

AP Physics 1 Fall Semester Review

PROBLEMS 1-10 DUE THURSDAY, 11-16 DUE FRIDAY, TEST ON MONDAY

Motion Problems from Unit 1

1. Forest Gump is walking to ping pong practice with Lieutenant Dan at 1.3 m/s when he glances at his watch and realizes that he is going to be late for his practice. Forest gradually quickens his pace (Run Forest Run) at a rate of 0.09 m/s^2 . A) What is Gump's speed after 10.0 s? B) How much time does it take him to go 50 meters?

2. A car is traveling at 75 m/s and slows to 50 m/s at a rate of 5.6 m/s^2 . A) How long does it take the car to make the change in velocity? B) How far does it travel during this change? C) How long would it take the car to come to a stop? D) Make quantitatively accurate x vs. t , v vs. t , and a vs. t graphs.

3. While repairing a defective TV transmitter atop the 410 m tall Statue of Liberty, Mr. Korman throws his remote control up at 8 m/s and it eventually falls all the way to the ground below (no air resistance). A) How long will it take Mr. Korman's remote control to fall? B) What will be the speed of remote control the instant before it hits the pavement? C) If the speed of sound is 340 m/s, how long did it take Mr. Korman to hear the remote hit the ground after he threw it up in the air (hint: it has to fall and then the sound has to travel back to Mr. Korman)?

4. The Steamboat Geyser in Yellowstone National Park, Wyoming is capable of shooting its hot water up from the ground with a speed of 48.0 m/s. A) How high can this geyser shoot? B) How long does it take for the water to get up and back down (assume no air resistance)? C) Draw qualitative x vs. t , v vs. t , and a vs. t graphs.

Projectile Problems from Unit 2

5. A ball is rolled off a horizontal counter at 5 m/s. A) Where does the ball land if the counter is 3 m off the ground? B) What is the velocity in the y direction the instant before the ball hits the ground? C) What is the velocity in the x directions the instant before the ball hits the ground?
6. A cannonball is shot out at an angle of 30 degrees above the ground at a velocity of 30 m/s. A) How long does it take the cannon ball to get to its highest point in its path? B) How high does it get? C) How far does it go?

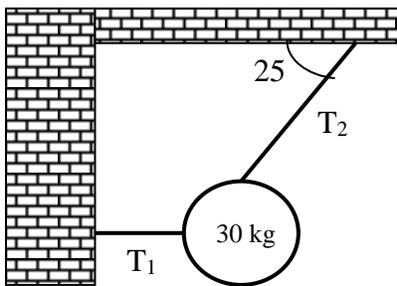
7. Randy Johnson threw his fastball from 2.5 meters off the ground. If he released the ball at an angle of 10 degrees above the horizontal at 43.4 m/s, A) how long does it take to hit the ground? B) How far does it go before it hits the ground? C) What is the highest it gets off the ground?

Force Problems from Unit 3 – Draw force diagrams for each problem!!!!

8. A bullet fired out of a gun travels at 40 m/s and embeds itself 4 cm into a target before coming to a stop. If the bullet has a mass of 0.5 kg, A) how much force did the target exert on the bullet? B) How much force did the bullet exert on the target? C) If the bullet's mass is increased to 1.0 kg, what does the force need to be changed to still make the bullet stop in 4 cm? Justify your answer (not with math).
9. Joe's favorite ride at Magic Mountain is the rollercoaster Batman. The Batman harness and passenger have a combined mass of m , and they descend the first hill at an angle of 50 degrees to the horizontal. A) What is the acceleration of the coaster if friction is negligible? B) What would the coefficient of friction need to be if the coaster moved down the hill at a constant speed?

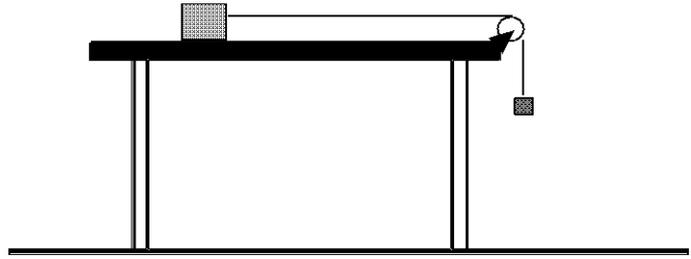
10. Fred the equipment manager pulls a box of football uniforms out to the field with a rope. 60 uniforms are in a box with a rope attached to the end pulling it at an angle of 30 degrees above the horizontal and pulled with a force of 40N. If each uniform has a mass of .4 kg and the box has a mass of .8 kg, A) what does the frictional force need to be if the box is moving at a constant velocity? B) What is the coefficient of friction? C) What would be the acceleration of the crate be if somehow the frictional force was brought down to 20 N?

