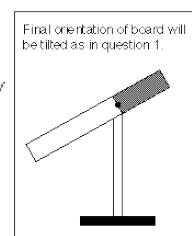
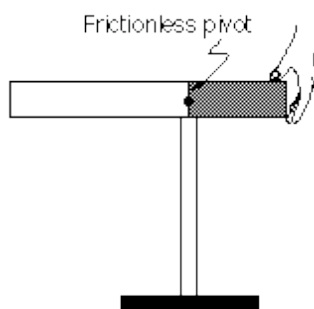


Figure 1.

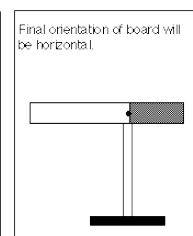


Figure 2.

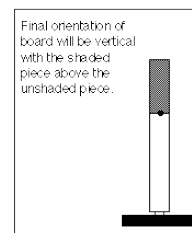


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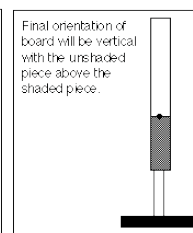


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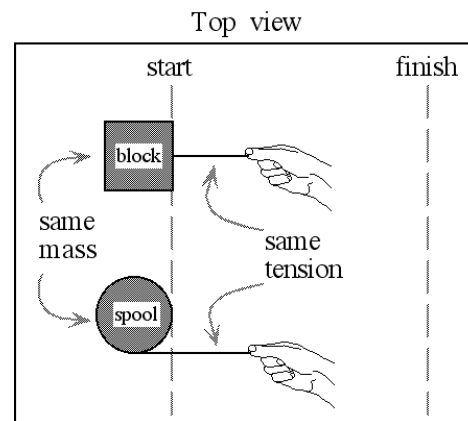
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Will the spool begin to rotate? Yes. The spool will begin to rotate.

Explain. It seems logical that the spool will begin to rotate.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line after the block.

Explain. For the block, the energy all goes into translational motion while for the spool the energy goes into both translational and rotational motion. This causes the spool to take longer to cross the finish line than the block.

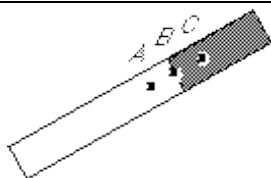
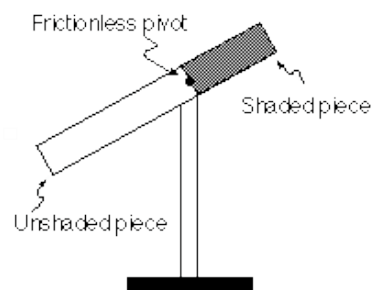


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The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is equal to the mass of the shaded piece.

Explain. It seems that if the two shaded area's didn't have equal masses... the board would tip over.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point B

Explain. The same reason as above.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? Yes.

The board will remain at rest.

Explain. I'm not sure why.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 2

Explain. This answer would be consistent with what i had already stated.

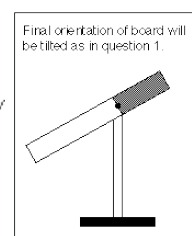
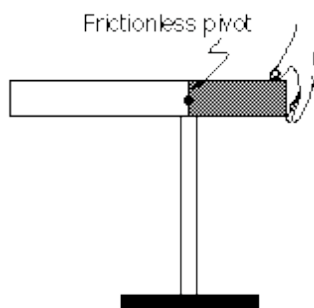


Figure 1.

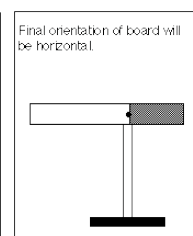


Figure 2.

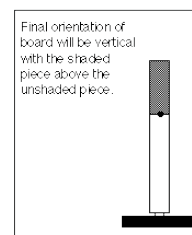


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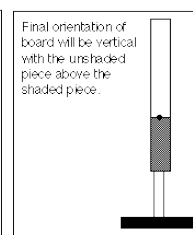


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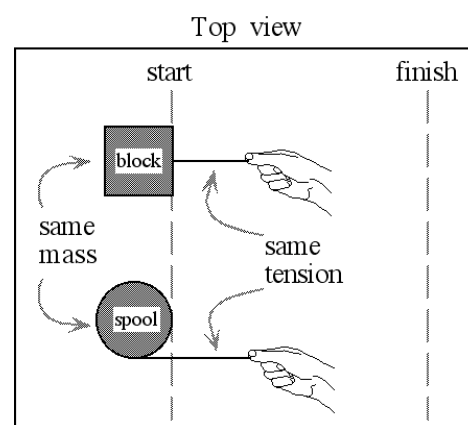
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Will the spool begin to rotate? No. The spool will not begin to rotate.

Explain. There would need to be a frictional force that would create a pivot in order for the spool to spin.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line at the same time as the block.

Explain. If the spool doesn't spin, it is essential a block.



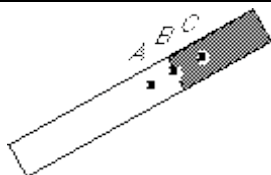
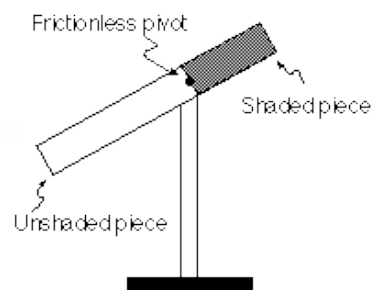
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The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is greater than the mass of the shaded piece.

Explain. because if they were of the same mass then they would remain in balance position. weight is equal of mass times gravity. since gravity is the same for both of them, the mass must be different, and looking at the picture, the weight force on the unshaded piece is greater and therefore pulling the piece down.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. center of mass of non uniform bodies are likely closer to the heavier side.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? Yes.
The board will remain at rest.

