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COMP1202 - Introduction

Son Hoang
(adapted from Prof David Millard's slides)

COMP1202 (AY2023-24)

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Part 1

Organisation

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Welcome to Programming I

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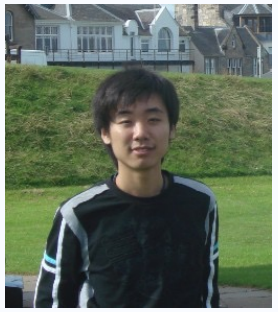
Purpose of this Module

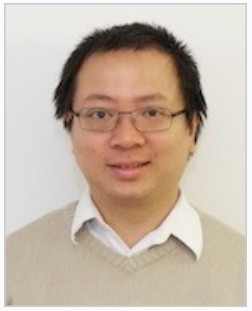
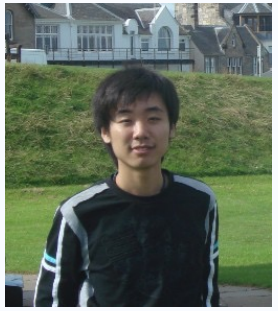
"This module aims to introduce students to the **principles of programming** using an object-oriented approach and to provide them with the programming skills necessary to continue the study of computer science. **Java is used as the introductory language**."

- Writing and running programs
- Compilation, Interpretation and the Java Virtual Machine
- Variables, Objects, Primitives and Scope
- Methods
- Computational Thinking
- Constructors
- Loops and Arrays
- Collections and Iterators
- The Java Library
- Integrated Development Environments
- Testing and Debugging
- Software Design (What makes a good program)
- Super and Sub Classes (Inheritance)
- Polymorphism and Dynamic Binding
- Abstract Classes and Interfaces
- Designing Applications (Moving from problem to solution)

Main Course Structure

- Two 1-hour lectures each week
  - Monday 13:00 (B32/1015)
  - Tuesday 16:00 (B32/1015)
- Also a 2-hour lab each week
  - (worth 15%, more to follow)
  - Tuesday 09:00-11:00, 14:00-16:00
  - Zepler Level 3 Lab (B59/3237)
- Other Assessments
  - Coursework (set in Week 4, due in Week 11, worth 45%)
  - Exam (after X-mas, worth 40%)
- More details on the next few slides


About Labs
Overview

- 2 labs every Tuesday
  - 09:00-11:00
  - 14:00-16:00
- Starting October 3rd (i.e., tomorrow)
- B59 (Zepler Building) Level 3 (R 3237)

- **Practice common courtesy**
- **There are no dumb questions**
- **Let someone know when you are stuck**
- **DO NOT** cut and paste code
- **DO NOT** share your code
- We treat **Academic Integrity** (AI) issues **seriously**

About Labs

Code Functionality Test Harness

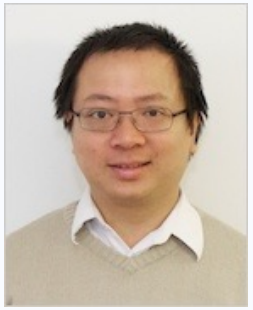
- Code functionality is assessed using a **test harness**
- You will **receive an email** detailing any
  - Errors and whether your code passed the tests
  - Styling problems (incorrect indentation, naming problems, etc.)
- **Make sure you follow the lab instructions carefully**, otherwise, your code might not meet the spec
  - That includes spelling in outputs!
- You must **structure** your code **exactly** the same as specified in the lab, otherwise, the test harness will not work
- **Submit your code well before the deadline**, otherwise, you might encounter issues making you miss the deadline

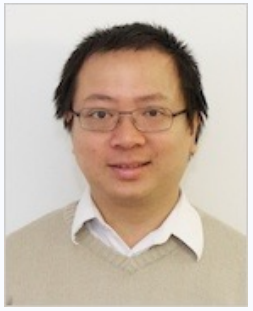
About Coursework and Exam

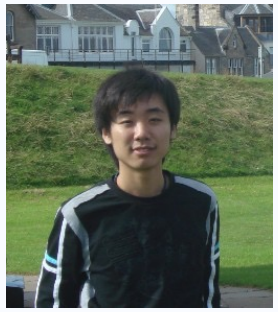
- Coursework
  - Set in Week 4
  - Due in Week 11 (before the X-mas break)
  - Feedback in the new year (before the exam)
- Exam
  - Multiple choice computer-based exam (QuestionMark OnDemand)
  - In-person (unless changed due to the pandemic situation)
  - A Mock Exam is available from the module website

