Universität Leipzig, Fakultät für Physik und Geowissenschaften

# Exercises for Experimental Physics 1 – IPSP

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## Exercise Sheet 3 (WS 2013/14)

Date of Issue: Nov. 1$^{st}$ 2013

**Date of Submission: Nov. 8$^{th}$ 2013**

**Submission Place:** Marked mailbox next to room 302 (Linnestr. 5)
**Submission Time:** 11:00 a.m. at the submission day noted above

**Please note: Write your name and matriculation number on EACH sheet of paper. Only submit the calculations and results for exercise 1-3, exercise 4 will be discussed during the seminar.**

**Exercises:**

1. Al and Bert stand in the middle of a large frozen lake (frictionless surface). Al pushes on Bert with a force of 20 N for 1.5 s. Bert's mass is 100 kg. Assume that both are at rest before Al pushes Bert.
   (a) What is the speed that Bert reaches as he is pushed away from Al?
   (b) What speed does Al reach if his mass is 80 kg?
   (7 Points)

2. A block of mass m slides across a frictionless floor and then up a frictionless ramp (Figure 1). The angle of the ramp is $\theta$ and the speed of the block before it starts up the ramp is $v_0$. The block will slide up to some maximum height h above the floor before stopping. Show that $h$ is independent of $\theta$ by deriving an expression for $h$ in terms of $v_0$ and $g$. (6 Points)

3. Two blocks are in contact on a frictionless horizontal surface. The blocks are accelerated by a single horizontal force $\vec{F}$ applied to one of them (Figure 2). Find the acceleration and the contact force of block 1 on block 2
   (a) in terms of $F$, $m_1$, and $m_2$, and
   (b) for the specific values $F = 3.2$ N, $m_1 = 2.0$ kg, and $m_2 = 6.0$ kg.
   Draw a sketch including all forces! (7 Points)

4. A chain consists of 5 links, each having a mass of 0.10 kg. The chain is being pulled upward by a force applied by your hand to its top link, giving the chain an upward acceleration of 2.5 m/s$^2$. Find (a) the force magnitude $F$ exerted on the top link by your hand; (b) the net force on each link; and (c) the magnitude of the force each link exerts on the link below it.

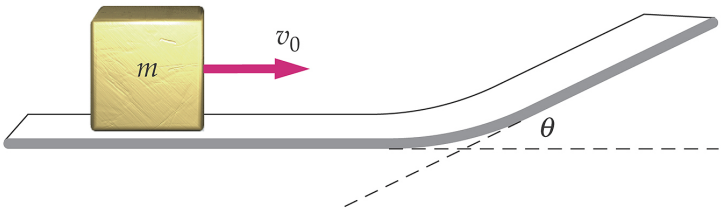


Figure 1: Exercise 2

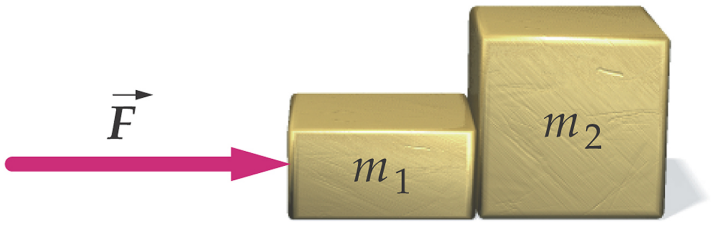


Figure 2: Exercise 3