

Physics 121
Midterm Examination #1
October 4, 2007

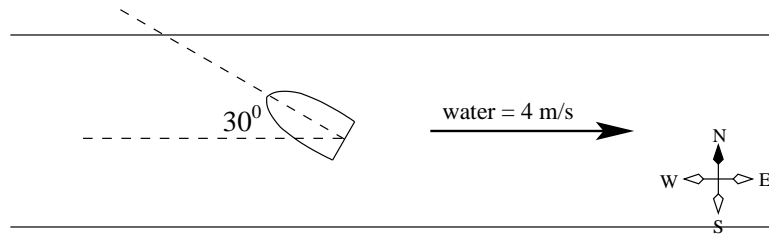
Name: _____

Recitation Section: _____

Lab Section: _____

	Score
Problem 1	
Problem 2	
Problem 3	
Problem 4	
Problem 5	
Total	

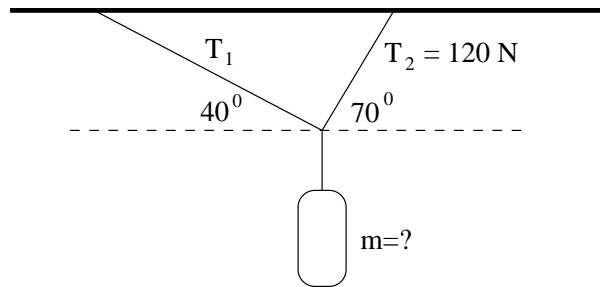
1. Shown in the figure below is a boat on a river. The water flows with a velocity of $4 \frac{m}{s}$ to the right. If the speedometer of the boat reads $6 \frac{m}{s}$, determine all the following:



- (a) (10 pts) The magnitude of the velocity of the boat as observed from the shore.
- (b) (10 pts) The direction of the boat's velocity as observed from the shore.

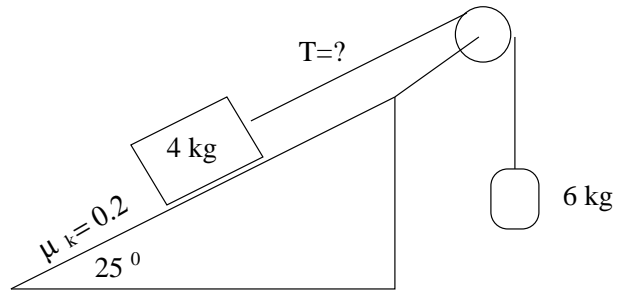
NOTE: Please express your answer as the "mathematician's angle" ...North of East.

2. Shown in the figure below is a block suspended, motionless, from two strings.



- (a) (10 pts) Determine the tension T_1 .
(b) (10 pts) Determine the mass, m , of the object.

3. Shown in the figure below is a system of two blocks connected by a string running over a pulley.



- (7 pts) Determine the normal force.
- (7 pts) Determine the acceleration of the system.
- (6 pts) Determine the tension in the string.

4. **The Tortuous and the Hare.** Once upon a time, a tortuous (turtle) challenged a hare (rabbit) to a race. They raced for a total distance of 3 km. The tortuous ran the entire race at a leisurely pace of $2 \frac{m}{s}$ (*i.e.* constant velocity). The hare ran for 2 km at a brisk pace of $10 \frac{m}{s}$, and decided that he was so far ahead that he could take a 20 minute nap.

- (a) (5 pts) How long did it take the tortuous to finish the entire race (answer in minutes)?
- (b) (5 pts) When did the hare awake from his nap (answer in minutes)?
- (c) (5 pts) Where was the tortuous located when the hare awoke (answer in meters)?
- (d) (5 pts) What constant acceleration would the rabbit need to tie the race (answer in $\frac{m}{s^2}$)?

NOTE: List all times as compared to the starting moment of the race.

NOTE: All answers must be in the requested units to get full credit.

5. A 2.00 m tall basketball player is standing on the floor 10.0 m from the basket, as in the figure below. If he shoots the ball at a 40.0° angle with the horizontal, at what initial speed must he throw the basketball so that it goes through the hoop without striking the backboard? The height of the basket is 3.05 m .

