Homework 2

Phys 1140, Fall 2012 Prof. Markus B. Raschke
Due: Monday, September 25, 4 pm, in your TA's hw box in G2B66

In this homework you will practice using the equations we have discussed in the third lecture. For the following problems assume that all variables expressed in quantitative error format are from uncorrelated measurements.

1) (2 points) With $x = 15.3 \pm 0.1$ cm and $y = 1.3 \pm 0.2$ cm calculate $Q = x + y/2$ and express the result with error using what you learned in class about error propagation. $Q = (15.95 \pm 0.14)$ cm

2) (2 points) With $x = (3.0 \pm 0.2) \times 10^{-4}$ cm and $y = (1.5 \pm 0.6) \times 10^{-4}$ cm calculate $Q = x - y$ with error. $Q = (1.5 \pm 0.6) \cdot 10^{-4}$ cm

3) (4 points) The radius of a very precisely polished sphere is measured to be (105.351 ± 0.002) mm. What the volume V of the sphere and the absolute error δV? (Note: derive the algebraic expression for δV using the "master equation" for error propagation). $V = (4.8978 \pm 0.0003) \cdot 10^{-3}$ m^3 or in mm^3, ok

4) (3 points) Calculate $E = \frac{1}{2} mv^2$ with error using $m = 6.425 \pm 0.003$ kg and $v = 2.7 \pm 0.2$ m/s. $E = 23 \pm 3 \frac{kg m^2}{s^2}$

5) (5 points) You want to find the angular momentum value of a disk $L = (1/2)MR^2\omega$. You measure mass $M = (0.220 \pm 0.005)$ kg, radius $R = (120.0 \pm 0.1)$ mm, and $\omega = (10.2 \pm 0.1)$ radians/sec. What is $L \pm \delta L$? $L = (1.62 \pm 0.04) \cdot 10^{-2} \frac{kg m^2}{s}$ rad

6) (4 points) A physical quantity is given by $z = x*\cos(\theta)$. What is $z \pm \delta z$ for $x = (1.203 \pm 0.001)$ m and $\theta = (35 \pm 1)$ degrees? (Note: do not forget to convert to radians).

$z = (0.985 \pm 0.012)$ m