

HOMEWORK 1
(due Tues. Jan.31)

Read: **Notes on Estimation** will be posted in **Course Documents** after we discuss Fermi problems in class.

Classical motion notes and Hewitt on projectiles These are to be read over the first 2 weeks, as they are handed out.

Problems:

1. Express the following numbers in exponential notation (e.g. $202 = 2.02 \times 10^2$):

- (a) 0.0002045 (b) 123.456 (c) 100,000 (d) 0.00000093

2. Carry out the following operations (and keep **only 2 significant figures**):

- (a) $(35 \times 10^5) \div (6.5 \times 10^4)$ (b) $123.456 \div (7 \times 10^{-5})$
(c) $154.7 + 0.00456$ (d) $-63.99 - (936 \times 10^{-1})$

3. Evaluate the following expressions (put into exponential notation):

- (a) 2^9 (b) 2^{-9} (c) 8^2 (d) 8^{-2} (e) $8^{1/2}$
(f) $8^{-1/2}$ (g) $2^{1/8}$ (h) $2^{-1/8}$ (i) $1/2^{-1/8}$ (j) $1/2^{1/8}$

4. Estimate the number of liters of water drunk by all people in the US each year. In answering this, state your assumptions and show all the steps clearly.

5. Consider a 50 meter long moving walkway at the airport that travels 1 meter/sec.

- (a) If you walk on the walkway at 2 m/s in the direction of the motion, what is your speed relative to the adjacent stationary sidewalk?
(b) How long does it take to reach the end?
(c) If you walk on the walkway at 2 m/s opposite to the direction of the motion, what is your speed relative to the adjacent stationary sidewalk?
(d) How long does it take the backward walker to travel from the end of the walkway to the beginning?



Justus Sustermans, late 16th century (Florence) Portrait of Galileo Galilei

Note: In Problem 2 (a) and (b) the first number is to be divided by the second number.