1. using the cctype library

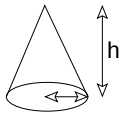
Write a program called **classify.cpp** that randomly selects 100 characters from the ASCII table and counts how many are lower-case letters ($a..z$), how many are upper-case letters ($A..Z$), how many are digits ($0..9$), how many are punctuation marks, and how many are none of these. After you select each character, print it out. At the end, print out the total count for each type (lower-case, upper-case, digits and punctuation).
HINTS:

- The standard ASCII table contains 128 characters, indexed from 0 to 127. So, to select one randomly, use the `rand()` function with the modulo operator ($\%$) to pick a random number between 0 and 127.
- Use the `(char)` coercion operator to convert the random number to a character so you can print it out. Note that characters less than 32 and greater than 126 are not printable, so don't print these.
- Use `cctype` functions (`islower()`, `isupper()`, `isdigit()` and `ispunct()`).
- Remember that the `cctype` functions take `int` arguments and return an `int` that can be interpreted as *true* or *false*. You can simply test the return value (and output the character) like this:

```
int k;
...
if ( islower( k )) {
  cout << "is lower: [" << (char)k << "]\n";
}
```

2. using the cmath library

Write a program called **cone.cpp** that computes the volume (v) of a cone:



$$v = (1/3)\pi r^2 h$$

Your program should ask the user to enter the radius of the base of the cone (r) and the height of the cone (h). Your program should echo the user's input. Then it should compute the volume (using the formula, above) and output the volume.
HINTS:

- If you compute $1/3$ in C++, it will consider 1 and 3 to be integers, and it will perform *integer division*, which means that $1/3 = 0$ instead of 0.33333. In order to force C++ to do math with real numbers (i.e., doubles), use $1.0/3.0$ instead of $1/3$.
- Don't forget that π is a *constant* in the `cmath` library: `M_PI`.

3. writing your own function

Create a program called **cone2.cpp** that does the same thing as the program in the previous step, but instead of doing everything inside the `main()`, write a **function** called:

```
double cone( double r, double h ) {
  ...
} // end of cone()
```

which computes and returns the volume, based on its arguments. The `main()` should prompt the user to enter the radius and height of the cone, then it should call your `cone()` function and output the value returned by your function.