Additional Streams

- Space Cadets
  - For people who are more **experienced programmers**
  - Run by Son and Frederick Nash (Freddie)
  - Optional weekly challenge and discussion
    - Friday 16:00-18:00 (B2/1039)
    - Weeks 1-7 (i.e., starts this week!)
- Ground Controllers
  - For people who are **new to programming**
  - Run by Son and Jian
  - Optional weekly workshop (Zepler Level 3 Lab (B59/3237))
  - Weeks 1-10 (i.e., starts this week!)

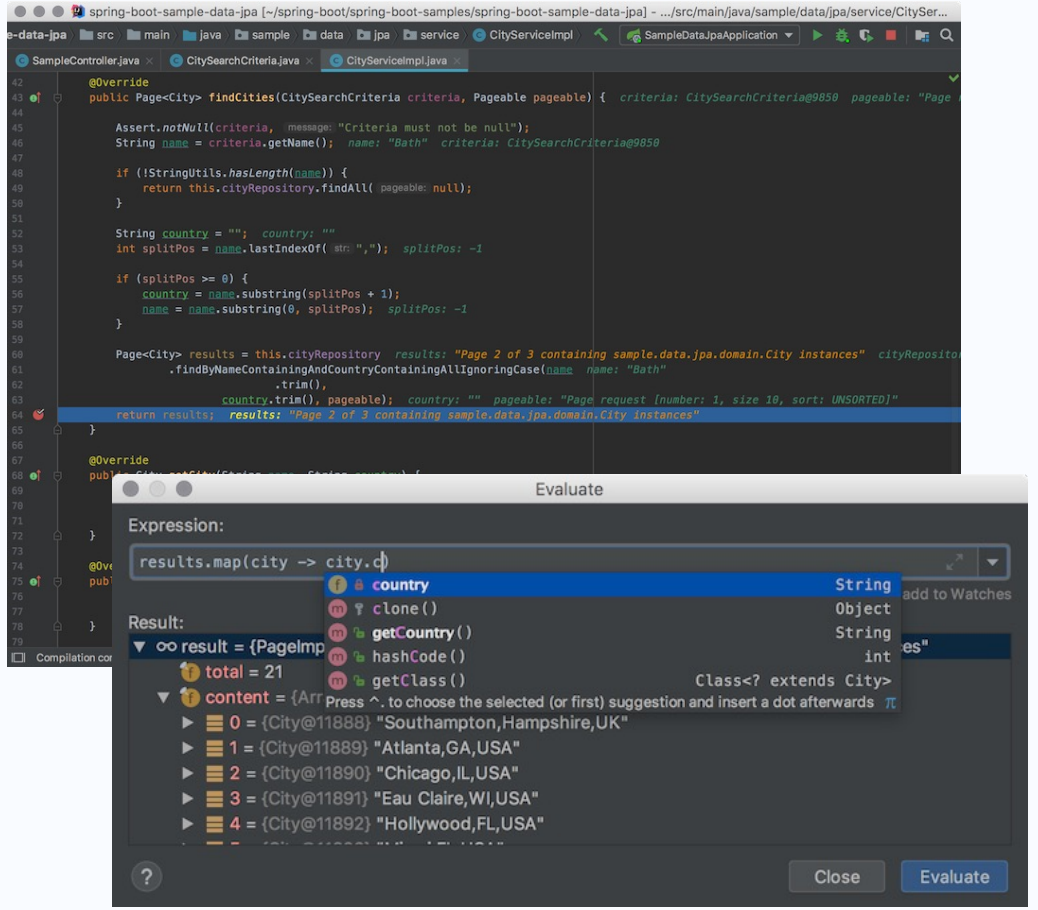






IntelliJ

- The main course text is *Objects First with BlueJ* (available from the library)
  - BlueJ is an environment designed for learning
- Although we will start with using Java from the command line, we will soon introduce you to the IntelliJ environment
- IntelliJ is a more professional environment (compare to BlueJ).



