Assignment 3 – Calculator

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Purpose

The purpose of this program is to create a calculator in C. For this calculator it will use reverse polish notation which takes the numbers being operated on first and then the operator that is being used. We will be comparing our functions and their accuracy to that in <math.h>.

How to Use the Program

To use this program the user can run it by typing out "./calc". They can follow that with "-h" to get a help menu or "-m" which uses the <math.h> library to compute the calculations. If nothing is entered or they choose to use <math.h> they can then enter the operation they want performed using reverse polish notation. Numbers and operators must be separated by spaces. To perform an operation the numbers must be first entered followed by the operation. So for example 2 + 2 would be inputted like "2 2 +". The program will then print the result.

Program Design

The program uses 3 other header files we create. "mathlib.h" is used for math functions, "operators.h" for applying operators. "stack.h" is used for the stack ADT. The main program is in calc.c.

Data Structures

The data structures used in this program is an array for the stack implementation. This array will be edited when pushing and popping elements.

Function Descriptions

The functions in mathlib.c are:

double Abs(double x) which returns the absolute value of x.

double Sqrt(double x) which returns the square root of x.

double Sin(double x) which returns the sin of x.

double Cos(double x) which returns the cos of x.

double Tan(double x) which returns the tangent of x.

The functions in operators.c are:

bool apply_binary_operator(binary_operator_fn op) which applies the binary operator.

bool apply_unary_operator(unary_operator_fn op) which applies the unary operator.

double operator_add(double lhs, double rhs) which add the lhs and rhs.

double operator_sub(double lhs, double rhs) which subtracts the lhs by the rhs.

double operator_mul(double lhs, double rhs) which multiplies the lhs by the rhs.

double operator_div(double lhs, double rhs) which divides the lhs by the rhs.

bool parse_double(const char *s, double *d) that parses the number in a string and returns true if possible and false if not.

The functions in stack.c are:

bool stack_push(double item) that adds an element to the top of the stack, adds 1 to stack_size, and returns true or false if possible or not.

bool stack_peek(double *item) gives item the value of the first element in the stack. Returns false if empty and true otherwise.

bool stack_pop(double *item) gives item the value of the top element and reduces stack_size by 1. Returns false if empty and true otherwise.

void stack_clear(void) clears the stack.

void stack_print(void) prints all the elements in the stack separated by a space.