11. Find the tension in both ropes.



12. A 3 kg block is attached by a string to a 5 kg block. A) If a pulling force of 50 N is applied to the 5 kg block that causes the blocks to accelerate to the left, what is the acceleration assuming friction is negligible? B) What is the tension in the string connecting the two blocks? C) How would the acceleration change if friction is NOT negligible? Justify your answer.

13. The block on the table is 8 kg and the block hanging over the edge is 4 kg. A) What is the acceleration of the block on the table if the coefficient of friction is 0.3? B) What is the tension in the rope? C) How would the acceleration of the blocks change if the mass of the block hanging over the edge is increased? Justify your answer.



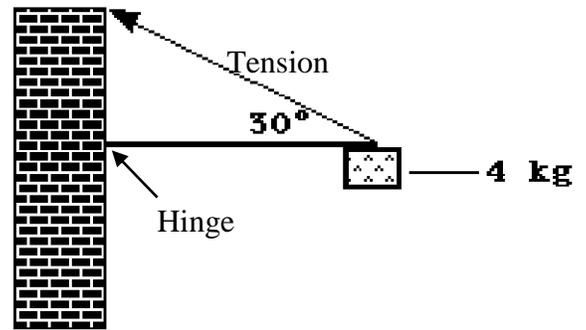
Combination Problems

14. A 13 kg rock is placed in a sling shot and the sling shot can apply a force of 250 N when the sling shot shoots the rock straight up into the air. A) What is the acceleration of the rock while it is being released and propelled up by the sling shot? B) What is the velocity of the rock if it travels 20 cm while in the sling shot before it is released? C) How high will the rock get in the air from the starting position of the rock?

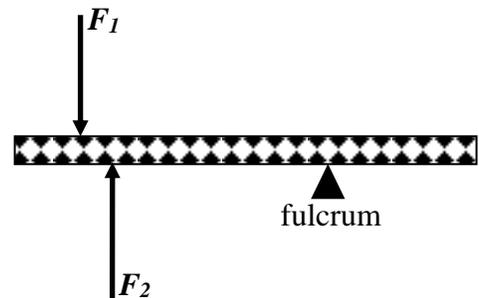
15. A 5 kg box is pushed horizontally ($F_{\text{push}} = 15 \text{ N}$) across a horizontal surface that has a coefficient of friction of 0.1. The box is pushed for 3 meters. At this point the box starts to slide up a frictionless surface that is elevated at 35° above the horizontal. It slides up this incline which is 1 m long and then launches off the edge which is 1.5 m above the ground. A) How long does it take the box to move across the 3 m long horizontal surface assuming it started from rest? B) What is the acceleration of the box while sliding up the incline (its no longer being pushed)? C) How far from the edge of the incline with the box hit the ground?
16. A 5 g bullet is shot from a rifle that has a barrel that is 0.9 m long. A) What is the acceleration of the bullet if it leaves the barrel moving at 125 m/s? B) What force does the expanding gasses apply if the frictional force acting on the bullet is 60 N while it moves through the gun barrel? C) If the gun is 1.8 m off the ground and was fired horizontally, what is the range of the bullet?

Optional Torque Problems

17. A) Find the tension in the rope. B) Find the force the hinge is applying to the rod holding up the sign.



18. A uniform 3 kg board that is 4 m long has two forces acting on the left side as shown to the right. The fulcrum is 1.6 m from the right edge and F_1 is 0.6 m from the left edge and F_2 is 1 m from the left edge. A) What is the value of F_2 if the board isn't moving and the force of F_1 is 8 N? B) What force is the fulcrum applying to the board?



19. A uniform 5 kg board that is 8 m long has a 3 kg mass hanging from the left edge. Where is the center of gravity of the board and mass?