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A Dirty Secret!!!

- No matter how we teach you will mainly learn through practice!

- Programming is the single most important skill for a computer scientist or IT specialist
  - Systematic thinking and problem solving
  - Abstraction and data modelling

- Did we mention that you need to PRACTICE?

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PRACTICE!

"I've often thought that sucking less every year is how humble programmers improve. You should be unhappy with code you wrote a year ago."

Jeff Atwood, https://blog.codinghorror.com/sucking-less-every-year/

(Co-Founder of stackoverflow.com)

"It is true. I have no talent. What I do have is a lot of practice. And I am not talking about occasionally dabbling in Ruby on the weekends. I am talking about the kind of practice where I beat code that isn't working into submission (though often times the code wins)."

John Nunemaker,

http://www.railstips.org/blog/archives/2010/01/12/i-have-no-talent/

Your Lecturer: A Warning from History

Online Notes Wiki

https://secure.ecs.soton.ac.uk/module/2324/COMP1202/29509/

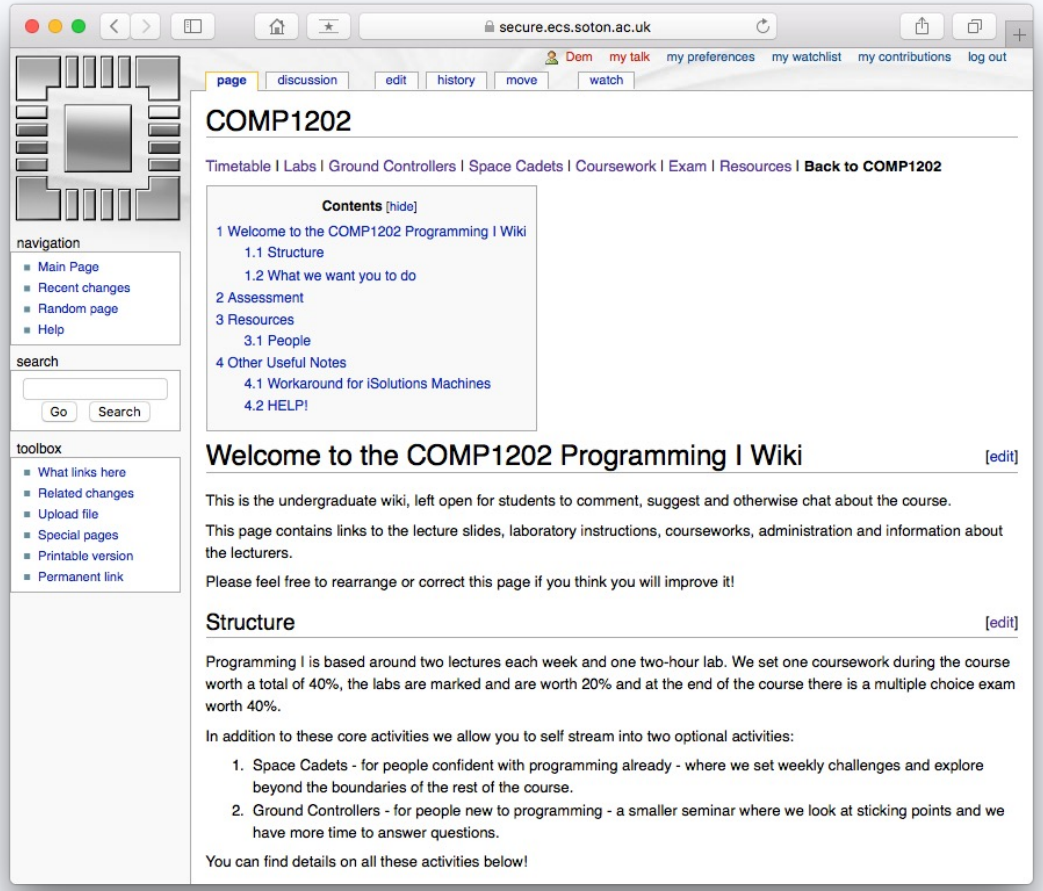
(Southampton campus)

leads to

https://secure.ecs.soton.ac.uk/student/wiki/w/COMP1202

Material is on different platforms

- EdShare (Slides and Summary Videos)
- Blackboard (Quizzes)
- MS Teams + Panopto (Recordings)



Timetables

- Your timetable shows all of the sessions/labs allocated to your modules

- Modules do not always use all of those sessions!
  - For example, we have optional labs (GC and SC)

- So check the notes pages of each course for more info and adjust your timetable accordingly!

