University of Hertfordshire

7COM1025
Programming for Software Engineers
Lecture 2

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THE ONE HUNDRED UNDER FIFTY

Starting from the very beginning

```
#include <iostream>
using namespace std;
int main()
{
   cout << “Hello World”;
   return 0;
}
```

Basic input/output

```
#include <iostream>
using namespace std;
int main()
{
    int a;
    cout << "What’s your age?\n";
    cin >> a;
    cout <<"You are "<<a<<" years old\n";
    return 0;
}
```

Basic: Data types

Type	Typical Bit Width	Typical Range	Type	Typical Bit Width	Typical Range
char	1 byte	-127 to 127 or 0 to 255	signed short int	2 bytes	-32768 to 32767
unsigned char	1 byte	0 to 255	long int	4 bytes	-2,147,483,647 to 2,147,483,647
signed char	1 byte	-127 to 127	signed long int	4 bytes	same as long int
int	4 bytes	-2147483648 to 2147483647	unsigned long int	4 bytes	0 to 4,294,967,295
unsigned int	4 bytes	0 to 4294967295	Float	4 bytes	+/- 3.4e +/- 38 (~7 digits)
signed int	4 bytes	-2147483648 to 2147483647	Double	8 bytes	+/- 1.7e +/- 308 (~15 digits)
short int	2 bytes	-32768 to 32767	long double	8 bytes	+/- 1.7e +/- 308 (~15 digits)
unsigned short int	2 bytes	0 to 65,535	wchar_t	2 or 4 bytes	1 wide character

Basic: Conditionals

```
#include <iostream>
using namespace std;
int main()
{
    int a;
    cout << "What's your age?\n";
    cin >> a;
    if (a>30)
        cout<<"You are over 30 years old\n";
    else
        cout<<"You are 30 years old or less\n";
}
```

If more than one statement in the "if" or "else", use "{" and "}".

Basic: conditionals II

&&
||
!
== vs =
!=
>=
<=

Other important operators
++, --, +=, -=

Basic: loops

```
#include <iostream>
using namespace std;
int main()
{
    int a;
    for (a=1; a<=100; a++)
        cout<<a<<"\n";
}
```

If you have more than one statement in the “for”, use “{“ and “}”.

Basic: using other libraries

```
#include <iostream>
#include <cmath>
using namespace std;
int main()
{
    float base, exponent;
    cout <<"Enter base:\n";
    cin >> base;
    cout <<"Enter exponent:\n";
    cin>>exponent;
    cout<<"That's:"<<pow(base,exponent)<<"\n";
}
```

Problem 1.1

Banking is one of the major industries in the UK. Banks need to be able to calculate repayments on loans and mortgages.

Write a program that calculates the values of repayments on a loan as per the equation below.

$$Payment = \frac{IntRate * \frac{Principal}{PayPerYear}}{1 - \left(\left(\frac{IntRate}{PayPerYear}\right) + 1\right)^{-(PayPerYear * NYears)}}$$

Basic: Array

```
#include <iostream>
using namespace std;
int main()
{
    float a[5], total;
    int i;
    for (i=0; i<5; i++)
        cin >> a[i];
    //Lets find the average now
    total=0;
    for (i=0; i<5; i++)
        total +=a[i];
    cout<<"The average is: "<<total/5;
}
```

You can have an 'old school' C string by using an array of characters.
char str[50]

Note: the last character in str will automatically be '\0'
Always take that into account!

Problem 1.2

Banks also need to encrypt customers' information

Write a program that allows a user to input 20 characters as a C string and a “key”. The program should show the encrypted string and then decrypt it.

Dynamic Initialisation

```
#include <iostream>
using namespace std;
int main()
{
    double radius = 4.0, height = 5.0;
    double volume = 3.1416 * radius * radius * height;
    cout << "Volume is " << volume<<"\n";
    return 0;
}
```

BASIC: Chain of assignments

```
#include <iostream>
using namespace std;
int main()
{
    int x, y, z;
    x = y = z = 100;
    cout<<x<<"\n";
    return 0;
}
```

BASIC: prefix vs postfix

```
#include <iostream>
using namespace std;
int main()
{
    int a, b, c, d;
    a=b=10;
    c=a++;
    cout << "a is "<< a << " c is "<< c <<"\n";
    d=++b;
    cout << "d is "<< d << " b is "<< b <<"\n";
    return 0;
}
```

WHAT'S THE OUTPUT?

```
#include <iostream>
using namespace std;
int main()
{
    cout <<2/3<<"\n";
    return 0;
}
```

DEALING WITH LITERALS

Data type	Example
int	2 23 52
long int	35000L -34L
unsigned int	1000U 7885U
unsigned long	124UL 9551UL
float	1.23F 4.32e-3F
double	1.25 3.2156
long double	100.5L

Problem 1.3

Factorials are used in a number of problems in statistics and economics.

Write a program that calculates the factorial of any integer.

Example: 5! = 5*4*3*2*1