Data Structures
BITL2

Worksheet 1

Fall 2021

2 September 2020

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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.

2. Consider the following `C++` code, compiled as a program `power` .

```
#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;
}
```

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

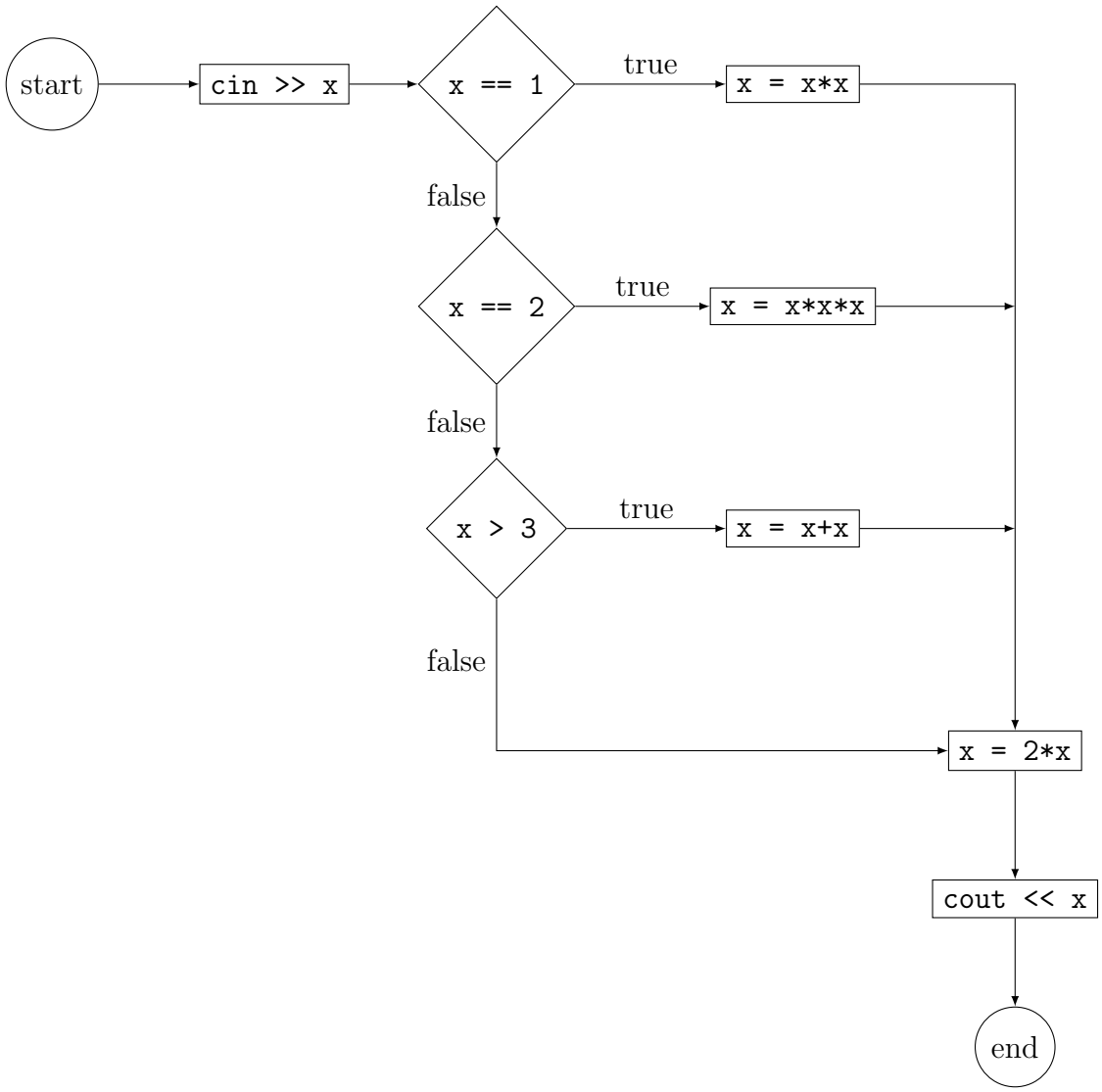
input	`2 4`	`4 4 4`	`-2 4`	`2 -4`	`-2 -4`	`2.9 4`	`2.9 4.9`	`2E10 4`
output								

   (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. Consider the following `C++` code, compiled as a program `stop`.

4. This question is about *flowcharts*.

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



   (b) Write a program for the same flowchart, but using `if` and without `switch`.

   (c) What will the program ouput 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`.