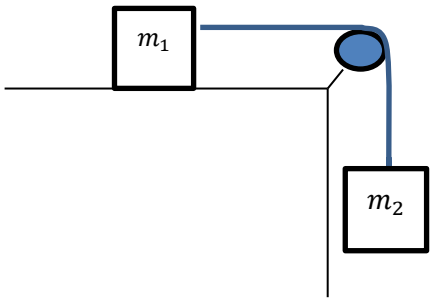
Name: _____ DISC: _____ Score: _____ / 20

Instructions:

- Do your own work.
- Answer the questions below in the space provided.
- Make sure you show all your work and any equations that you use.
- Please place a box around your answers.
- Remember to give the correct units with all numerical answers

Q1	Q2	Q3	Q4
5	5	5	5

1. Two blocks are attached to each other by a massless cord as shown in the diagram below. Both the table and pulley are *frictionless*:



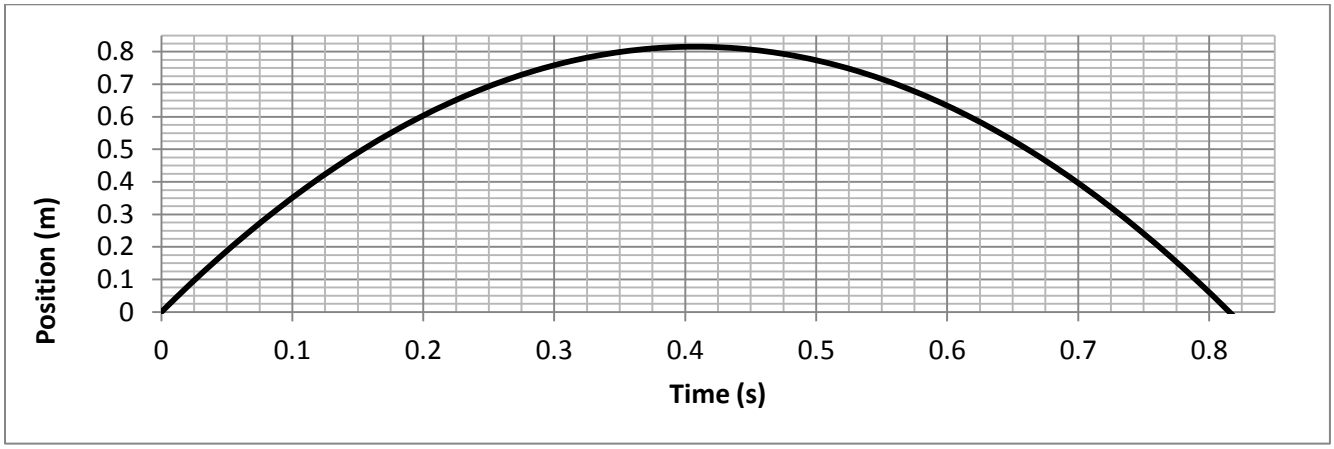
Force Vectors:
Labels:

a. Finish the free-body diagram by including all of the forces which can act on the blocks. Include a coordinate system.

b. Can this system be in equilibrium? Explain your reasoning.

Answer:
Explanation (2 pts):

2. You and your roommate are playing a game of catch. The graph shows the position of the ball as a function of time.



Set-up:
Algebra:

a. Using the graph, estimate the speed *v* at the time when the ball has reached its maximum height.

Speeds:
Graph:
Observation:

b. Estimate the speed *v* at $t = 0.2\ s$ and $t = 0.6\ s$. Sketch a speed vs. time plot using the three speeds you estimated, including the speed in part (a). What do you observe?

3. You want to determine the height of a mountain 125 km from your current position. You look around and notice that about 75 m away from you is a tall tree. You look up and notice that the peak of the mountain and the top of the tree are aligned.

Description:
Missing information:

a. Describe how you would use this information to find the height of the mountain. What information do you still need to solve the problem?

Set-up:
Algebra:
Substitutions:

b. The tree is 25 m tall. How tall is the mountain?

4. You are pushing a cart up a hill when the wheels fall off. If the hill makes an angle θ with the horizontal:

Diagram:
Force Labels:

a. Draw a free-body diagram and label all of the forces. Include the coordinate system.

Set-up:
Algebra:
Substitutions:

b. The cart has a mass $m = 35\ kg$. Let $\theta = 45^o$ and the coefficient of kinetic friction $\mu_k = 0.3$. How much force must you apply to the cart to maintain a constant velocity up the hill? Assume you can direct your push directly up the hill.