Lecture 4
Expressions and Control Flow

Wed Jan 19, 11:05-12:30
Fri Jan 21 2:00-3:25

Prof. R K Joshi
Computer Science and Engineering
IIT Bombay
Email: rkj@cse.iitb.ac.in
Objects used inside a program
Variables: some of the identifiers
Assignment
Lvalue and rvalue
Expressions and variables
Storage space

Types
Variable declarations
Initialization
Determining size requirement of variables
Checking for types during assignment
Standard data types and their sizes
Decimal Numbers

- Numbers to the base 10
  - Decimal system
  - Use of just 10 digits: 0, 1, 2, ..., 9
  - Example: 7356
  - We have used 4 symbols: 7, 3, 5, 6
  - We have placed them in a sequence
  - Each place has a different value weightage
  
  \[= 7000 + 3000 + 50 + 6\]

  i.e. \[7 \times 10^3 + 3 \times 10^2 + 5 \times 10^1 + 6 \times 10^0\]
Binary Numbers

- Numbers to the base 2
  - Binary system
  - Use of just 2 digits digits 0,1
  - Example: 1 0 1 1
  - We have used 4 symbols in total
  - We have placed them in a sequence
  - Each place has a different value weightage

\[
= 8 + 0 + 2 + 1
\]

i.e. \(1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 0 \times 2^0\)
Storage required for a variable

- **Char c**
  - 8 bits kept aside for every char
  - How many characters can we accommodate all in all?
    - $2^8$
- **int x**
  - 4 bytes kept aside for every integer
  - i.e. 32 bits
  - -2147483648 to +2147483647
- **Unsigned int**
  - 4 bytes kept aside
  - 0 to 4294967295
Expressions

- \( a+b \) \hspace{1cm} a = b
- \((a+b)\) \hspace{1cm} (a==b)
- A-b \hspace{1cm} a < b
- a*b \hspace{1cm} a > b
- a/b \hspace{1cm} a <= b
- a%b \hspace{1cm} a >= b
Operator Precedence

\[ a + b \times c \] is equivalent to \( (a + (b \times c)) \)

- Brackets can be omitted if we write expressions considering the precedence rules
Sequential Control

1. Select item
2. Scan Card
3. Deduct amount
int main () {
    cin >> x;
    cin >> y;
    cout << x + y;
}

Sequential control
Conditional Control

Reject transaction

Enough balance?

Deduct amount

no

yes
If else statement

Syntax:

if (condition) statement1 ;
else statement2;

Example:

if (a%2==0) cout << “even number\n”;
else cout << “odd number\n”;
Using expressions in statements

- In assignment `<variable> = <expression> ;`
  
  ```
  x = a + b
  z = (x * x * 4) + (y *2) + k ;
  ```

- In a branching statement as conditions

  ```
  if ( a < b)
      { cout << “a is smaller than b”; }
  else
     { cout << “a is not smaller than b”; }; 
  ```