Explain. I'm not sure I understand the situation!!

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 1

Explain. the mass of each side of the board haven't changed therefore it should remain in its original position.

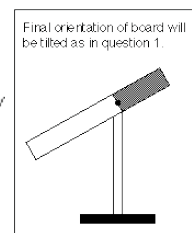
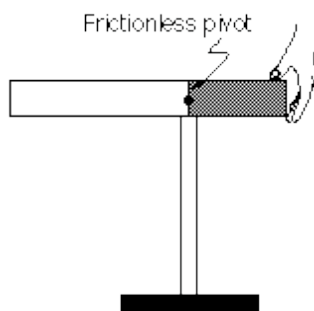


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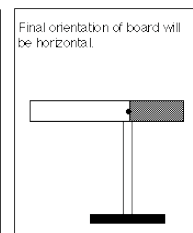


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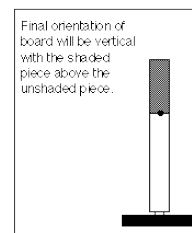


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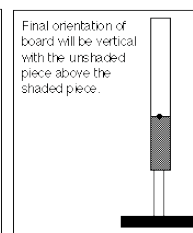


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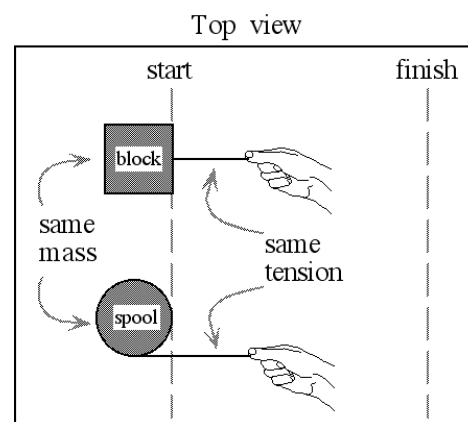
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Will the spool begin to rotate? Yes. The spool will begin to rotate.

Explain because there is a tension force exerting on the spool which will generate torque

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line after the block.

Explain. because the tension force on the block all goes into kinetic energy to move the block. where as on the spool, part of the force also convert into rotational force to spin the spool and not all into kinetic energy to move the spool.

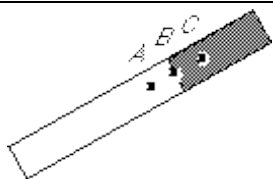
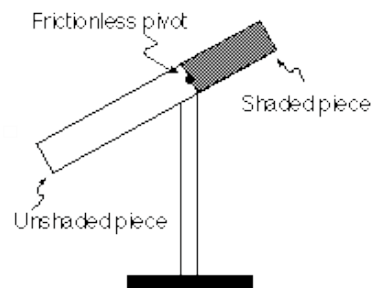


END OF RESPONSE

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The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? There is not enough information to tell which has a greater mass. Explain.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point B

Explain. this is the point where the board pivots from

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released. Explain. since it is the same board it must move because it was at rest when the board was pivoted to the left and the shaded side was higher

Choose the figure from the choices at far right that most accurately shows the final orientation of the board. Figure 1
Explain. the board will go back to its original configuration.

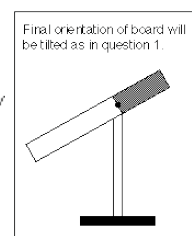
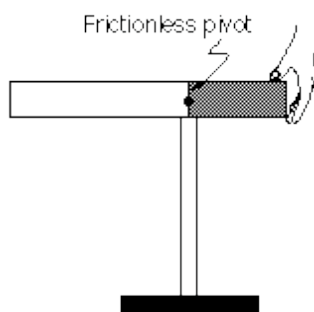


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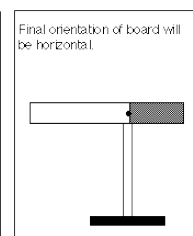


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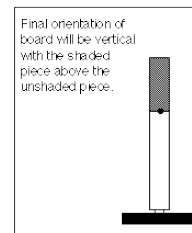


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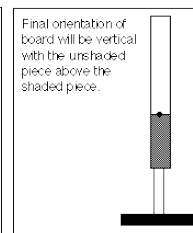
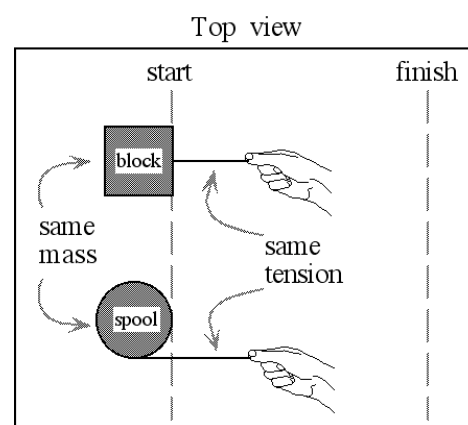


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Will the spool begin to rotate? No. The spool will not begin to rotate. Explain the surface is frictionless, so there can be no torque applied to the spool at the point of contact, since there is no torque there cant be any rotation

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line at the same time as the block. Explain. both the spool and the block will cross the line at the same time, because all the energy that will make the spool and block move is translational, no rotational energy is formed from the spool because the surface is frictionless

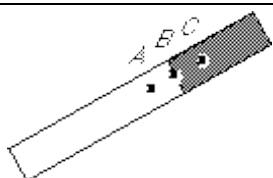
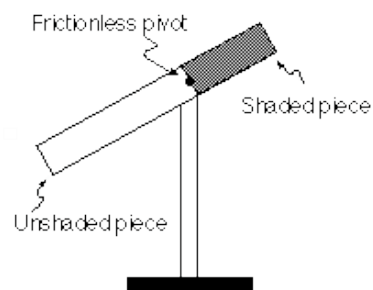


END OF RESPONSE

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The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is greater than the mass of the shaded piece. Explain. It looks like its greater because if it was less than the board would not be balanced. If the axle were in the middle than it would seem as if the board would be horizontal meaning there is more unshaded area and more mass.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. Because the board is tipping when the axle is located at B it looks as if it were at point A the board would be horizontal.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released. Explain. Because the mass of the unshaded area is greater the board would have more force acting in the direction of gravity.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board. Figure 3
Explain. Because there is a torque acting on the board downward the board would be vertical to its force.

