

2 September 2020

1. **Warm up:** Answer the following True / False questions.

- (a) One byte is four bits.
- (b) One integer `int` is four bytes.
- (c) The sign of an integer `int` is given by the bit - in front of the `int`.
- (d) Since one byte can have 256 different values, 10 bytes can have 2560 different values.

The next two problems refer to the following C++ code. When compiled, the code on the left is a program called `power`, and the code on the right is a program called `readstop`.

```
#include <iostream>
using namespace std;
int main() {
    float base;
    int exp;
    cin >> base;
    cin >> exp;
    float result = base;
    for (int i = 1; i < exp; i++) {
        result = result*base;
    }
    cout << result << "\n";
    return 0;
}
```

```
#include <iostream>
using namespace std;
int main() {
    char next;
    bool stop;
    stop = false;
    while (!stop) {
        next = cin.peek();
        if (next == "x") {
            stop = true;
        }
        cin >> next;
        cout << next;
    }
    cout << endl;
    return 0;
}
```

2. This question is about the program `power`.

(a) Complete the table below for a given input to the program `power`.

input	2 4	4 4 4	-2 4	2 -4	-2 -4	2.9 4	2.9 4.9	2E10 4
output								

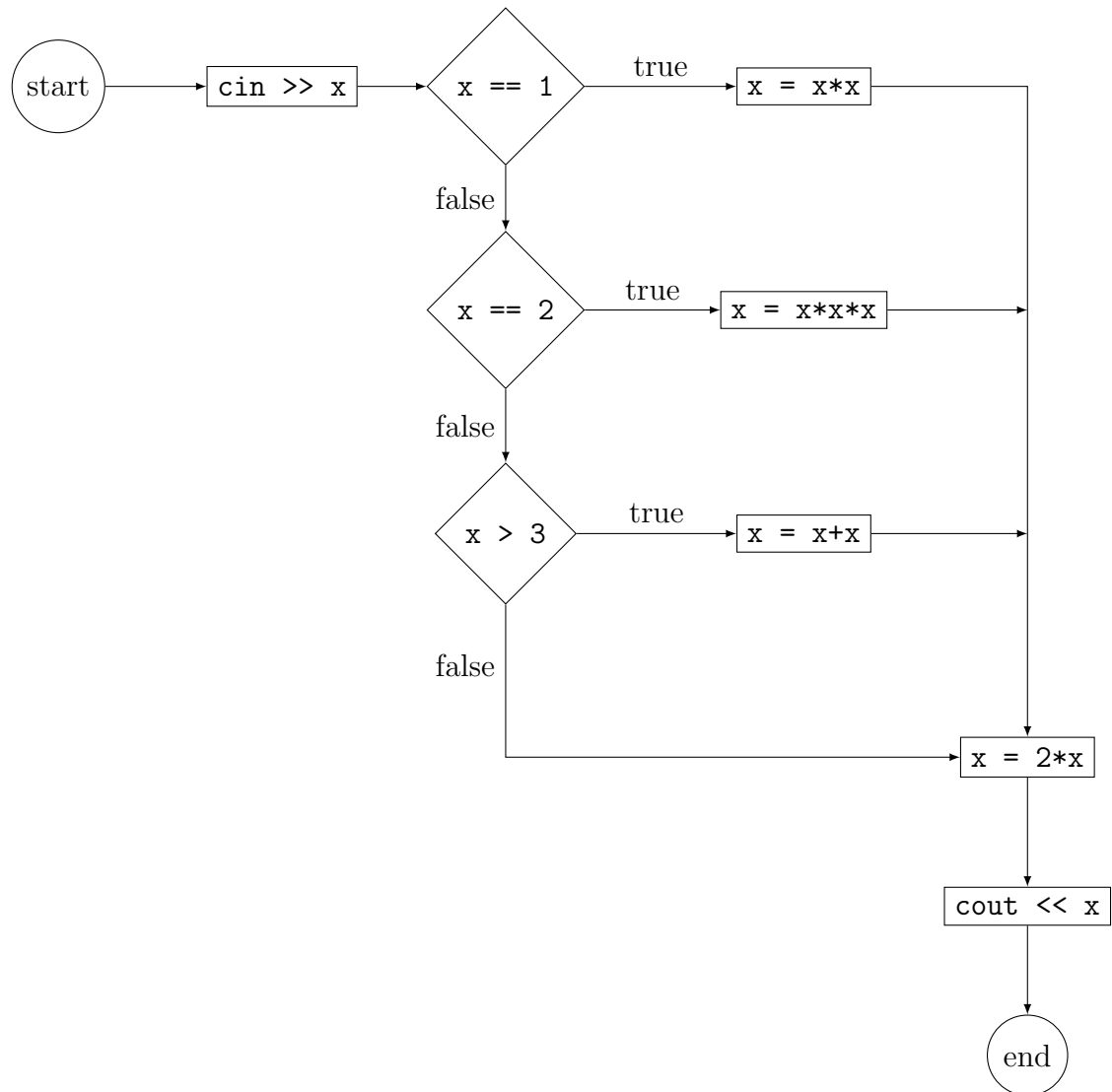
(b) Recall that `float` has a limited range. What is the largest number `X` for which the input `X 2` will output the square of `X`?

3. This question is about the program `readstop`. You may assume the input has no spaces.

- (a) What will be output if a file with contents `dexterous` will be used as input?
- (b) Modify the code so that the `while` loop exits at the second occurrence of `x`.
- (c) Modify the code so that the `while` loops exits either if `x` is encountered, or if the end-of-file character is encountered. Hint: use the boolean `cin.eof()`.
- (d) **Bonus:** Modify the code so that the `while` loop exits at the occurrence of two sequential characters `ax`, but not at each separately.

4. This question is about *flowcharts*.

- (a) Write a program that corresponds to the following flowchart and uses `switch` in a nontrivial way.



(b) Write a program for the same flowchart, without `switch`.

(c) What will the program output if 3 is input?

(d) Is it ever possible to get an odd number output?

(e) Find two different numbers that give the same output.

5. Write a C++ program called `dropunits` that takes as input an integer, and outputs the same integer, but without the units (that is, as a multiple of 10). For example, if the input 145 is given, then the program will print out 140.