CS1050 – Prelab 4
Spring 2020

Concepts to Practice
- User-written functions
- math.h

Description

For the prelab assignment, you are to write a function called log16() to calculate the logarithm base 16 of a number. You may call any function from math.h such as log() or log10() in your implementation of log16(). In your main(), you should loop through powers of 2 starting at 1 (which is 2^0) up through 4096 and print these numbers along with their log16() – see sample output below.
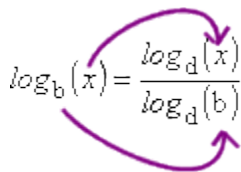
If (like me) you need a refresher on how to convert logarithms, here is some info from Purple Math (https://www.purplemath.com/modules/logrules5.htm):

> In order to evaluate a non-standard-base log, you must use the Change-of-Base formula:

Change-of-Base Formula:

$$\log_b(x) = \frac{\log_d(x)}{\log_d(b)}$$

> What this rule says, in practical terms, is that you can evaluate a non-standard-base log by converting it to the fraction of the form "(standard-base log of the argument) divided by (same-standard-base log of the non-standard-base)". I keep this straight by looking at the position of things. In the original log, the argument is "above" the base (since the base is subscripted), so I leave things that way when I split them up:

$$\log_b(x) = \frac{\log_d(x)}{\log_d(b)}$$

Functions You Must Write

You may write any functions you wish to implement this program, in **addition** to the following functions. However, you **must** implement the following functions:

- **double log16(double x)** – This function returns the log base 16 of x.
- **int main(void)** – Of course, you need to write a main().

Hints

- You should print double numbers with %lf as the formatter.

Sample Output

```
jimr@JimRHadesCanyon:~/CS1050/SP2020/labs/lab4$ compile prelab4.c
jimr@JimRHadesCanyon:~/CS1050/SP2020/labs/lab4$ ./a.out
Log base 16 of 1 = 0.000000
Log base 16 of 2 = 0.250000
Log base 16 of 4 = 0.500000
Log base 16 of 8 = 0.750000
Log base 16 of 16 = 1.000000
Log base 16 of 32 = 1.250000
Log base 16 of 64 = 1.500000
Log base 16 of 128 = 1.750000
Log base 16 of 256 = 2.000000
Log base 16 of 512 = 2.250000
Log base 16 of 1024 = 2.500000
Log base 16 of 2048 = 2.750000
Log base 16 of 4096 = 3.000000
```