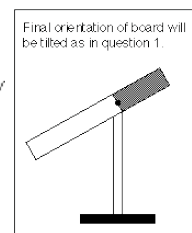
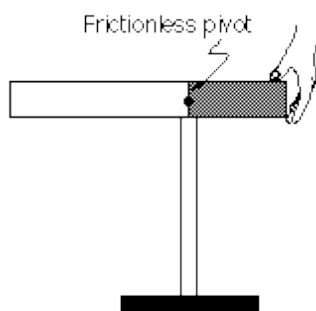


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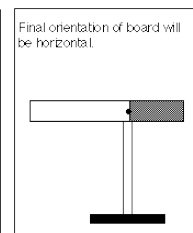


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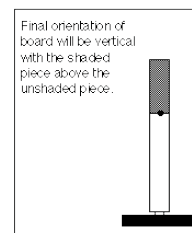


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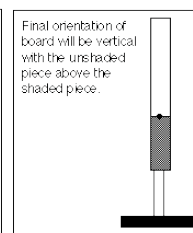
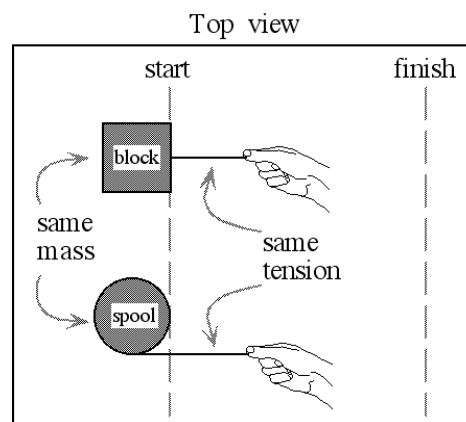


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Will the spool begin to rotate? Yes. The spool will begin to rotate. Explain. Because the torque in the direction of the tension is greater than the direction opposite of the tension. Therefore causing the spool to have a Angular acceleration in the direction of the hand.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line at the same time as the block. Explain. Because the square still is being rotated and the radius is equivalent to the squares radius as it spins in a circle they should both have an equal angular acceleration.

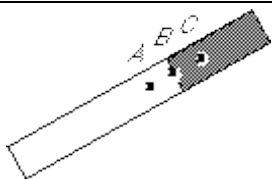
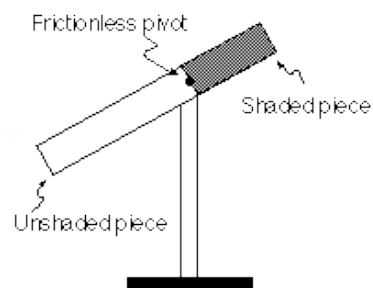


END OF RESPONSE

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The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is greater than the mass of the shaded piece.
Explain. The unshaded piece is lower than the shaded piece.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. The unshaded piece is heavier, so the CM is not going to be in the shaded region (so it is not C). It is not B either because when the pivot was placed at B, the board swayed to one side.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No.
The board will move after it is released.
Explain. the frictionless pivot point is not the board's CM, and since the unshaded region is heavier, when the board is released, it will rotate counter-clockwise

Choose the figure from the choices at far right that most accurately shows the final orientation of the board. Figure 3
Explain. the board does not have enough torque to keep it rotating. the shaded region is not heavy enough to maintain the board's rotation.

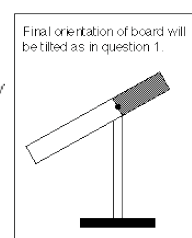
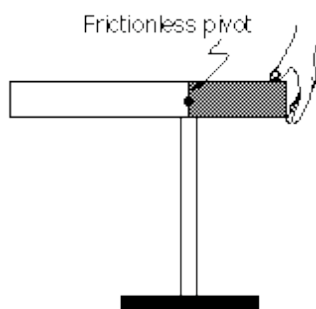


Figure 1.

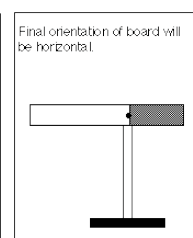


Figure 2.

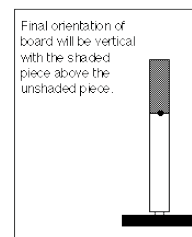


Figure 3.

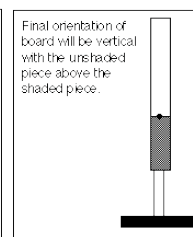
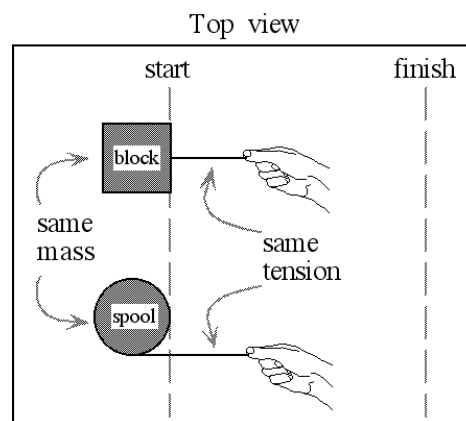


Figure 4.

