ESCI 386 – IDL Programming for Advanced Earth Sciences Applications
Exercise #5 – Input/output

1. The file "exercise_5_input.txt" contains a header followed by records that contain a floating-point value representing either a radius or a diameter, and a string that indicates whether it is a radius or diameter. Write an IDL main program that will do the following:

- Reads in the values from the input file.
- Uses the SPHERE() function you created in Exercise 3 to calculate both the surface area and volume of the sphere based on the value you read in.
- Creates a new file called "exercise_5_output.txt" that will list the radiuses of the spheres for all the values you read in, the surface area and the volumes.

Notes:

- The values in the output file should be sorted by radius, from lowest to highest.
- The radius field should show 2 decimal places, while the area and volume fields should show 1 decimal place.
- The file should have a header showing the meaning and units of the values.

Hints:

- As you read in the values and the type of value ('diameter' or 'radius') put them into arrays. Then you can convert the diameters to radiuses using the `WHERE()` function, and then you can sort the radiuses from smallest to largest. Then, loop through the array of radiuses calling your `SPHERE()` function for each one twice (once for surface area and once for volume).

Your output file should look like:

```
radius (cm)      area (cm^2)    volume (cm^3)
   0.01             0.0             0.0
   0.04             0.0             0.0
   0.23             0.7             0.1
    .                .               .
    .                .               .
    .                .               .
  82.98          86528.0        2393365.4
  85.91          92746.5        2655949.6
  94.53         112292.1        3538323.8
```

2. Write an IDL program that will create a file that has the values of sine for all angles between 0 and 359. Format the output so that it looks like that below. Turn in your program, and the output file it created. Hints:

Make your array of angles a 10 by 36 array. This makes printing the rows a lot simpler.

Remember that the `SIN()` function in IDL uses radians as its argument.

Your table should look like:

	0	1	2	3	4	5	6	7	8	9
0	0.0000	0.0175	0.0349	0.0523	0.0698	0.0872	0.1045	0.1219	0.1392	0.1564
10	0.1736	0.1908	0.2079	0.2250	0.2419	0.2588	0.2756	0.2924	0.3090	0.3256
20	0.3420	0.3584	0.3746	0.3907	0.4067	0.4226	0.4384	0.4540	0.4695	0.4848
30	0.5000	0.5150	0.5299	0.5446	0.5592	0.5736	0.5878	0.6018	0.6157	0.6293
.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.
320	-0.6428	-0.6293	-0.6157	-0.6018	-0.5878	-0.5736	-0.5592	-0.5446	-0.5299	-0.5150
330	-0.5000	-0.4848	-0.4695	-0.4540	-0.4384	-0.4226	-0.4067	-0.3907	-0.3746	-0.3584
340	-0.3420	-0.3256	-0.3090	-0.2924	-0.2756	-0.2588	-0.2419	-0.2250	-0.2079	-0.1908
350	-0.1736	-0.1564	-0.1392	-0.1219	-0.1045	-0.0872	-0.0698	-0.0523	-0.0349	-0.0175