Determine the four problems in problem set 7. 1. A child builds a 2-meter long ramp for his toy cars to slide down and crashes them at the bottom. If he wants to double the height of his ramp, what length does he need? 2. Two blocks are stacked such that their edges touch and an object is placed on top of one block as shown in Figure P7-2. The coefficient of static friction between each block and F1 = 0.65, and between each block and F2 = 0:4: How high can the object go before it begins to slide off the bottom edge? 3. If two blocks are stacked such that their edges touch and an object is placed on top of one block as shown in Figure P7-3, then one block is rotated by a quarter turn. Calculate the horizontal and vertical distances of the object and the coefficient of static friction between each block and F1. 4. A child pivots a 2-meter long ramp for his toy car to slide down. To double its height, he builds a 1-meter high ramp out of 4 1-meter long boards with white chalk lines painted on them to simulate chalked grooves. The coefficient of static friction between metal parts is 0.65, but the coefficient between chalk marks is 0:4. How fast will the car slide down the ramp with its weight F1 = 10 kg and friction coefficient F2 = 0:65? Solución: Find the length of the ramp necessary to double the height. If we move one end of the ramp up by half a meter, we find that we need two additional boards of length 2x4 = 4 meters. If we want this ramp to double in height again, then we need another board x2 = 4 meters. Also notice that when these extra boards are added, we increase the ramp's width by half a meter and shorten it by half a meter. This is because the boards are already 4 meters long, so they are only half a meter shorter when moved up. So, the total length of our ramp will be 6x4 = 24 meters. Figure P7-2. A block of mass M with a small object on top is placed on top of another block of mass M with coefficient of static friction between them equal to 0.6 Figure P7-3. A block of mass M with a small object on top is placed on top of another block of mass M with coefficient of static friction between them equal to 0.6. The bottom block is then rotated by a quarter turn. To find the vertical distance the object will fall, we can use our formula for gravitational potential energy: ¨y = ∫y(x)dx = Mgx(0) + ½Mgx2(0). The top edge has height 6m because the ramp is 6 meters long, so it takes 6 units to get over that distance. The bottom edge has height 0 because it's at ground level, so it only requires one unit.

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