Part II. A block and a spool, are each pulled across a level, frictionless surface. The string pulling the block is tied to a small hook at the center of the front face of the block. The string pulling the spool is wrapped many times around the spool and may unwind as it is pulled. The block and the spool have the same mass. The strings are pulled with the same constant tension and start pulling at the same time. (Assume the strings and the hook are massless.)

Will the spool begin to rotate? Yes. The spool will begin to rotate.
Explain because the person is pulling on a string wrapped around the the spool, the tension in the string will cause the spool to rotate.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line after the block.
Explain. the spool will stay in about the same position while all the string wrapped around it is being unwound by the hand pulling the string. after the pool is fully unwound, the spool will begin to move. because of this, the spool will take longer to cross the finish line than the block.



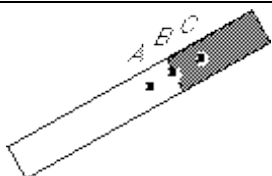
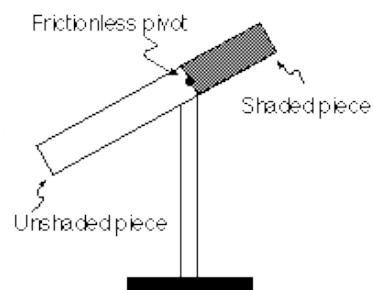
END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is equal to the mass of the shaded piece.

Explain. If the masses were not equal then the board would not balance at rest on the pivot, it would swing so that the heavier end was on the bottom and the board was completely vertical.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point B

Explain. If the two parts are equal in mass as I claimed earlier, then the point in between them is the center of mass, point B.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released.

Explain. the board will move into the position shown in the first diagram, or else fall off the pivot completely.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 3

Explain. Momentum will carry the unshaded piece through equilibrium to rest at the bottom, rather than tilted as before.

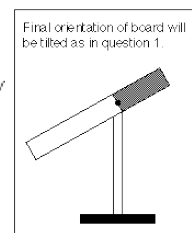
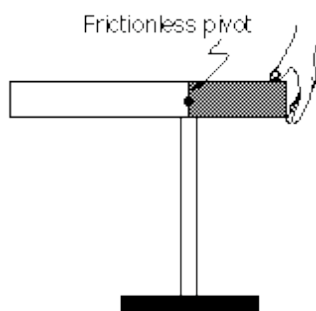


Figure 1.

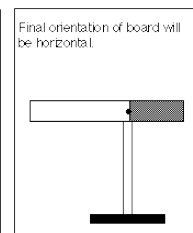


Figure 2.

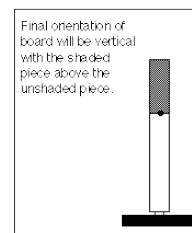


Figure 3.

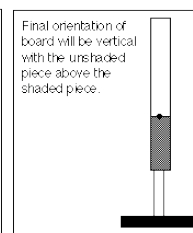


Figure 4.

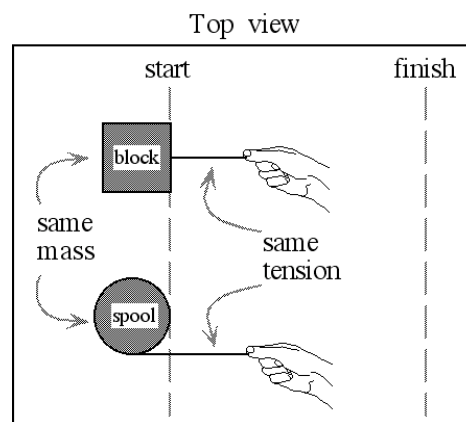
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Will the spool begin to rotate? Yes. The spool will begin to rotate.

Explain the string will unwind before it directly exerts tension force on the spool.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line after the block.

Explain. the block is pulled with constant tension and therefore constant speed, but the spool unwinds before it begins to move. therefore the block will win.

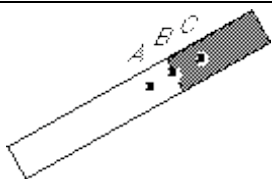
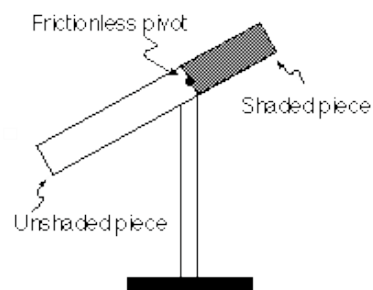


END OF RESPONSE

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The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is greater than the mass of the shaded piece. Explain. The board would be perpendicular to the ground if .



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. The shaded piece doesn't have enough mass to balance with the unshaded piece. So moving the point to give the shaded side more mass would.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released. Explain. The board would fall due to its greater mass affected by gravity. The greater mass

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 3
Explain.

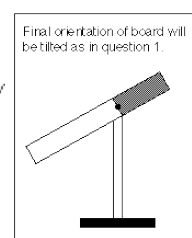
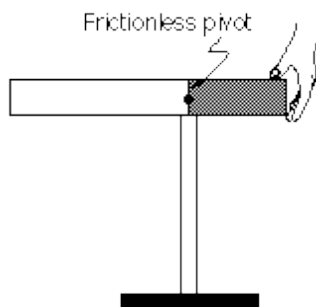


Figure 1.

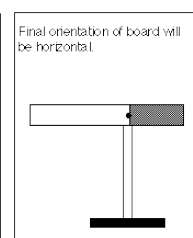


Figure 2.

