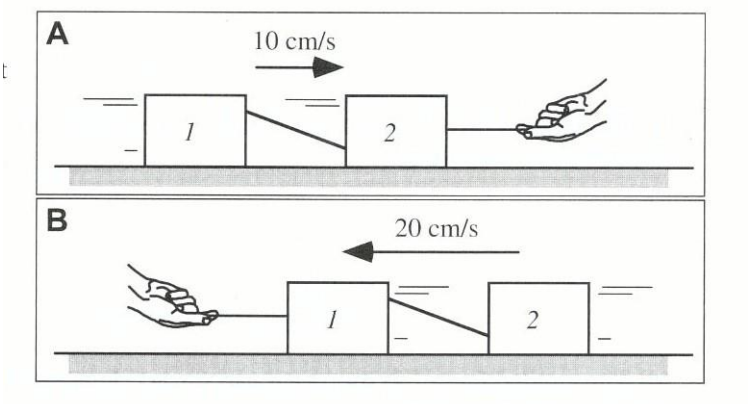
Problem 1 (10 points)

Two identical blocks, 1 and 2 are connected by a massless string. In case A, a student pulls a string attached to block 2 such that the blocks travel to the right, across a desk, at a constant speed of 10 cm/s. In case B, the student pulls a string attached to block 1such that the same blocks travel across the same desk to the left at a constant 20 cm/s.

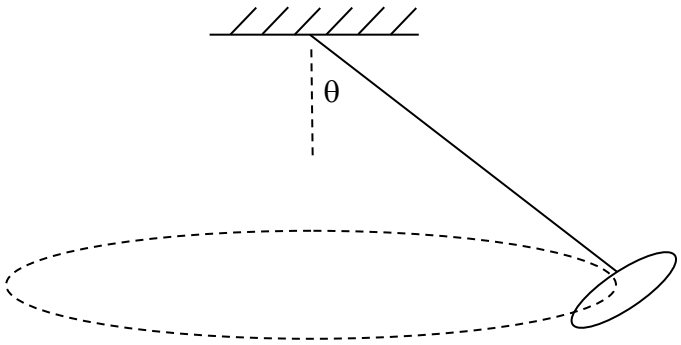


Will the tension in the diagonal string connecting the two blocks be greater in case A, greater in case B, or the same in both cases? Explain your reasoning.

Problem 2 (15 points)

A small toy airplane (weight = 0.9 N) is tied to the ceiling with a string. When its motor is started, it moves with a constant speed of 1.2 m/s in a horizontal circle of radius 0.6 m.

a) Find the tension in the string.

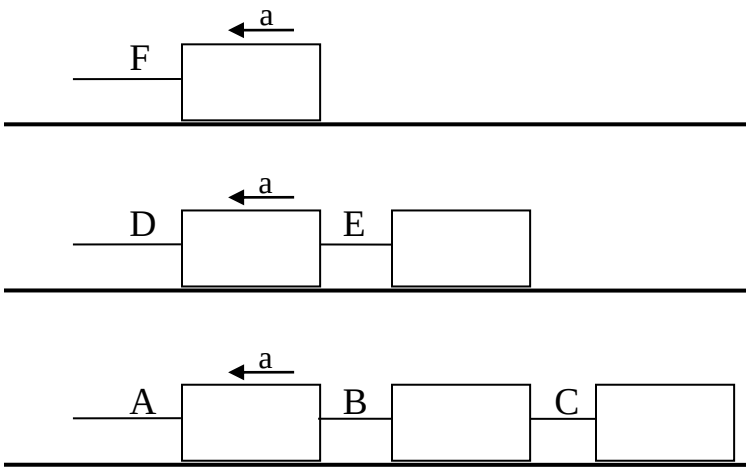


b) Find θ, the angle the string makes with the vertical.

Problem #3 (10 points)

The figures below show boxes that are pulled to the left along frictionless surfaces, accelerating toward the left. All of the boxes are identical (mass = M) and the acceleration is the same in each figure. As you can see, some boxes are pulled by ropes attached to the boxes in front of them.

Rank the ropes from greatest to least tension in the rope.



Greatest tension:
1 _____
2 _____
3 _____
4 _____
5 _____
Least tension:
6 _____

If there is a tie, put them on the same line.
If any are zero, specifically state that.

Or,

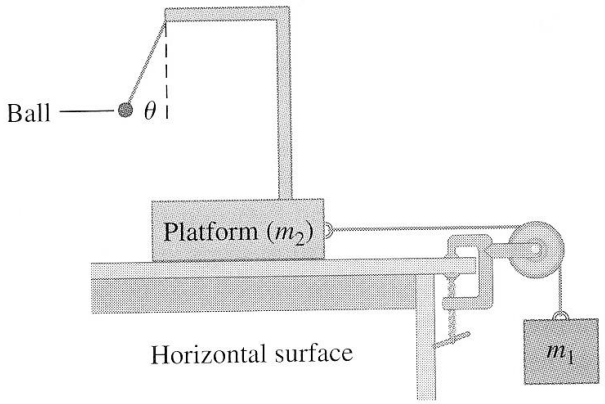
They are all the same _____

Explain your reasoning:

Problem 4 (25 points)

a) Draw a system schema next to the diagram below (your system consists of the ball, thread supporting the ball, platform, rope connecting m_1 and m_2, hanging mass, and earth - since the pulley is massless, we will ignore it at this time). Use your system schema to draw free body diagrams for the ball, platform, and hanging mass. An observer riding on the platform measures the angle θ that the thread supporting the ball makes with the vertical.

Additional Information
Angle: θ = 13°
Weight of m_1: 390 N
Mass of m_2: 60 kg
Mass of ball: 2 kg



Draw a free body diagram for the ball	Draw a free body diagram for the platform	Draw a free body diagram for the hanging mass

b) Identify any Newton's Third Law pairs using "x" on each arrow for the first pair, "xx" for the second pair, etc. If there are none, state that.

c) What is the coefficient of friction between the platform (m_2) and the horizontal surface?