

Calculator Module

My final project for Math 480 is a console-based calculator module. I built this calculator module using only Python. It is for the most part based upon the Windows 7 calculator. Overall, this module is really just for fun and can be considered a toy. For people truly trying to find a computer calculator program, I strongly recommend they use Sage instead. Sage has far more capabilities than this module and its functions are far more optimized. One advantage that this module does have over Sage though is that it is highly interactive. The user needs to know almost no programming knowledge to use this calculator. He or she would just need to follow the instructions. In addition, the user also needs very little mathematical background to use this module.

This module is divided into multiple sections depending on the functionality that the user wants to use. I shall briefly discuss the included functions in each of the sections.

Basic Math Functions

The basic math functions section includes only the most basic of functions. It includes the following functions:

- Add
- Subtract
- Multiply
- Divide
- Negate
- Invert
- Convert to Percentage
- Square Root

These functions are close to what one would see on a basic four function calculator.

Note: All of these functions can also be reached from the scientific functions section of this module.

Scientific Functions

This section includes more advanced functions that one might expect to see on a scientific calculator. The functions included in this section include:

- Squaring, Cubing, nth power exponentiation
- Square root, cube root, nth root
- Factorial
- Modulo
- Integer and Decimal parts of floating point numbers
- 10^x , $\log x$, e^x , $\ln x$
- \sin , \cos , \tan , \sinh , \cosh , \tanh
- \arcsin , \arccos , \arctan , $\operatorname{arcsinh}$, $\operatorname{arccosh}$, $\operatorname{arctanh}$
- Conversion between degrees and radians

- Mathematical constants pi and e

Bitwise Functions

This section includes operations that one may need to use on bits. It includes the following functions:

- Bitwise NOT, AND, OR, XOR, left shift, right shift, left rotate, right rotate
- Modulo
- Conversions between binary, octal, decimal, and hexadecimal

List Functions

This section includes some statistical operations that work on lists. It includes the following functions:

- Adding, removing, creating a list
- Mean, median, mode
- Sum and product of values in the list
- Standard deviation and variance

Date Functions

This section includes operations involving dates. It includes the following functions:

- Printing a calendar
- Finding the day of the week of a given date
- Finding the difference between two dates
- Add or subtracting days from a given date
- Getting today's date

Unit Conversions

This section allows the user to convert values from one type of unit to another. There is a wide range of unit type conversions supported. The following are the categories in which users can convert units in:

- Angle
- Area
- Energy
- Length
- Power
- Pressure
- Temperature
- Time
- Velocity
- Volume
- Weight/Mass

As stated above, this calculator module is largely based upon the Windows 7 calculator. Users familiar with the Windows 7 calculator will recognize that the great majority of the

functions included in this calculator module are direct implementations of the functions in that calculator.

There are not really any complicated algorithms in this module. In fact, there are hardly any algorithms at all. Most of the functions are fairly straightforward and somewhat trivial. Much of the code of this module is just giving users an interactive interface. Most of the math that is found in this module is just doing basic math operations. For the more complicated parts, I have made use of the Python math and date imports. The list functions include a few larger functions that do things such as calculating the mean, median, mode as well as standard deviation and variance. The date functions include the doomsday calendar functions that we created for homework 4.

Given additional time to develop this module, I could conceivably begin to create new and more complicated functions. Typing up all of the functions took up quite a bit of time even though many of them are trivial. However, with the functions already in place, it is quite possible to develop this module into doing bigger and more complex things. But for now, the most useful thing this module can be used for is probably doing unit conversions.