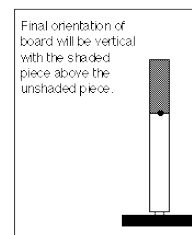


Figure 3.

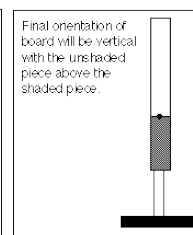
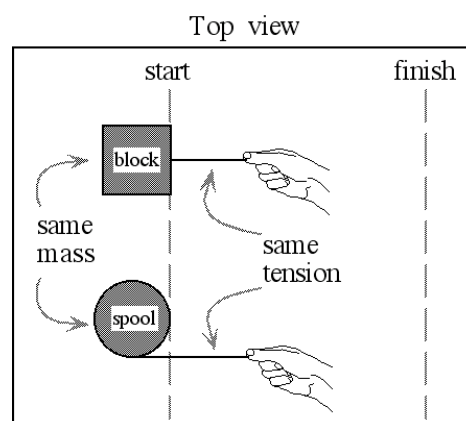


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Will the spool begin to rotate? Yes. The spool will begin to rotate. Explain. The spool acts as.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line after the block. Explain. The block

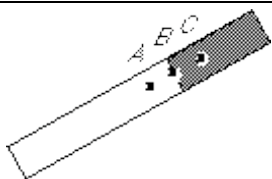
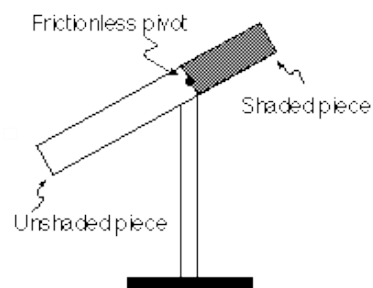


END OF RESPONSE

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The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is less than the mass of the shaded piece.
Explain. Heavier side would tilt down.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. Gravity acts on point A, that's why the unshaded part is tilted down.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No.
The board will move after it is released.
Explain. Unshaded area has a greater mass.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 1
Explain.

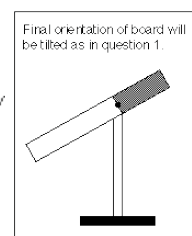
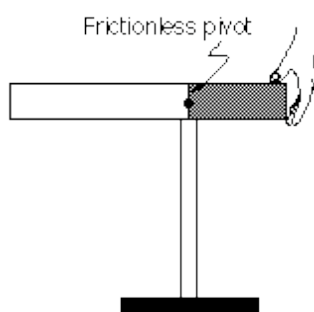


Figure 1.

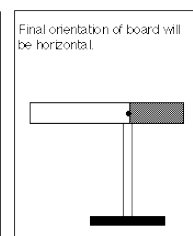


Figure 2.

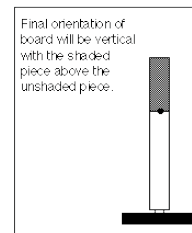


Figure 3.

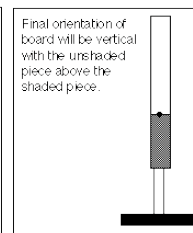
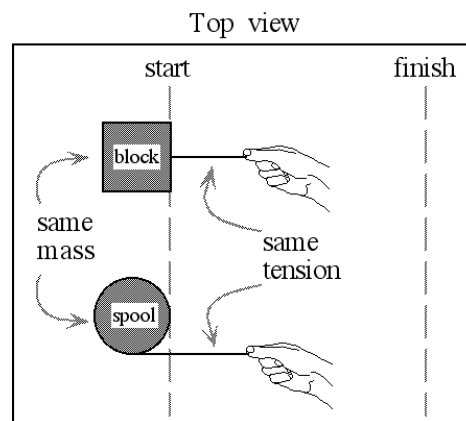


Figure 4.

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Will the spool begin to rotate? unanswered
Explain

Which of the following options best describes when the spool crosses the finish line? unanswered
Explain.

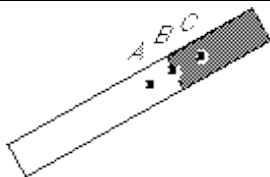
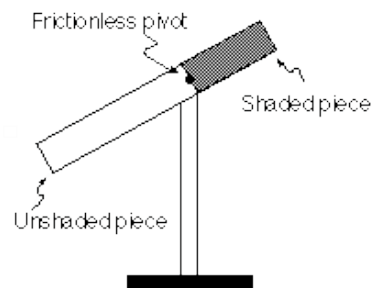


END OF RESPONSE

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The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is greater than the mass of the shaded piece. Explain. that explains the angle.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. the center of mass must lie to the left of the pivot, that is why it leans that way.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released. Explain. the unshaded side is heavier.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board. Figure 3

Explain. the heaviest side will fall toward the earth. like a teeter-totter with a parent on one end, and a kid on the other.

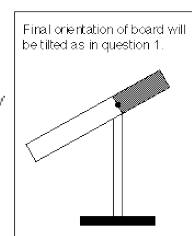
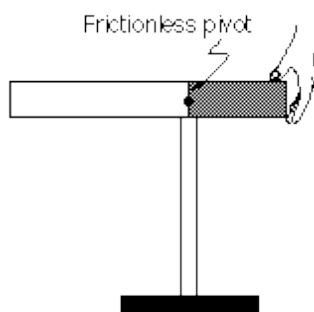


Figure 1.

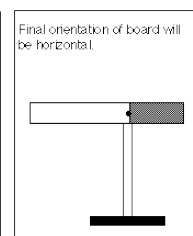


Figure 2.

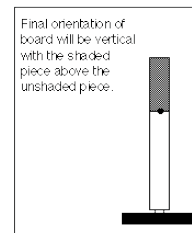


Figure 3.

