Feel free to discuss these problems with other students currently taking the class, but give them credit and describe their contribution (e.g. “Fred had the insight that all cats are mortal and Sue pointed out that Socrates was mortal, but from there I figured out that Socrates was a cat on my own”) and write up your own work. You may use class readings and the reserve textbooks, but no other reference materials.

1) Ashley and Brian have implemented two different algorithms, A and B, to calculate the solution to the same problem. Input size is $n$.

Algorithm A takes $42.168n \log_2 n + 177.123n + 42$ operations.
Algorithm B takes $3.968n^2 + 65.977n + 19$ operations.

Your computer can do $1.8G$ operations per second, i.e., $1.8 \times 10^9 \times 10^9$. For input size of $n = 100$, $n = 1,000$, and $n = 1,000,000$, what are the actual running time for each of the two algorithms? (Express each in the units that make the quantity most easily understood by humans¹, which may be seconds, minutes, hours, etc., depending, and may be different for the 6 cases.)

2) Give the 32 bit value corresponding to the IEEE floating point for the base 10 value $2/3$ (1 sign bit, followed by 8 bit exponent, followed by 23 bit “fraction”).

3) Run your polygon area calculation program from the last assignment (or debugged version you just sent Wei if original was buggy) on the following two polygons:

a) $v_1 = (.2,.2)$, $v_2 = (.1,.2)$, $v_3 = (.1,.1)$, $v_4 = (.2,.1)$ ($v_5=v_1$)
b) $v_1 = (9999999.2, 9999999.2)$, $v_2 = (9999999.1, 9999999.2)$, $v_3 = (9999999.1, 9999999.1)$, $v_4 = (9999999.2, 9999999.1)$ ($v_5=v_1$)

Do you get different results? (If you get the same results for both these inputs, find a classmate who gets different results and determine why their results differ from yours.) Which result is more accurate? Why? Suggest a modification to the formula given in HW2 that will give equally accurate results for both inputs, and modify your program accordingly. Email Wei your revised code.

4) Read Regehr’s blog entry on debugging linked on the class website. Tell us your favorite debugging story from your personal experience and relate it to the blog post – e.g. did you use one of the strategies described? Should you have, but didn’t know better? Or was a different strategy needed?

¹Who want to know if they should wait for the answer, or if they should go get a coffee, or just go home...