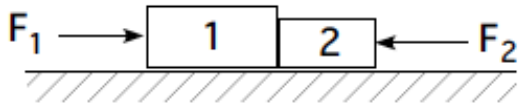
Application of Newton's Laws
Concept Questions

Question 1 Two blocks 1 and 2, on a frictionless table, are pushed from the left by a horizontal force $\vec{F}_1$, and on the right by a horizontal force of magnitude $\vec{F}_2$ as shown above. The magnitudes of the pushing forces satisfy the inequality $|\vec{F}_1| > |\vec{F}_2|$.



Which of the following statements is true about the magnitude N of the contact force between the two blocks?

1. $N > |\vec{F}_1| > |\vec{F}_2|$

2. $|\vec{F}_1| > N > |\vec{F}_2|$

3. $|\vec{F}_1| > N = |\vec{F}_2|$

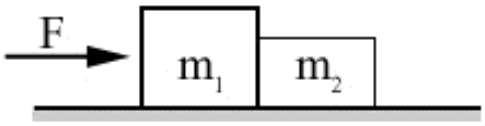
4. $|\vec{F}_1| = N > |\vec{F}_2|$

5. $|\vec{F}_1| > |\vec{F}_2| > N$

6. Cannot be determined from the information given.

Question 2: Newton's Laws of Motion: *Force Applied to Two Blocks*

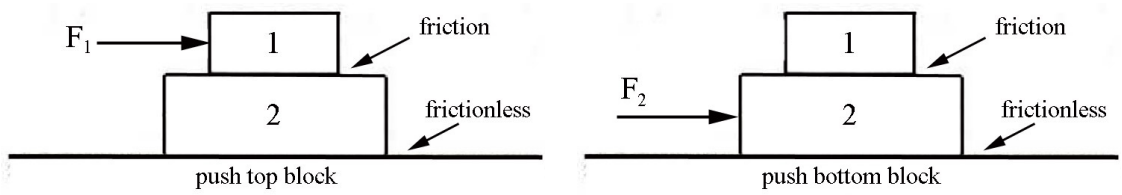
Two blocks sitting on a frictionless table are pushed from the left by a horizontal force $\vec{\mathbf{F}}$, as shown below. The magnitude of the contact force between the two blocks is



a) greater than the magnitude of the pushing force $\vec{\mathbf{F}}$.
b) lesser than the magnitude of the pushing force $\vec{\mathbf{F}}$.
c) equal to the magnitude of the pushing force $\vec{\mathbf{F}}$.
d) Cannot determine from the information given.

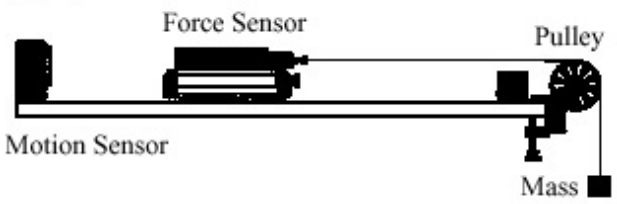
Briefly explain your reasoning.

Question 3 Consider two textbooks that are resting one on top of the other. The bottom book has mass M_2 and is resting on a nearly frictionless surface. The top book has mass M_1, with $M_1 < M_2$. Suppose the coefficient of static friction between the books is μ_s.



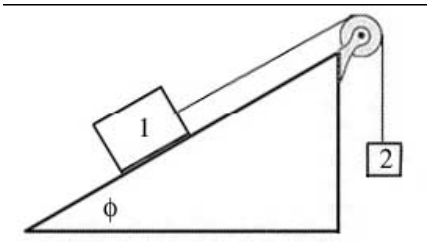
Consider the following two experiments. You push the top book horizontally with the maximum force so that the two books move together without slipping? You push the bottom book horizontally with the maximum force so that the two books move together without slipping? Explain which force is greater in magnitude.

Question 4: A force sensor on a cart is attached via a string to a hanging weight. The cart is initially held. When the cart is allowed to move does the tension in the string



1. increase?
2. stay the same?
3. decrease?
4. cannot determine. Need more information about friction acting on the system.

Question 5 A block of mass m_1, constrained to move along a plane inclined at angle φ to the horizontal, is connected via a massless inextensible rope that passes over a massless pulley to a bucket to which sand is slowly added. The coefficient of static friction is μ_s. Assume the gravitational constant is g. What happens to the tension in the string just after the block begins to slip upward?

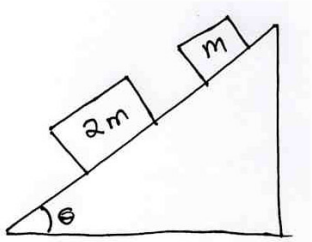


1. Increases
2. Decreases
3. Stays the same
4. Oscillates
5. I don't know
6. None of the above

Question 6 Weightlifting

A weightlifter and a barbell are both at rest on a large scale. The weightlifter begins to lift the barbell, ultimately holding it motionless above her head. Does the scale reading ever differ from the combined weight of the two bodies at any time during the lift? Explain.

Question 7 You place a single and a double brick on a level board and then slowly raise one end of the board. The double brick has twice the mass and twice the surface contact area as the single brick. The coefficient of static friction between each of the bricks and the surface is μ_s. The coefficient of kinetic friction between each of the bricks and the surface is μ_k. Which of the following statements is true?



1. The single brick slides before the double brick.
2. Both slide at the same time.
3. The single brick has a greater acceleration than the double brick.
4. The acceleration is the same for both.
5. None of the above.
6. Two of the above.

8.01SC Physics I: Classical Mechanics