

GENERAL PHYSICS COURSE BONUS QUESTIONS.

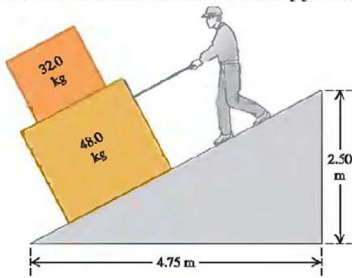
There are four questions below. Each question is worth 5 points, totaling 20 points. Please solve your homework on A4 papers and bring it to the class on Wednesday 18 December 2024.

Prof. Dr. Hüseyin Çavuş

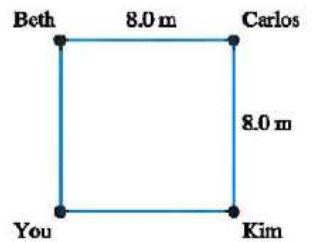
Firemen are shooting a stream of water at a burning building using a high-pressure hose that shoots out the water with a speed of 25.0 m/s as it leaves the end of the hose. Once it leaves the hose, the water moves in projectile motion. The firemen adjust the angle of elevation α of the hose until the water takes 3.00 s to reach a building 45.0 m away. You can ignore air resistance; assume that the end of the hose is at ground level. (a) Find the angle of elevation α . (b) Find the speed and acceleration of the water at the highest point in its trajectory. (c) How high above the ground does the water strike the building, and how fast is it moving just before it hits the building?

A 5.00-g bullet is fired horizontally into a 1.20-kg wooden block resting on a horizontal surface. The coefficient of kinetic friction between block and surface is 0.20 . The bullet remains embedded in the block, which is observed to slide 0.230 m along the surface before stopping. What was the initial speed of the bullet?

You are lowering two boxes, one on top of the other, down the ramp shown in Figure by pulling on a rope parallel to the surface of the ramp. Both boxes move together at a constant speed of 15.0 cm/s . The coefficient of kinetic friction between the ramp and the lower box is 0.444 , and the coefficient of static friction between the two boxes is 0.800 . (a) What force do you need to exert to accomplish this? (b) What are the magnitude and direction of the friction force on the upper box?



You and three friends stand at the corners of a square whose sides are 8.0 m long in the middle of the gym floor, as shown in Figure. You take your physics book and push it from one person to the other. The book has a mass of 1.5 kg , and the coefficient of kinetic friction between the book and the floor is $\mu_k = 0.25$. (a) The



(a) The book slides from you to Beth and then from Beth to Carlos, along the lines connecting these people. What is the work done by friction during this displacement? (b) You slide the book from you to Carlos along the diagonal of the square. What is the work done by friction during this displacement? (c) You slide the book to Kim who then slides it back to you. What is the total work done by friction during this motion of the book? (d) Is the friction force on the book conservative or nonconservative? Explain.