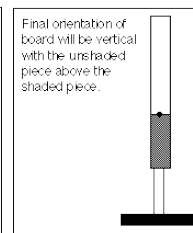
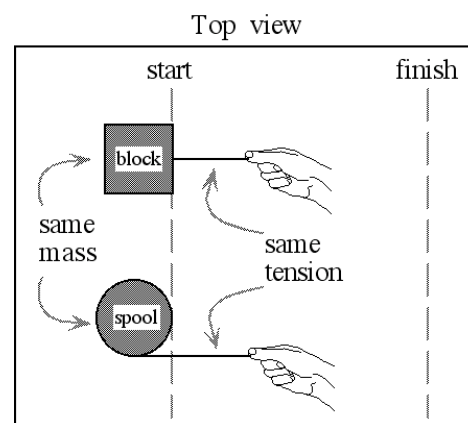


Figure 4.

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Will the spool begin to rotate? Yes. The spool will begin to rotate. Explain. the string creates a torque.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line after the block. Explain. some of the force goes into rotating the spool.

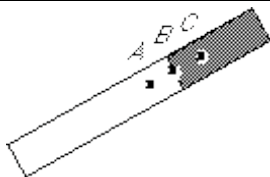
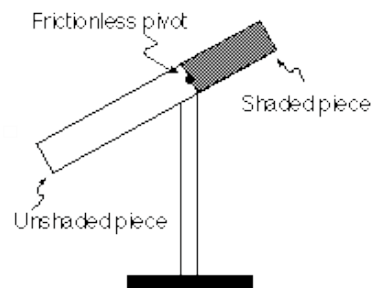


END OF RESPONSE

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The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? There is not enough information to tell which has a greater mass. Explain. It doesn't tell you what point the picture is of or how long each piece of board is.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A

Explain. because the mass should be centered more towards the heavier side.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released. Explain. because one side is heavier than the other.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board. Figure 3

Explain. Because the heavier side will go down.

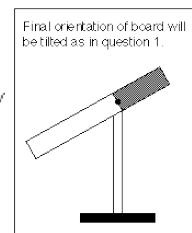
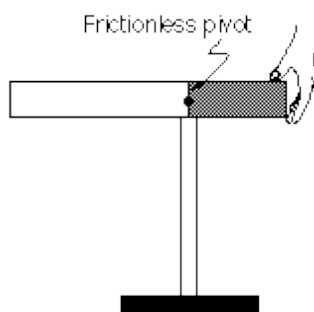


Figure 1.

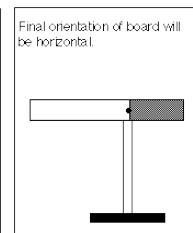


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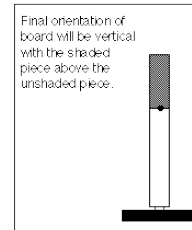


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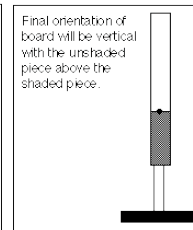
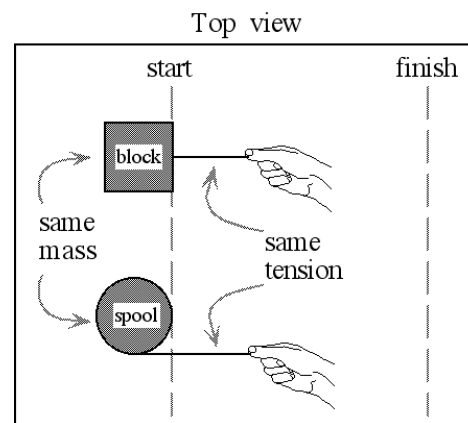


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Will the spool begin to rotate? No. The spool will not begin to rotate. Explain. Because there is no friction to cause it to rotate.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line at the same time as the block. Explain. because they have the same mass and the same force acting on them so they should have to same acceleration.

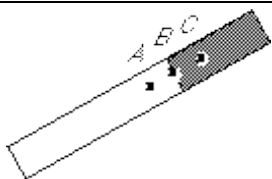
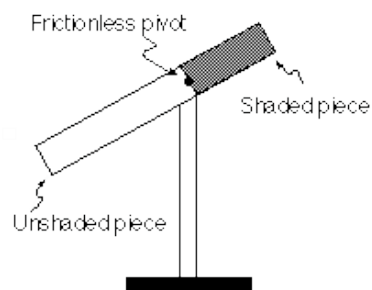


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The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is greater than the mass of the shaded piece. Explain.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point A
Explain.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No.
The board will move after it is released.
Explain.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.
Figure 1
Explain.

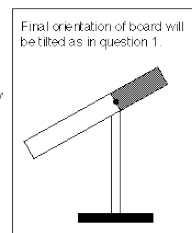
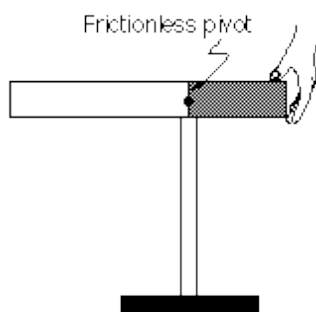


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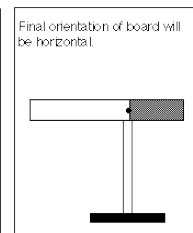


Figure 2.

