CS 101: Computer Programming and Utilization

19-Programming with Classes

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What does this program do?

class poly {
    private:
        float coefs[10]; int degree;
    public:
        void read();
        void print();
};

int main() {
    poly p; double point;
    p.read();
    p.print();
}
Recall: Class = Struct + ?

- Constructor(s)
  - How to set up the initial configuration
  - Perhaps allocate memory
- Destructors
  - Release resources and clean up state
- Methods (functions)
  - Change the state of the struct members in clean, controlled ways
  - Methods are like functions except they have access to the invisible variable “this” (more on this later)
- Access control: public, protected, private
- Inheritance (extending classes)
Activity: Adding a method to a class

Add a function 'eval' to the class poly that will evaluate the value of the polynomial at a given point and output that value.

Think: Write the pseudo-code for eval().
Pair: Write the C++ function for eval(). Modify main().
Share: Compare with demo18-poly.cpp.

Further Discussion: demo18-poly-constructor.cpp
• What is the need for constructors?
Newton-Raphson: Finding root of poly

Recall the Newton-Raphson method for finding root of a polynomial in one variable.

- Given a function $f$ defined over real $x$, and its derivative $f'$, begin with a guess $x_0$ for a root of $f$.
- Get a better approximation $x_1$:
  $$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)}$$
- Repeat the process until a sufficiently accurate values is reached.
Activity

**Think:** Add a function 'diff' to the class poly that will return its derivative as → poly 'q'.

**Pair:** Modify the main() program to find the root of the given polynomial, using Newton-Raphson method.

**Share:** Compare with demo18-poly-NR-1.cpp.

Use of 'this' pointer: *(Not discussed in class; see lab12)*

- What is need for 'this' pointer?
  - this → eval(x)
- demo18-poly-NR-2.cpp
Notes

Newton-Raphson Method:
- en.wikipedia.org/wiki/Newton's_method
- www.mathresource.iitb.ac.in/applet/NewtonRaphson/

Classes
- www.cplusplus.com/doc/tutorial/classes/

'this' pointer
- www.tutorialspoint.com/cplusplus/cpp_this_pointer.htm