Fortran and Python HW1

Upload all your source files to Collab. Also upload your output from the designated test cases. With text-only output it is sufficient to cut and paste into the text box but be sure to distinguish the output from the different problems with some kind of separator. Be sure to read the language-specific notes at the end before you start.

1. Read from the user the lengths of the long and short axes of a prolate spheroid. (A rugby ball is a pretty close approximation to a prolate spheroid. American footballs are a bit too pointy.) Compute the volume using the formula

$$V = \frac{4}{3}\pi a^2 b$$

where *a* is the *semi*minor axis and *b* is the *semi*major axis. Check that both values are greater than zero and if that condition does not hold, print an error message and exit. Otherwise print the volume to three decimal places. Test your code with the following input values:

   a. long=12.3 short=9.2
   b. long=-3.3 short=1.2
   c. long=5.4 short=-2.0

2. Write a program that takes as input a population, expressed as an integer. If the population is less than 10,000 print "This is a small town." If the population is greater than or equal to 10,000 and less than 100,000 print "This is a small city." If the population is greater than or equal to 100,000 and less than 1,000,000 print "This is a medium city." If the population is greater than or equal to 1,000,000 print "This is a large city." Test with the following values
   a. 5,000
   b. 100,000
   c. 101,000
   d. 1,000,001

3. You are writing a program to examine strings. You want to collect strings for which the first two characters are 'de' or the second two characters are 'no' but both are not true. Write a program that reads a string, determines that it is at least four characters long, then checks whether the string passes these conditions. If it does print "Word is accepted." otherwise print "Word is rejected." Test with the following four strings. Do not worry about case, assume the strings will always be lower case.
   a. denominate
   b. unnoticeable
   c. deteriorate
   d. literal

Note: you are permitted to use the Internet to look up things such as exclusive or implementations although you may not copy code you find, you must write your own version. Stack Overflow is a particularly helpful site for beginning programmers. You may find that there is a very concise way to implement this but please use the full expansion.

Hints for Specific Languages

Python

You will need to load some *modules*. Don't worry yet about what you are doing; just follow the example. To obtain pi, at the top of your script put the line

import math

Then when you need pi it is accessible as math.pi

To terminate before the end of the script is reached, import another module

import sys

Then terminate with the line

sys.exit()

You can and generally should group all your import statements at the top of your script.

Fortran

For input values use non-advancing IO.

To obtain the value of pi declare a variable in this form

real, parameter :: pi=4.0*atan(1.0)

To obtain the length of a string ignoring trailing blanks, use the len_trim intrinsic function. Example: str_len=len_trim(string)