

Physical Science 303 – Homework 1

This assignment is due at the beginning of class Tuesday Sept. 18th. Show your work.

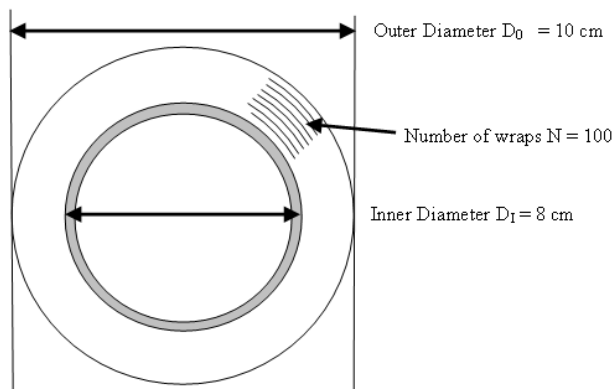
Hewitt Chapter 1, Exercises 3,5,9,10
Unit I Problems 5,6,9

Problem A. We are interested in calculating the thickness t and length L of the tape on a roll (see picture below). Write down an equation for the thickness using the problem's variables (D_0 , D_I , and N). Now calculate the thickness using the numerical values given below. Does your answer make intuitive sense?

Problem B. An upper bound is an estimate which is definitely higher than the actual value. For example, there are at most 31 days in a month and every year has 12 months, so an upper bound on the number of days in a year is $31 * 12 = 372$. A lower bound is an estimate which is definitely lower than the actual value. For example, there are at least 28 days in a month, so a lower bound on the number of days in a year is $28 * 12 = 336$. We then know that the actual value is somewhere between 336 and 372. Write down an equation using the problem's variables for an upper and lower bound for the length of tape on the roll. Now plug in the numerical values into your equations and evaluate.

Challenge problem (extra credit): Find the length of the tape on the roll. Since the tape has finite thickness, you'll have to specify how you are calculating circumference (e.g. from the inside edge of the tape's thickness, in the middle of the tape's thickness, from the outer edge of the tape's thickness, etc.). Does your answer make intuitive sense? Two pieces of information that you might need:

$$\sum_{n=0}^N 1 = N + 1 \quad \text{and} \quad \sum_{n=0}^N n = \frac{N(N+1)}{2} \quad (1)$$



Where the world ceases to be the stage for personal hopes and desires, where we, as free beings, behold it in wonder, to question and to contemplate, there we enter the realm of art and science. - Albert Einstein