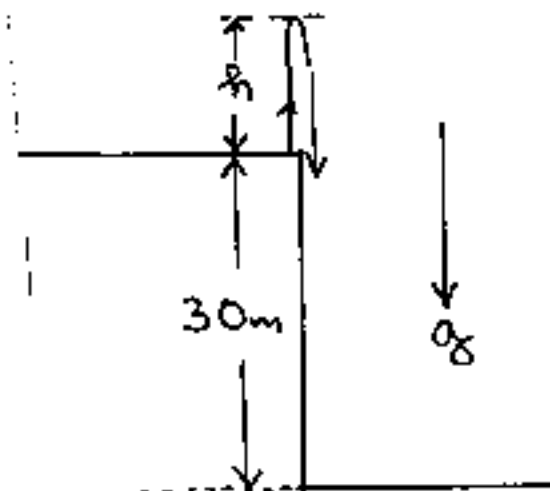


Physics 149 Final Exam Fall 1996

(20 pts.) 1.) A stone is thrown upwards with a velocity of 15 m/sec from the top of a building and just misses the edge of the building on the way down.

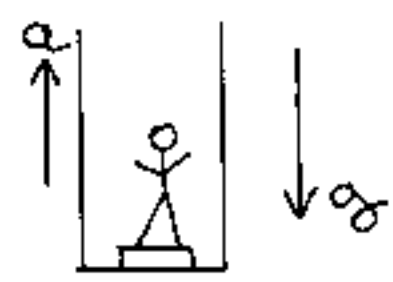
- What is the maximum height?
- The velocity of the stone after 3 seconds?



(15 pts.) 2.) Given two vectors $\vec{A} = 4.0\hat{i} + 5.0\hat{j}$ and $\vec{B} = 3.0\hat{i} - 7.0\hat{j}$.

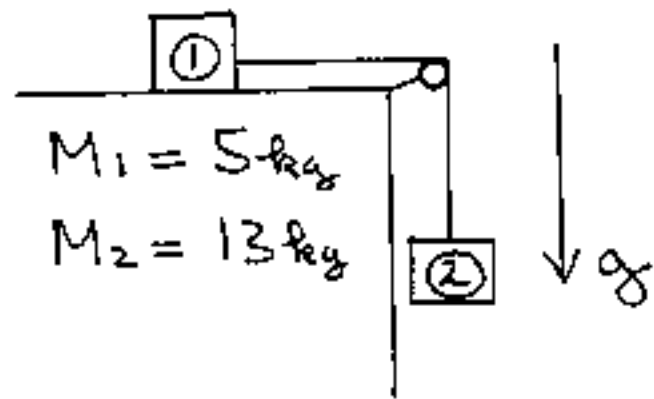
- What is the vector $\vec{C} = \vec{A} + \vec{B}$?
- What is the magnitude of \vec{C} ?
- What angle does \vec{C} make with the x-axis?

(15 pts.) 3.) A man with a mass of 100 kg. is standing on a scale in an elevator that is accelerating upwards at 5m/s^2 . What does the scale read?

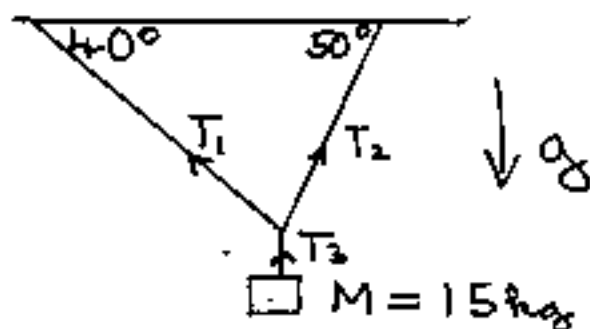


(15 pts.) 4.) The system of two blocks shown is released from rest at $t=0$. The coefficient of friction is 0.2 for block #1.

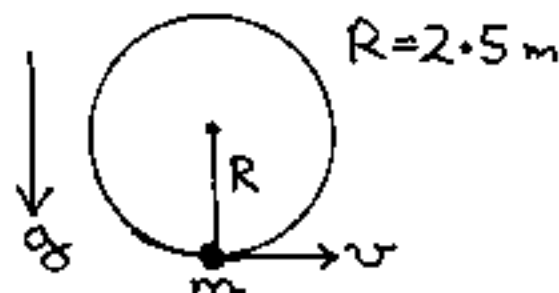
- What is the velocity of block #2 after it has fallen 3 meters?



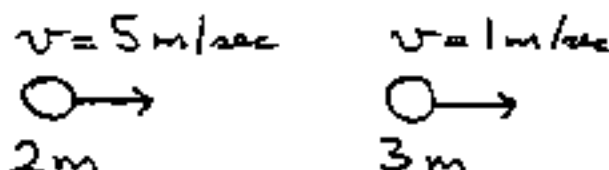
- (15 pts.) 5.) For the problem shown determine the two tensions T_1 and T_2 .



