



Armstrong Numbers

Create a C++ program that will list all the Armstrong Numbers between 0 and 999.

An Armstrong Number is a number where the sum of the cubes of each digit of the number is equal to the number itself.

Example.

$$153 = 1^3 + 5^3 + 3^3$$

$$153 = (1 \times 1 \times 1) + (5 \times 5 \times 5) + (3 \times 3 \times 3)$$

You will need to use a for loop and if statements.

Solution 1

Using Only One Loop

Part of the "Armstrong Number" problem is that you need to isolate the hundred's digit, the ten's digit and the one's digit. This can be a bit tricky.

Example.

If you have 347, and you divide it by 100, you would get 3.47.

If however, you are storing the result in a variable of type int, the decimal part would be cut off, and you would be left with 3. In this manner, we have isolated the hundred's digit.

We could now subtract 3×100 from 347 and we would be left with 47.

Now, if we divide 47 by 10, we get 4.7. As above, if we were assigning this value to a variable of type int, the decimal part would be cut off, and you would be left with 4. In this manner, we have isolated the ten's digit.

We could now subtract 4×10 from 47 and we would be left with 7.

The remaining number is the one's digit.

```
#include <iostream>
using namespace std;

int main(int argc, char** argv)
{
    int hundreds = 0;
    int tens = 0;
    int ones = 0;

    int num = 347; // Place whatever 3 digit number you want here
    hundreds = num / 100;
    num = num - hundreds * 100;
    tens = num / 10;
    num = num - tens * 10;
    ones = num;

    cout << "Hundred's digit is " << hundreds << "\n";
    cout << "Ten's digit is " << tens << "\n";
    cout << "One's digit is " << ones << "\n";

    return 0;
}
```

Solution 2

Using Three Nested Loops

```
#include <iostream>
using namespace std;
int main()
{
    int number;
    cout << "The Armstrong Numbers between 0 and 999 are: ";
    for(int hundreds = 0; hundreds <= 9; hundreds++)
    {
        for(int tens = 0; tens <= 9; tens++)
        {
            for(int ones = 0; ones <= 9; ones++)
            {
                number = hundreds*100 + tens*10 + ones;
                if(number == (hundreds*hundreds*hundreds + tens*tens*tens + ones*ones*ones))
                {
                    cout << number << ", ";
                }
            }
        }
    }
    return 0;
}
```