Random Number Generation

- The standard C library -- **cstdlib** -- contains functions for generating pseudo-random numbers.
    - Numbers aren't truly random, because they are simply generated with an algorithm
    - A pseudo-random number generation algorithm starts with a value called a **seed value**. (If you use the same seed, you get the same pattern of "random" numbers!)
- In C++ (and C), the functions needed from **cstdlib** are **rand()** and **srand()**
- **srand()** is used to seed the random number generator (and only needs to be called once, best to do this at the start of main()).
    - The seed value *could* be obtained from user input, but usually the best way is to use the time value obtained from the computer's clock, since that will change frequently (like between runs of the program)
    - To get the clock value, call the function `time(0)` from the library `ctime`

  Example:

  ```
  #include <cstdlib>     // for srand(), rand()
  #include <ctime>    // for time()

  // ...

  srand( time(0) );      // seed the random number generator

  //if the above line gives you a warning when you compile, try:
  //srand((unsigned int)time(0));
  ```

- Once the random number generator has been seeded, use the **rand()** function to retrieve a random number. The function takes no parameters, and returns the random number selected:

  ```
  int r;
  r = rand();            // r now contains a random number
                         //  in the range of possible integers
  ```

- Since the random number returned could be from a very large range, sometimes we want to force the number into a smaller range. This can be done with the modulus operator `%`. Divide by the size of the range and take the remainder:

  ```
  r = rand() % 10;     // r will be a random number from 0 through 9
  ```

- If we want to have the range of random numbers start somewhere other than 0, just add an offset (or subtract) to shift the starting point of the range:

  ```
  r = rand() % 10 + 1;          // a random number from 1 - 10
  r = rand() % 10 + 5;          // a random number from 5 - 14
  ```

- [This example](#) shows some random number generation