

A data type defines a set. For example, the set of Boolean values consists of two values **{false,true}**

A description of a data type includes:

1. a definition of the set of values represented by that type
Example: The set B of Boolean values is $B = \{\text{false}, \text{true}\}$
2. its representation
Example: Figure 1 illustrates how Boolean values false and true are represented on the computer science department computer, cs.ucok.edu.

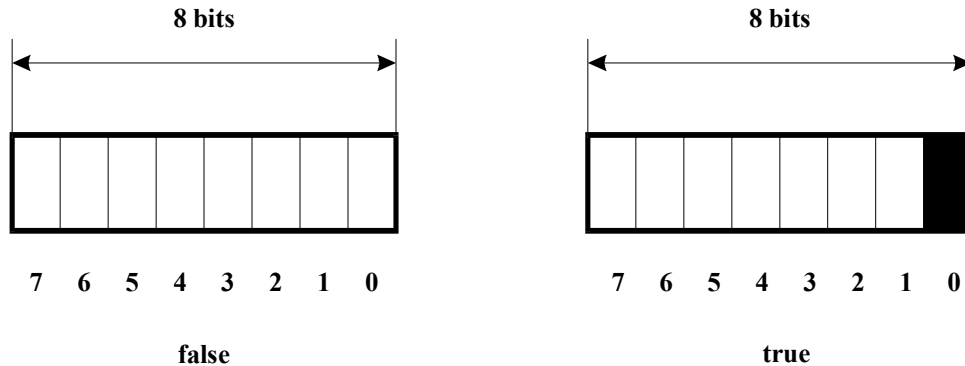


Figure 1. Boolean data representation on cs.ucok.edu

3. declaration syntax
Example: Variable *isprime* in Figure 2 has type **bool**.

```
#include <iostream>
using namespace std;
int main()
{   bool isprime;
    return 0;
}
```

Figure 2. Example Boolean declaration.

4. constants
Example: Variable *isprime* in Figure 3 is initialized to the Boolean constant **false**.

```
#include <iostream>
using namespace std;
int main()
{   bool isprime=false;
    return 0;
}
```

Figure 3. Example Boolean constant.

5. operations: Operations on Boolean data include and (**&&**), or (**||**), not (**!**), equality (**==**), and inequality (**!=**).
Example: The program listed in Figure 4 illustrates an example of a Boolean expression. The program in Figure 4 prints **true**.

```
#include <iostream>
using namespace std;
int main()
{ bool istrue=!false&&true||false;
  if (istrue) cout << "true"; else cout << "false";
  cout << endl;
  return 0;
}
```

Figure 4. Example Boolean expression.

References:

Boolean Types

Stroustrup p 71, 835,615,610

Horstman and Budd; *Big C++*; p 136,137

Data Types

Stroustrup p 69-78

Horstman and Budd; *Big C++*; Chapter 2

Exercises:

1. Write a program that proves deMorgan's Theorem.

$$\overline{(A + B)} = \overline{A} \overline{B}$$

$$\overline{AB} = \overline{A} + \overline{B}$$

2. Write a program that proves $A + B = B + A$
3. Write a program that proves $A + 1 = 1$
4. Write a program that proves $A \cdot 0 = 0$