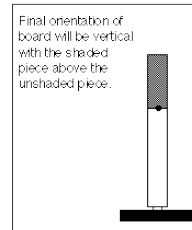


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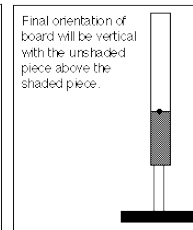
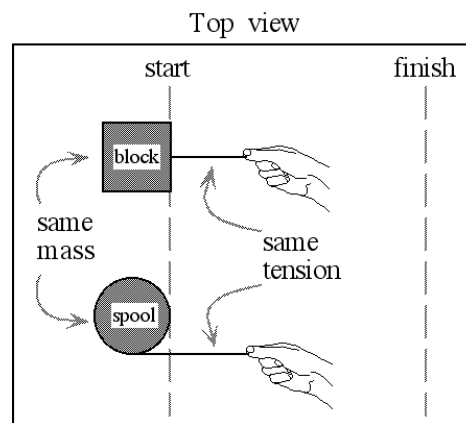


Figure 4.

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Will the spool begin to rotate? No. The spool will not begin to rotate.
Explain

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line at the same time as the block.
Explain.



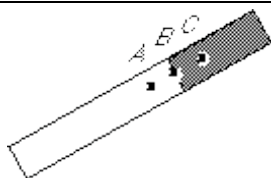
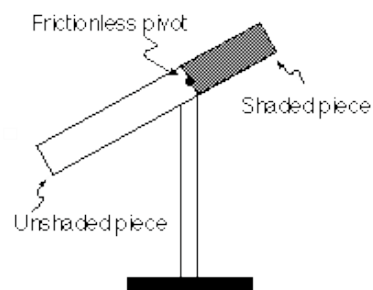
END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? There is not enough information to tell which has a greater mass.

Explain. I can not tell because i dont know where the stick is placed on the pivot, like in the middle or not.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. The center of mass cannot be determined from the information given.

Explain. same as above

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No.

The board will move after it is released.

Explain. this is what has shown before

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 2

Explain. because that was shown before

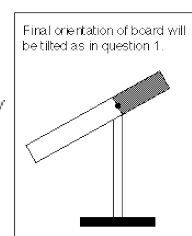
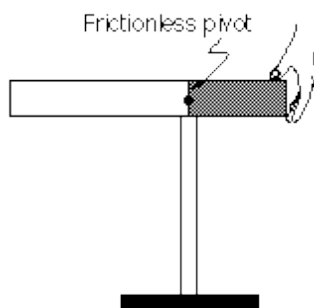


Figure 1.

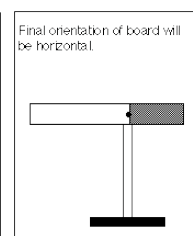


Figure 2.

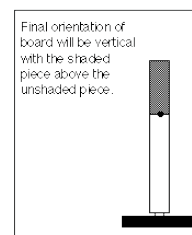


Figure 3.

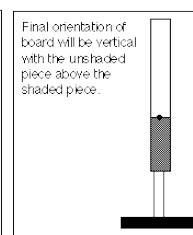


Figure 4.

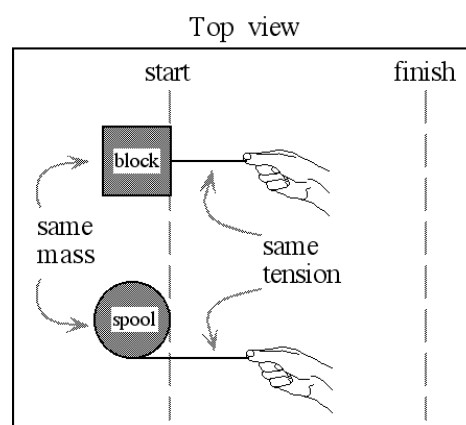
Part II. A block and a spool, are each pulled across a level, frictionless surface. The string pulling the block is tied to a small hook at the center of the front face of the block. The string pulling the spool is wrapped many times around the spool and may unwind as it is pulled. The block and the spool have the same mass. The strings are pulled with the same constant tension and start pulling at the same time. (Assume the strings and the hook are massless.)

Will the spool begin to rotate? No. The spool will not begin to rotate.

Explain this is because there is no friction

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line at the same time as the block.

Explain. because it has the same mass and the same amount of tension on it.



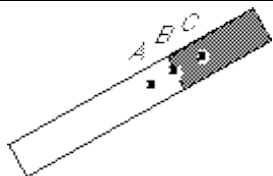
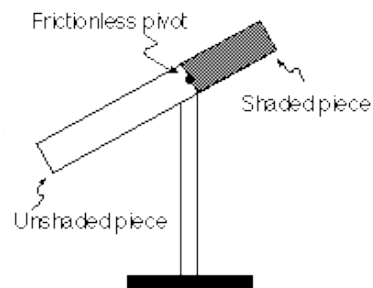
END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is less than the mass of the shaded piece.

Explain. to be able to balance like that, the unshaded piece would have to be less than the shaded piece.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point C

Explain. the center of mass will be closer to the part that has more mass. since the shaded part has more mass than the unshaded part, the cm will be closer to the shaded part.

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? No. The board will move after it is released.

Explain. the board will move once released because of torque.

Choose the figure from the choices at far right that most accurately shows the final orientation of the board.

Figure 1

Explain. this is the figure where it is at rest, so it would move to this position.

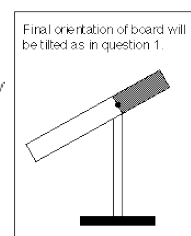
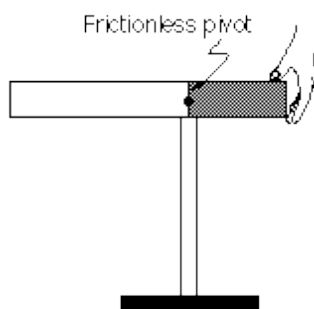


Figure 1.

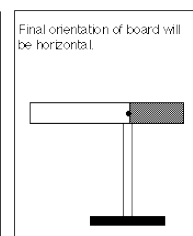


Figure 2.

