• **rand()**
  – used for random numbers from 0 – **RAND_MAX**
  – RAND_MAX defined constant in `<cstdlib>`

• **srand()**
  – used to “seed” the random number generator
  – seed off time
    • `#include <ctime>`
Random numbers between 0 - RAND_MAX

cout << "How many random numbers do you want?";  
cin >> count;

while ( count > 0 ) {
    cout << rand() << endl;
    count = count - 1;
}

cout << "Finished!" << endl;
Random numbers between 0 - 1
Random numbers between 0 - 1

```cpp
cout << "How many random numbers do you want?";
cin >> count;

while ( count > 0 ) {
    cout << rand() * 1.0 / RAND_MAX << endl;
    count = count - 1;
}

cout << "Finished!" << endl;
```
Random numbers between 0 - 9
Random numbers between 0 - 9

```cpp
#include <iostream>
#include <cstdlib>

int main() {
    int count;
    cout << "How many random numbers do you want?"; cin >> count;

    while (count > 0) {
        cout << rand() % 10 << endl;
        count = count - 1;
    }

    cout << "Finished!" << endl;
    return 0;
}
```

Seeding random numbers

- Run code again – get the same series of “random” numbers
A different series of “random” #'s each time

```cpp
#include <iostream>
#include <ctime>
#include <cctype>
using namespace std;

int main()
{
    char response;
    cout << "Do you want a random seed? ";
    cin >> response;
    if (toupper(response) == 'Y') {
        time_t seed = time(0);
        srand(seed);
    }

    int count;
    cout << "How many random numbers do you want? ";
    cin >> count;

    while (count > 0) {
        cout << rand() << endl;
        count = count - 1;
    }

    cout << "Finished!" << endl;
    return 0;
}
```
#include <iostream>

using namespace std;

int main() {
    char response;
    cout << "Do you want a random seed? ";
    cin >> response;

    if (toupper(response) == 'Y') {
        time_t seed = time(0);
        srand(seed);
    }

    int count;
    cout << "How many random numbers do you want? ";
    cin >> count;

    while (count > 0) {
        cout << rand() << endl;
        count = count - 1;
    }

    cout << "Finished!" << endl;

    return 0;
}
A different series of “random” #'s each time

```cpp
#include <iostream>
#include <ctime>
#include <cctype>
using namespace std;

int main()
{
    char response;
    cout << "Do you want a random seed? ";
    cin >> response;

    if ( response == 'Y' ) {
        time_t seed = time(0);
        srand(seed);
    }

    int count;
    cout << "How many random numbers do you want? ";
    cin >> count;

    while ( count > 0 ) {
        cout << rand() << endl;
        count = count - 1;
    }

    cout << "Finished!" << endl;
    return 0;
}
```
#include <iostream>

#include <ctime>

#include <cctype>

using namespace std;

int main()
{
    char response;
    cout << "Do you want a random seed? ";
    cin >> response;

    if ( response == 'Y' ) {
        time_t seed = time(0);
        srand(seed);
    }

    int count;
    cout << "How many random numbers do you want? ";
    cin >> count;

    while ( count > 0 ) {
        cout << rand() << endl;
        count = count - 1;
    }

    cout << "Finished!" << endl;
    return 0;
}
#include <iostream>
#include <ctime>
#include <cctype>

using namespace std;

int main()
{
    char response;
    cout << "Do you want a random seed? ";
    cin >> response;
    if ( response == 'Y' ) {
        time_t seed = time(0);
        srand(seed);
    }
    int count;
    cout << "How many random numbers do you want? ";
    cin >> count;
    while ( count > 0 ) {
        cout << rand() << endl;
        count = count - 1;
    }
    cout << "Finished!" << endl;
    return 0;
}
A different series of “random” #’s each time

```cpp
#include <iostream>
#include <ctime>
#include <cctype>

using namespace std;

int main() {
    char response;
    cout << "Do you want a random seed? ";
    cin >> response;

    if ( toupper(response) == 'Y' ) {
        time_t seed = time(0);
        srand(seed);
    }

    int count;
    cout << "How many random numbers do you want? ";
    cin >> count;

    while ( count > 0 ) {
        cout << rand() << endl;
        count = count - 1;
    }

    cout << "Finished!" << endl;
    return 0;
}
```
Problem: Lottery Game

* This program simulates one player playing a simple lottery game. The rules are:
  1) the player bets $1 each play, then chooses a number between 1 and MAX
  2) the computer draws a pseudo random number in same range
  3) if there is a match, the player wins $MAX
  4) the player keeps playing the game until either he/she is broke or wins once
```cpp
int main()
{
    int numPicked,       // number player picks
        numDrawn,       // number computer draws
        balance = START_BALANCE; // start off with this amount on hand
    bool won = false;   // reset to true if player does win
    time_t seed;        // seeds (initializes) rand()

    seed = time (0);
    srand(static_cast<unsigned int>(seed));

    printIntro();
    printBalance(balance,0);

    while ( (balance != 0) && (!won) )
    {
        placeBet(balance);
        numPicked = pickNum(MAX);     // get human pick
        numDrawn = drawNum (MAX);      // computer draw
        won = checkForMatch(numPicked, numDrawn);
    }
    printClosing(won, balance);
    return 0;
}
```
void placeBet(int& bal)
{
    bal = bal - BET;
    printBalance(bal, 1);
}
int drawNum (int max)
{
    int num;
    num = 1 + rand() % max;
    cout << "Number Drawn: " << num << endl;
    return (num);
}

int pickNum(int max)
{
    int num;
    string junk;

    cout << endl << "Pick a number between 1 and " << max << " \-> ";
    cin >> num;

    while ( (num < 1) || (num > max) || cin.fail() )
    {
        if (cin.fail())
        {
            cin.clear();
            getline(cin, junk);
        }
        cout << "Invalid number! Please try again \-> ";
        cin >> num;
    }

    return num;
}
bool checkForMatch(int pick, int drawn)
{
    if ( pick == drawn )
    {
        cout << "The numbers match! You win!" << endl;
        return true;
    }
    else
    {
        cout << "Sorry, no match." << endl;
        return false;
    }
}
void printBalance(int bal, int bet)
{
    if (bet)
        cout << "\n\n*** Betting *** " << endl;

    cout << "Your balance is: "$ << bal;
}