Reminder COMP1202 Timetable

https://secure.ecs.soton.ac.uk/student/wiki/w/COMP1202/Timetable

Week	Start Date	Topic	Section of Objects First Textbook	Mon 13-14 lecture - B32/1015	Tue 16-17 lecture - B32/1015	Labs (Tue 9-11, 11-13) - B59/3237	Ground Controllers (Tue 14-16) - B59/3237	Space Cadets (Fri 16-18) - B2/1039
1	02/10/23	Introduction	1.1, 1.2	(0) Starting Out (sh) ▪ EdShare ▪ Please take the "00 - Starting Out" quiz on Blackboard	(1) Introduction to Java (sh) ▪ EdShare,	Lab 0: Lab Preparation (hp)	GC1. Odd Time (sh)	SC0. Introduction (sh)
2	09/10/23	Programming in Java	1.5, 2.15, 2.5	(2) Variables, Objects, Primitives and Scope (js) ▪ EdShare ▪ slides	(3) Methods (js) ▪ EdShare ▪ slides ▪ code	Lab 1. Hello World and Conditionals (hp)	GC2. ECS Course (sh)	SC1. Challenge 1 Review (sh)
3	16/10/23	Building Better Programs/Objects	2.4, 3.10, 3.11	(4) Constructors (js) ▪ EdShare ▪ slides with demo code	(5) Computational Thinking (ms) ▪ EdShare	Lab 2. Classes, Conditionals and Control Statements (hp)	GC3. Text Book (sh)	SC2. Challenge 2 Review (sh)
4	23/10/23	Loops and Arrays	4,4, 4.9, 4.10, 4.12	(6) Loops and Arrays (sh) ▪ EdShare ▪ Blackboard quizzes	(7) Collections and Iterators (sh) ▪ EdShare	Lab 3. Methods, Object Interaction and Testing (hp)	GC4. Loops and Arrays (sh)	SC3. Challenge 3 Review (sh)
5	30/10/23	Environments and the Java Lib	6.3, 6.6	(8) The Java Library (sh) ▪ EdShare	(9) Using IDE (sh) & Academic Integrity (AI Officer) ▪ EdShare	Lab 4. Loops and ArrayLists (hp)	GC5. Phone Book (js)	SC4. Challenge 4 Review (sh)
6	06/11/23	Inheritance	10.2, 10.3, 10.4, 10.6, 10.7	(10) Super and Sub-classes (js) ▪ EdShare ▪ Slides ▪ Handout	(11) Polymorphism (js) ▪ EdShare ▪ Slides	Lab 5. Arrays, HashMaps and APIs (hp)	GC6. Module Management (js)	SC5. Challenge 5 Review (sh)
7	13/11/23	Building Better Classes	12.3, 12.6, 3.13	(12) Abstract Classes and Interface ▪ EdShare (js) ▪ Slides ▪ Handout.pdf	(13) Testing and Debugging (sh) ▪ EdShare	Lab 6. Inheritance, Method Overriding, Polymorphism and Exceptions (hp)	GC7. Tax Calculator (sh)	SC6. Challenge 6 Review (sh)
8	20/11/23	Object-Oriented Design	8.3, 8.4, 8.6	(14) Software Design (ms) ▪ EdShare	(15) Designing Applications (ms) ▪ EdShare	Lab 7. Scope, Test Harnesses and Debugging (hp)	GC8. Assessment (js)	n/a
9	27/11/23	Coding in Practice	n/a	TBA	TBA	Lab 8. Method Overloading, Interfaces and Class Hierarchy (hp)	GC9. File Reader (sh)	n/a
10	04/11/23	Revision and Other Languages	n/a	Languages Balloon Debate (sh) ▪ EdShare	Revision Lecture (sh) ▪ EdShare	Lab 9. Handling Files (hp)		n/a
11	11/12/23	Back-up	n/a	n/a	n/a	Coursework surgery	n/a	n/a
12	16/01/23	Back-up	n/a	n/a	n/a	n/a	n/a	n/a

