Object Oriented Programming
Laboratory 1 - Fundamentals & Control Structures

1 Aims & Objectives

The aims of this lab are:

- to obtain basic familiarity with the programming environment;
- to obtain initial practice in programming and compiling;
- to learn to declare variables and to assign them values;
- to learn the role of simple control structures in directing the program flow.

2 Hello World

Type in, compile and run the following listing.

```
#include <iostream>

using namespace std;

int main(void);

int main(void)
{
  cout << "Hello World\n";
  return(0);
}
```

Try adding some comments to this listing. Remember

```
/* This is a 'C' style, multiline comment */

// This is a C++ style, singleline comment
```

3 Variables and Input

Now try the following listing.

```
#include <iostream>

using namespace std;

int main(void);

int main(void)
{
  int number1;
  int number2;
  int number3;

  cout << "Please␣enter␣an␣integer...";
  cin  >> number1;

  cout << "Please␣enter␣an␣integer...";
  cin  >> number2;

  number3 = number1 * number2;
  cout << number1 << "␣multiplied␣by␣"
       << number2 << "␣is␣" << number3;
  return(0);
}
```

Can you understand the listing? Comment the listing.

4 Control structures

We shall now look at some ways of directing program flow.

4.1 if statements

```
#include <iostream>

using namespace std;
```

```
int main(void);

int main(void)
{
  int  number1;
  int  number2;
  int  number3;
  char operation;

  cout << "Please␣enter␣an␣integer...";
  cin  >> number1;

  cout << "Please␣enter␣an␣integer...";
  cin  >> number2;

  cout << "Please␣enter␣an␣operation...(+␣-␣/␣*):";
  cin  >> operation;

  if(operation == '*')
  {
    number3 = number1 * number2;
    cout << number1 << "␣multiplied␣by␣"
         << number2 << "␣is␣" << number3;
  }
  return(0);
}
```

Try this program out. Can you expand the listing so that it works for the other operations too?

4.2 for statements

```
#include <iostream>

using namespace std;

int main(void);

int main(void)
{
  int loop;
```

```
10
  for(loop = 0; loop < 3; loop++) cout << "Hello World..";
  return(0);
}
```

What does this program do? Can you alter it to ask the user for the number of times to print the message?

Now try this listing

```
#include <iostream>
2
using namespace std;

int main(void);

7 int main(void)
{
  int total = 0;
  int loop;

12  for(loop = 1; loop <= 10; loop++)
  {
    total += loop;
    cout << "So far... total is " << total << "\n";
  }
17  cout << "At the end total is " << total << "\n";
  return(0);
}
```

Can you modify the listings to work out what all the numbers from 1 to 10 multiply together to give?

4.3 switch statements

Can you use switch statements to implement the "calculator" program we looked at before?

5 Conversion

C has a function to convert numbers from one base to another. But for a little practice with binary manipulation try the listings below.

```
int main(void)
{
  int number;

  int units;
  int twos;
  int fours;
  int eights;

  cout << "Please␣enter␣a␣number␣less␣than␣15␣:";
  cin >> number;

  if(number > 15) return;

  units  = number % 2;
  number = number >> 1;
  twos   = number % 2;
  number = number >> 1;
  fours  = number % 2;
  number = number >> 1;
  eights = number % 2;
  number = number >> 1;

  cout << "Binary␣representation␣is␣"
       << eights << fours << twos << units << "\n";

  return(0);
}
```

Can you create a listing to print out a number in number base 5?