

CSC 120

Introduction to Programming with Java



Lecture 1

University of Mount Union
Department of Computer Science



Computer Science \neq Coding

Many people think that all computer careers involve the stereotype of the lone programmer sitting in front of a monitor for 12 hours a day, getting no sunlight, etc.

This is simply not true in today's world

Computing touches almost all aspects of modern life

There are many tech and tech-related careers where the majority of the work is something other than programming

Network Administration, Computer Security, Database Orchestration, Analytics, etc

These are high-paying careers with lots of growth potential for people with skills and knowledge



So why is our first course at Mount Union a Coding course?

Even though many careers in the tech sphere are not programming-only jobs, knowledge of how programming works is critical to understanding the functioning of computers and computer applications

Why the structure of a network must be organized the way it is, or the reasons why a specific password policy is not secure, are based on the programming of the software used in the system.

In order to work in the tech sector or to effectively make use of modern applications, one needs a basic understanding of programming



CSC 120 is the foundation of the majors & minors in our Department

Basic Programming Skills are essential for success in our departmental programs

This course (Programming and Problem Solving I) is required for both of our majors and all of our minors except for the Web Design minor

Several departments across the campus require CSC 120 for one or more of their programs

Mathematics; Financial Math

National Security & Foreign Intelligence Analysis

Computer Engineering; Electrical Engineering



What is Computer Programming?

a.k.a. Software Development

Specifying step-by-step instructions for computing an answer, solving a problem or completing a task

Similar to a cooking recipe

Sequence of activities to cook something

We save the instructions in a *program* so that we don't have to retype the commands every time

Can run a program many times; each time the same steps are taken



Initial Difficulty in Learning to Program

Using a traditional programming language (Java, C++, Basic) in an introduction to programming can be difficult, because two new skills need to be applied at the same time:

Imagine attempting to instruct a child who has never cooked before and who only speaks Portuguese to bake a cake

two constraints that you face:

Must specify all actions exactly & explicitly, using simple, basic steps
cannot assume the child knows terms like “braise”, “fricassee”, “whisk”, etc.

Must use a foreign language that you’ve never used before, spelling every command correctly and using the proper punctuation, etc.

CS departments around the country and the world have encountered this difficulty with intro. programming courses



Our Approach to Introductory Programming at Mount Union

We have had success in our department with students of varying levels of prior programming experience in teaching the introductory programming course

Mount Union was a very early adopter of Java for our programming courses first used here in 1996

We've changed our approach to the intro course many times, to make things better for students learning programming techniques

We've found that what works best for our students is an early and exclusive focus on **objects as everything**

Challenge: there aren't any textbooks available that use this exact approach

our solution? assigning appropriate readings from different texts at different times in the semester, from the University Library's SAFARI TECH BOOKS subscription

free full-text access for Mount Union students to over 34,000 titles!!



Objects as Everything? What are Objects?

- Data in a computer program must be stored in the computer's memory
 - keystrokes in a word processing document
 - numbers entered into a spreadsheet
 - images in a photo editor
- Different programming languages have different ways of naming and accessing the data being processed by the program
- The most widely-used languages today use **Object-Oriented** data representations



Objects for Data

- Anything from the problem domain that is to be represented in a program is stored as an object
 - problem domain – the part of the outside world that is relevant to the program being written
 - examples of objects – TVSet, Mammal, Student

- Objects have:
 - a unique NAME
 - one or more PROPERTIES (data values)
 - one or more METHODS (capabilities)



Object Representation of a TVSet

- There can be multiple TVSets in a house
 - each one is given a unique name, for ease of identification
 - “Hey, turn off that TV!”
 - “Which one? The Living Room TV or the Kitchen TV?”
- Each object has a unique name, and a **class** that it comes from
 - a class is the type of object we are talking about
 - a general description of an object that could exist, describing the properties and methods of the object



Object Representation of a TVSet

- A TVSet has properties that represent values that describe the current state of operation of the TVSet
 - can you think of some example properties that a TVSet might have?
- A TVSet has methods that represent operations or things that the TVSet can do
 - what kinds of things can you “ask” a TVSet to do with a remote control?



Object Representation of a TVSet

- Some TVSet properties:

- channel
- volume
- brightness
- contrast
- on/off status

- Some TVSet methods:

- channelUp
- volumeDown
- setChannel
- powerOn/Off



Objects as Everything

- A pure Object-Oriented programming language uses the Object concept to represent all data in a program
- Java is an Object-Oriented language that was developed from older, non-OO languages
 - for ease of adoption by programmers who knew other languages, some non-OO features were built into Java
- Most (all?) Java programming textbooks don't use a pure OO approach



Objects as Everything

- But at Mount Union, we've found that using objects exclusively to represent everything in a program works best for teaching programming techniques
- Everything in a Java program is an object (including the program itself!)
- Every program has properties (data) and methods (procedures and/or functions that can be called upon and carried out)



Objects as Everything Programming Approach

- Our programs are collections of class definitions
- We define the data objects that the program will contain
- Then we ask the objects in our program to carry out operations in a specific sequence
- an example: a program that displays several Balloons on the screen...

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