

Practice Problem Set 3

Not to be turned in for grades!

Partial credit may be given even if the final answer is incorrect so please show all work!

Question 1 (1 point)

Newton's Third Law states that for every force there is a reaction force which is equal in magnitude and opposite in direction. If the sum of these two forces is zero, and a total net force is required to accelerate, how does anything ever accelerate?

Question 2 (3 points)

A train engine of mass 4800 kg is connected by a rope to a boxcar of mass 1600 kg. The boxcar is connected by a second rope to a caboose of mass 2400 kg. The whole train is sitting on a flat railroad track. The train engineer starts the train engine moving so that the tension on the first rope is 4500 N. What is the tension on the second rope? How fast is the whole train accelerating?

Question 3 (3 points)

A block with a mass of 25 kg is hung midway between two pulleys, with a rope connecting a hook at the top of the block to each of the two pulleys. On the other side of the pulleys, both ropes are connected to blocks with masses of 15 kg. The 25 kg mass in the middle sags downward until the 3 blocks and 2 pulleys form the shape of an "M". If the pulleys are 45 cm apart, how far below the level of the pulleys does the top of the 25 kg mass need to be in order for the system to be in equilibrium?

Question 4 (3 points)

A 28 kg block slides down a ramp which is inclined at an angle of 20 degrees up from the horizontal. The block and the ramp have a coefficient of kinetic friction of 0.22. The top of the ramp is 2.5 m above the ground. How much energy was lost to friction as the block slid down the ramp? What is the final speed of the block when it reaches the bottom of the ramp?