- (15 pts.) 6.) At $t=0$ the mass m is given an horizontal velocity v . What is the minimum value of v so that the string does not become slack at the top of the circle?

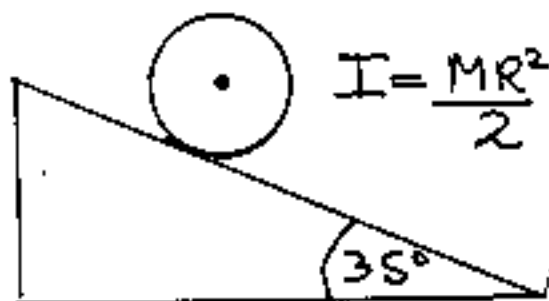


- (15 pts.) 7.) Two objects collide and then stick together.

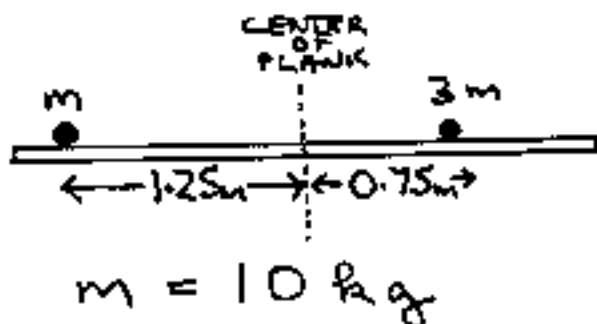


- a) What is the final velocity?
b) What fraction of the initial energy is lost?

- (15 pts.) 8.) A cylinder with moment of inertia I rolls without slipping down an incline plane starting from rest. What is its velocity after moving down the plane 3.0 meters?

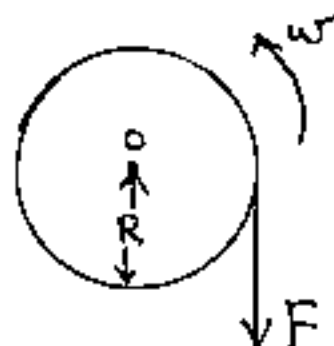


- (15 pts.) 9.) At what position is the center of mass for the system shown? The plank is uniform with a mass of 20 kg.



- (15 pts.) 10) A bicycle wheel is free to rotate about an axis which is fixed. It is initially rotating at 10 revs/sec. A force of 50 Newtons is applied tangentially to the edge of the wheel in order to slow the wheel down.

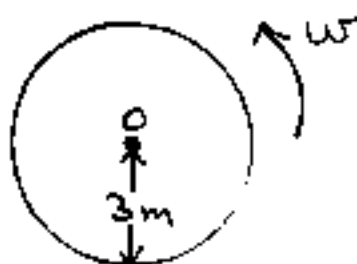
a) How long does it take the wheel to stop?



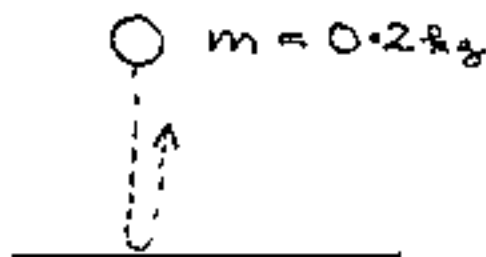
$$R = 1.5 \text{ m}$$

$$I = 3.5 \text{ kg m}^2$$

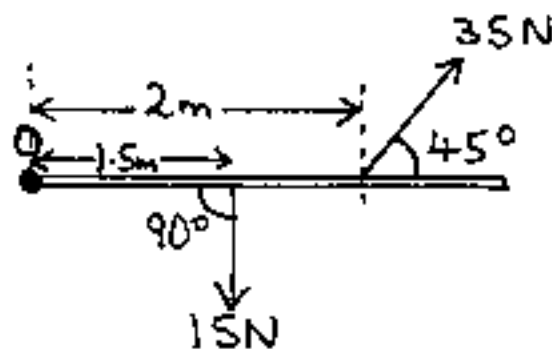
- (15 pts.) 11) A merry-go-round has a moment of inertia $I = 250 \text{ kg m}^2$. A 25 kg child jumps onto the edge of the merry-go-round at a radial distance of 3 meters. If the initial rotation of the merry-go-round is 8 rev/min., what is the new angular speed? (The moment of inertia of a mass a distance R from an axis is $I = MR^2$).



- (15 pts.) 12) A tennis ball hits the floor with a velocity $v = 3 \text{ m/sec}$, and rebounds with $v = 2.5 \text{ m/sec}$. If the ball is in contact with the floor for 0.12 sec., what average force is exerted?



- (15 pts.) 13) For the problem shown, what is the net torque acting on the object?



O = AXIS OF ROTATION