Exponents & Output

page 85-87 & Section 3.8

Advanced Output Section 3.8

- How can we force output to look a particular way?
  - Precision of numbers
  - Spacing around output

```
Here are some floating point numbers:
       72.0
       72.00
       72.000
Here is a table of data:
         4   cat     15
       100     6    2.1
```

Spacing

- How can we output data in a table?

```
 cs150 42 house
3.1415 42   dog
```

```
string name = “cs150”;

int integer = 42;
cout << setw(6) << name;
```

Spacing around output

```
#include <iostream>
#include <iomanip> //New Library!
#include <string>
using namespace std;
int main()
{
  double number = 3.141592653589793;
  string name = "cs150";
  int integer = 42;
  cout << setw(6) << name << setw(6) << integer << endl;
  //cout << setw(6) << fixed << setprecision(3) << number;
  cout << setw(4) << integer <<endl;
  return 0;
}
```

```
•cs150••••42
••42
```

A • represents a blank space

Setw

- Setw is not *sticky*
  - you must specify it every time

```
double number = 3.141592653589793;
int integer = 42;
cout << setw(6) << integer << integer << endl;
cout << integer <<endl;

//output?
```

Practice

- Write a program segment that allows the user to input two integer values into variables num1 and num2. Display both numbers as shown below, always displaying the smaller number first.

```
Please enter two numbers: 100 9
The numbers are:
   9
 100
```

Precision

```
double number = 3.141592653589793;
cout << number << endl; // default output
```

- What does this output?

- Precision

```
cout << setprecision(2) << number;
```

Output:

Spacing around output

```
#include <iostream>
#include <iomanip> //New Library!
#include <string>
using namespace std;
int main()
{
  double number = 3.141592653589793;
  string name = “cs150”;
  int integer = 42;
  cout << setw(6) << name << setw(6) << integer << endl;
  cout << setw(6) << fixed << setprecision(3) << number;
  cout << setw(4) << integer <<endl;
  return 0;
}
```

```
•cs150••••42
•3.142••42
```

A • represents a blank space

Precision

- Precision can also be used to set the number of digits after the decimal point

```
double number = 3.14159265358979 3;
cout << fixed << setprecision(2) << number;
```

- Output:

Precision of numbers

```
#include <iostream>
#include <iomanip> //New Library!
using namespace std;
int main()
{
  double number = 3.141592653589793;
  cout << number << endl; // default output
  cout << fixed << setprecision(4) << number << endl;
  cout << fixed << setprecision(3) << number << endl;
  cout << fixed << setprecision(2) << number << endl;
  cout << fixed << setprecision(1) << number << endl;
  return 0;
}
```

```
3.14159
3.1416
3.142
3.14
3.1
```

These numbers are *rounded*!

Explore on your own what happens if **`number`** is an integer.

Precision

- Precision and fixed are *sticky*
    - remains in effect until changed

```
double number = 3.141592653589793;
cout << fixed << setprecision(4) << number << endl;
cout << setprecision(2) << number << endl;
cout << number << endl;

// Output?
```

double

- a **double** has a range of:
  - ±1.7E-308 to ±1.7E308
  - however, only tracks 16 significant digits

```
double bignumber = 1234567891.123456789;
cout << fixed << setprecision(20);
cout << bignumber <<endl;
bignumber = 9234567891.123456789;
cout << bignumber <<endl;
```

- Output:

Practice

- Using the variables below, create the output shown:

```
double number = 3.141592653589793;
string name = “cs150”;
string animal = “cat”;
string cover = “hat”;
int integer = 42;
```

A • represents a blank space

```
••••cat•3.1416
••••hat••cs150
•42••42••42•42
3.14159265•3.1
```

Exponents (page 85-87)

- The exponent operator was missing from the list! x^2 y^n
- C++ does not provide an exponent operator as part of the language
- Use **`pow()`** in the **`cmath`** library

```
#include <cmath>
double area;
area = pow(4, 2); // area = 4²
```

`pow()`

- **`pow()`** is not an operator
  - it is a *function*
  - like **`main()`**
  - **`double pow(double x, double y)`**
  - it takes as arguments two **`doubles`**
    - **`x and y`**
  - it produces a **`double`**

Practice using exponents!

```
// Calculate the area of a square
double lengthOfSide = 4.9;



// Calculate the volume of a cube
```