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How to Get Help

- **Refrain** from emailing (get lost in the avalanche)
- **Do not** drop by the office (often busy)
- **Do** come down to ask questions at the end of the lecture
- **Do** ask questions in the sessions
- **Do** ask questions in the labs
- **Do** ask each other!
  - Be careful of **academic integrity**.
- **Do** ask questions on Discord (COMP1202 area)
- **Do** ask questions Programming Helpdesk (Weekdays: 10:00—12:00, 14:00—16:00)
  - on Discord (https://discord.ecs.soton.ac.uk)
  - via email (helpdesk@ecs.soton.ac.uk)

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Part 2

Starting Out

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In this Part

- What is Programming?
- Programming Paradigms

- A Taste of Things to Come
  - Classes and Objects
  - Variables
  - Logic
  - Data Structures
  - Skills

What is Programming?

- Wikipedia (2023)
  - "is the process of performing particular computations (or more generally, accomplishing specific computing results), usually by designing and building an executable computer program … The purpose of programming is to find a sequence of instructions that will automate the performance of a task (…) on a computer, often for solving a given problem."
- thefreedictionary.com / dictionary.com (2023)
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Programming Flavours

- Procedural (e.g., **C** or Pascal)
  - Fixed list of instructions
  - Do this, Do that, if this then do that

- Declarative
  - More like declaring rules (or grammar)
  - Behaviour emerges from the rules being applied
  - Examples
    - Functional Programming (e.g. Scheme or **Haskell**)
    - Logic Programming (e.g. Prolog)

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Object-Oriented Programming

The main idea

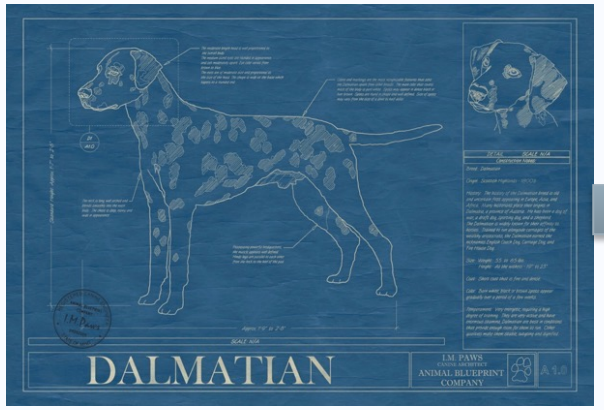
- Everything is a Thing
- A Program is made up of Things interacting
- Things have both properties and behaviours
- E.g. Dogs
  - What are the properties of a dog?
  - What can a dog do?

Classes and Objects

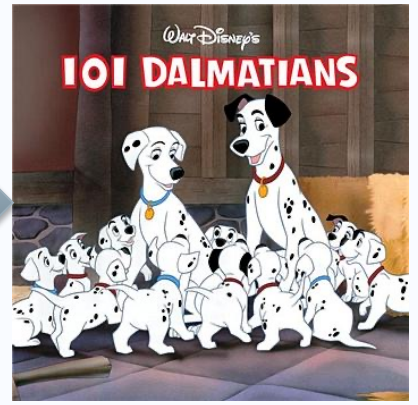
All the properties and behaviours of a Dog can be packaged in a **class**

- A class is like a Blue Print
- We can build many unique dogs from the same Blue Print
- These are called **objects**
- They all have similar properties and behaviours as defined by the class

1 Class



101 Objects



http://www.animalblueprintcompany.com/

Building Blocks

- Objects and Classes are specific to Object-Orientated Programming

- But there are more common, more fundamental Programming Principles that we will be covering in the course

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Variables

- Like algebra
  - x = 4
- Not so much like algebra
  - name = “Rover”
- Object properties are stored in variables

