

CSC 221: Computer Programming I

Fall 2005

See online syllabus (also accessible via Blackboard):

- <http://www.creighton.edu/~davereed/csc221>

Course goals:

- To develop problem solving and programming skills to enable the student to design solutions to non-trivial problems and implement those solutions in Java.
- To master the fundamental programming constructs of Java, including variables, expressions, classes, methods, control structures, and arrays.
- To build a foundation for more advanced programming techniques, including object-oriented design and the use of standard data structures (as taught in CSC 222).

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What is programming?

programming is *applied problem-solving*

1. understand a problem
2. identify relevant characteristics
3. design an algorithm (step-by-step sequence of instructions to carry out a task)
4. implement the algorithm as a computer program
5. test the program by repeated (and carefully planned) executions
6. GO BACK AND REPEAT AS NECESSARY

in short: *programming* is the process of designing, writing, testing and debugging algorithms that can be carried out by a computer

we encounter algorithms everyday: directions to dorm, instruction manual, recipe

- people are smart, so spoken languages can be vague
- computers are not smart, so programming languages are extremely picky

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Object-oriented programming

the dominant approach to software development is *object-oriented design*

- solve problems by modeling real-world objects
 - e.g., if designing a banking system, model clients, accounts, deposits, ...
- a program is a collection of interacting objects
- emphasizes code reuse (important in industry not to keep reinventing the wheel)

when designing a program, first focus on the data objects involved, understand and model their interactions

QUESTION: what is a die?

this course will emphasize object-oriented programming techniques

- utilizes the Java programming language (1995, Sun Microsystems)
- we will also use the BlueJ IDE, designed for teaching/visualizing OOP
- good news: **both are free**

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Programming is a means to an end

important point: programming is a tool for solving problems

- computers allow people in many disciplines to solve problems they couldn't solve without them
 - natural sciences, mathematics, medicine, business, ...
- to model this, many exercises will involve writing a program, then using it to collect data & analyze results

PAPER FOLDING PUZZLE: if you started with a regular sheet of paper and repeatedly fold it in half, how many folds would it take for the thickness of the paper to reach the sun?

- what information do you need (e.g., distance of sun)?
- what data values do you need to store and update?
- what is the basic algorithm?

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Java solution

```
/**
 * This simple class is used to solve the Paper Folding Puzzle
 * @author Dave Reed
 * @version 8/26/04
 */
public class FoldPuzzle
{
    private double thickness;

    /**
     * Constructs the FoldPuzzle object
     * @param initial the initial thickness (in inches) of the paper
     */
    public FoldPuzzle(double initial)
    {
        thickness = initial;
    }

    /**
     * Computes how many folds it would take for the paper thickness to reach the
     * goal Distance
     * @param goalDistance the distance (in inches) the paper thickness must reach
     * @return number of folds required
     */
    public int FoldUntil(double goalDistance)
    {
        double current = thickness;
        int numFolds = 0;

        while (current < goalDistance) {
            current *= 2;
            numFolds++;
            System.out.println(numFolds + " " + current);
        }
        return numFolds;
    }
}
```

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Next week...

review basic computer terminology and history

- hardware vs. software
- generations of computer technology
- evolution of programming

begin programming on Thursday

- we will go over the details – NO PREVIOUS EXPERIENCE NECESSARY!
- bring a memory stick
- classes will mix lecture and hands-on experimentation, so be prepared to DO THINGS

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