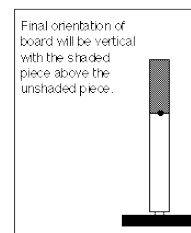


Figure 3.

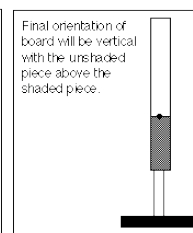


Figure 4.

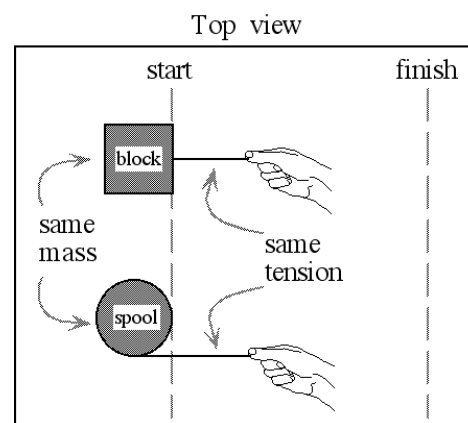
Part II. A block and a spool, are each pulled across a level, frictionless surface. The string pulling the block is tied to a small hook at the center of the front face of the block. The string pulling the spool is wrapped many times around the spool and may unwind as it is pulled. The block and the spool have the same mass. The strings are pulled with the same constant tension and start pulling at the same time. (Assume the strings and the hook are massless.)

Will the spool begin to rotate? No. The spool will not begin to rotate.

Explain. the spool will not rotate because there is no friction to cause torque to cause rotation.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line at the same time as the block.

Explain. since the spool and the block are the same mass and pulled by the same tension of the string with no friction, they will cross at the same time.



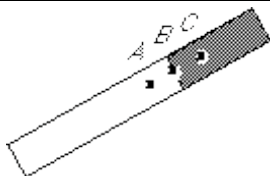
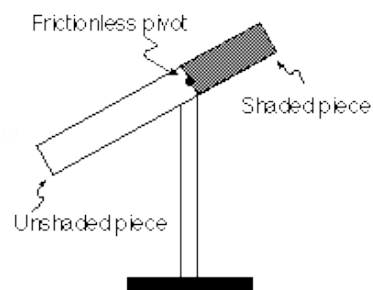
END OF RESPONSE

A rectangular board is made of two pieces as shown. The shaded piece and the unshaded piece are made of materials of different uniform mass densities.

The board is placed on a frictionless pivot. It remains at rest as shown.

Is the mass of the unshaded piece *greater than*, *less than*, or *equal to* the mass of the shaded piece? The mass of the unshaded piece is equal to the mass of the shaded piece.

Explain. assuming gravity is in effect if they were not of the same mass the board would be completely vertical.



The figure at left shows three points on the board, labeled A, B, and C.

Choose the point that most accurately approximates the location of the board's center of mass. Point B

Explain. if it were not, the board would be vertical in position

The same board is now rotated and held at rest in the orientation shown at right.

Would the board remain at rest after it is released? Yes. The board will remain at rest.

Explain. the center of gravity is at the pivot point, it would require energy from a system external force to rotate the board

Choose the figure from the choices at far right that most accurately shows the final orientation of the board. Figure 2

Explain. for the same reason as above

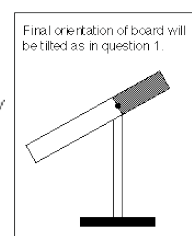
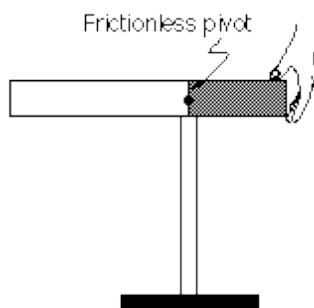


Figure 1.

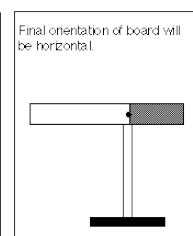


Figure 2.

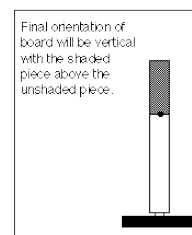


Figure 3.

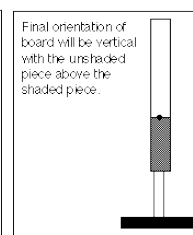


Figure 4.

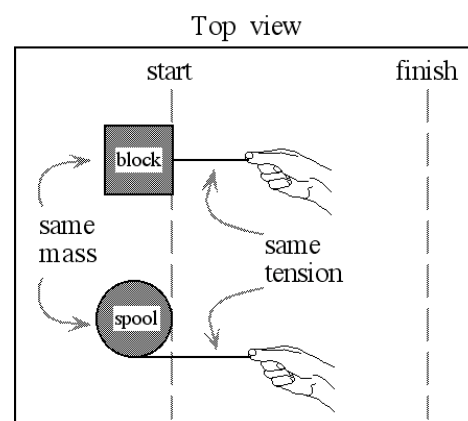
Part II. A block and a spool, are each pulled across a level, frictionless surface. The string pulling the block is tied to a small hook at the center of the front face of the block. The string pulling the spool is wrapped many times around the spool and may unwind as it is pulled. The block and the spool have the same mass. The strings are pulled with the same constant tension and start pulling at the same time. (Assume the strings and the hook are massless.)

Will the spool begin to rotate? No. The spool will not begin to rotate.

Explain. from the angle of the string rotation seems unlikely.

Which of the following options best describes when the spool crosses the finish line? The spool crosses the finish line at the same time as the block.

Explain. same mass, same tension, no rotation of the spool... same time crossing the surface



END OF RESPONSE