Methods

- Blocks of code that define a sequence of actions
- Object behaviours are defined by methods
- Often this will use the object's properties

```
printDogsDetails()
{
   print name;
   print age;
}
```

Logic

https://blackboard.soton.ac.uk/webapps/blackboard/content/launchAssessment.jsp?course_id=_221896_1&content_id=_6319336_1&mode=view

True or False – The basis of all decisions

Meaning	Formula	x = 3	x = 4	x = 11
x is equal to 4	x == 4	True or False?	True or False?	True or False?
x is greater than 4	x > 4	True or False?	True or False?	True or False?
x is greater than or equal to 4	x <= 4	True or False?	True or False?	True or False?
x is not equal to 4	x != 4	True or False?	True or False?	True or False?
x is greater than 2 and x is smaller than 8	x > 2 && x < 8	True or False?	True or False?	True or False?
x is greater than 8 or x is smaller than 2	x > 8 || x < 2	True or False?	True or False?	True or False?

Control Flow

- If statements

```
if size<10
    dog says “Yip Yip”
else
    dog says “Ruff Ruff”
```

- Loops

```
while number<10
    dog says “Bark!”
    number = number + 1
```

Side Note:

Human readable versions of programs are called **Pseudocode**.

They look like real programs but are not as precisely defined.

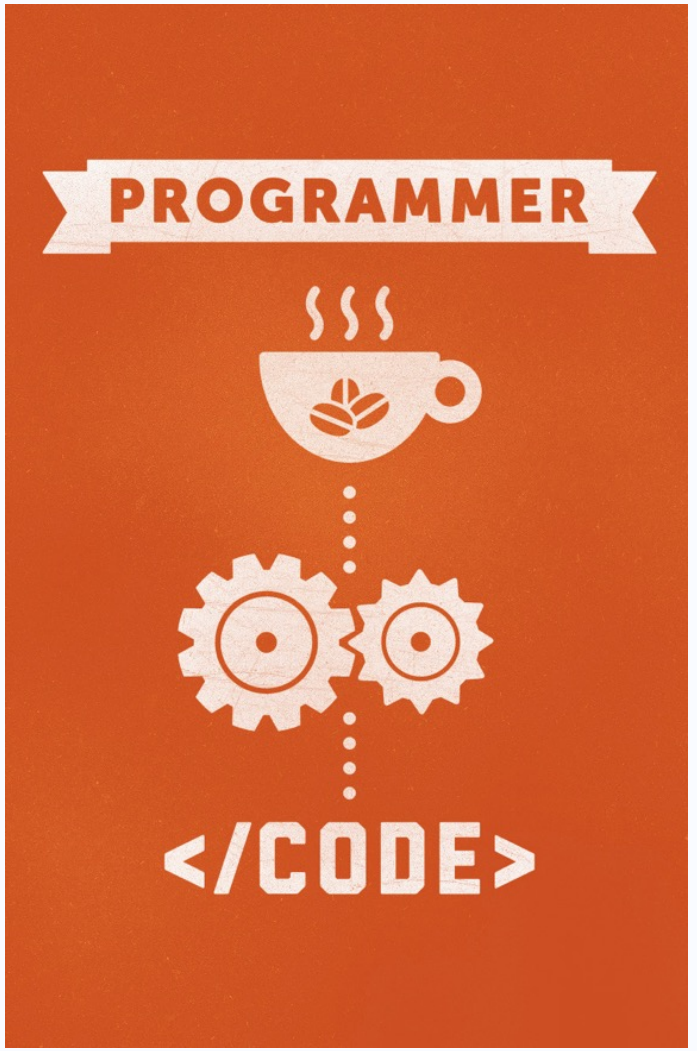
They are good for communicating ideas and showing structure.

Data Structures

- More complex data …
- Arrays:
  - Like Lists, Tables, Matrices
- HashMaps
  - Associate a key with a value
  - Like a dictionary

Skills

- Computational Thinking
- Program Design
- Choosing Tools (IDEs)
- Testing/Debugging



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Summary

- What is Programming?
- Programming Paradigms
- A Taste of Things to Come
  - Classes and Objects
  - Variables
  - Logic
  - Data Structures
  - Skills

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YOUR QUESTIONS

Quizzes