Universität Leipzig, Fakultät für Physik und Geowissenschaften

# Exercises for Experimental Physics 1 – IPSP

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## Exercise Sheet 2 (WS 2013/14)

Date of Issue: Oct. 25$^{st}$ 2013

**Date of Submission: Nov. 1$^{st}$ 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. Estimate how far you can throw a ball if you throw it
   (a) horizontally while standing on level ground,
   (b) at $\theta = 45°$ above horizontal from the top of a building 12 m high.
   Ignore any effects due to air resistance. (6 Points)

2. A swimmer *heads* directly across a river, swimming at 1.6 m/s relative to the water. She arrives at a point 40 m downstream from the point directly across the river, which is 80 m wide.
   (a) What is the speed of the river current?
   (b) What is the swimmer's speed relative to the shore?
   (c) In what direction should the swimmer head in order to arrive at the point directly opposite her starting point? (7 Points)

3. A rock is thrown from the top of a 20-m-high building at an angle of 53° above the horizontal.
   (a) If the horizontal range of the throw is equal to the height of the building, with what speed was the rock thrown?
   (b) How long is it in the air?
   (c) What is the velocity of the rock just before it strikes the ground?
   (Ignore any effects due to air resistance.) (7 Points)

4. An archerfish launches a droplet of water from the surface of a small lake at an angle of 60° above the horizontal. He is aiming at a juicy spider sitting on a leaf 50 cm to the east and on a branch 25 cm above the water surface. The fish is trying to knock the spider into the water so that the fish may eat the spider.
   (a) What must the speed of the water droplet be for the fish to be successful?
   (b) When it hits the spider, is the droplet rising or falling?