Introduction to the Module

Structure, Assessment and Ethos

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http://www.wit.ie/

Module Structure

- 10 credits.
- 8 contact hours in FTG24.
- Typically follow this structure:
  - 2 hours of lectures, 6 hours of labs, but this can vary depending on the topic.

Lectures

- Introduce theory.
- Slide decks and/or programming demonstrations.
- All material presented will be available online prior the lecture taking place.

Labs

- Exercises based on the theory presented in lectures.
- Sometimes we will use labs to introduce new concepts and follow up with a lecture.
- All lab work will be available online and will typically come with solutions.
- Labs developed by John Fitzgerald but delivered by Dr. Siobhán Drohan.

Lab advice

- Not a race to be the first student finished!
  - take your time.
  - read the instructions carefully.
  - ask your lecturer to explain concepts that you don't understand; that is what we are here for!
- Complete all labs!
- You are free to work on your own or you can choose to use a Pair programming approach: https://www.youtube.com/watch?time_continue=8&v=rG_U12uqRhE.

Assessment

- 100% CA (i.e. no final written exam).

- 3 assignments:
  - Week 5
  - Week 9
  - Week 12

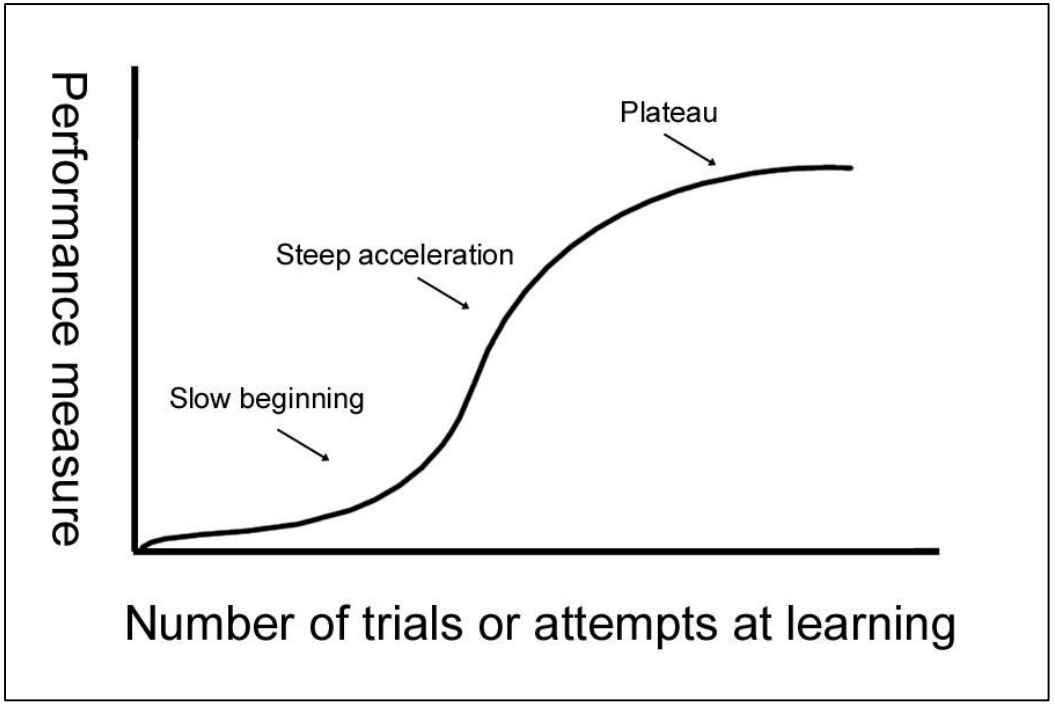
Week	Date	Event
1	16th Jan	
2	23rd Jan	
3	30th Jan	
4	6th Feb	
5	13th Feb	Assignment 1
	MIDTERM	MIDTERM
6	27th Feb	
7	6th Mar	
8	13th Mar	
9	20th Mar	Assignment 2
10	27th Mar	
11	3rd April	
	EASTER	EASTER
	EASTER	EASTER
12	24th April	Assignment 3

Ethos of the Module

- Student engagement:
  - Ask questions, and lots of them!
- Practice makes perfect:
  - practice, practice, practice.
- Work submitted must be your own work:
  - Compulsory interviews will be conducted on all submitted work to verify:
    - Authorship
    - Understanding

Learning Curve

- When learning a new topic, there is a learning curve…
  - This is natural
  - Stick with it
  - Ask for help



Module Contents

Introduction to object-oriented programming…

…with a strong software
engineering foundation

…aimed at producing and maintaining
large, high-quality software systems.

Programming Language

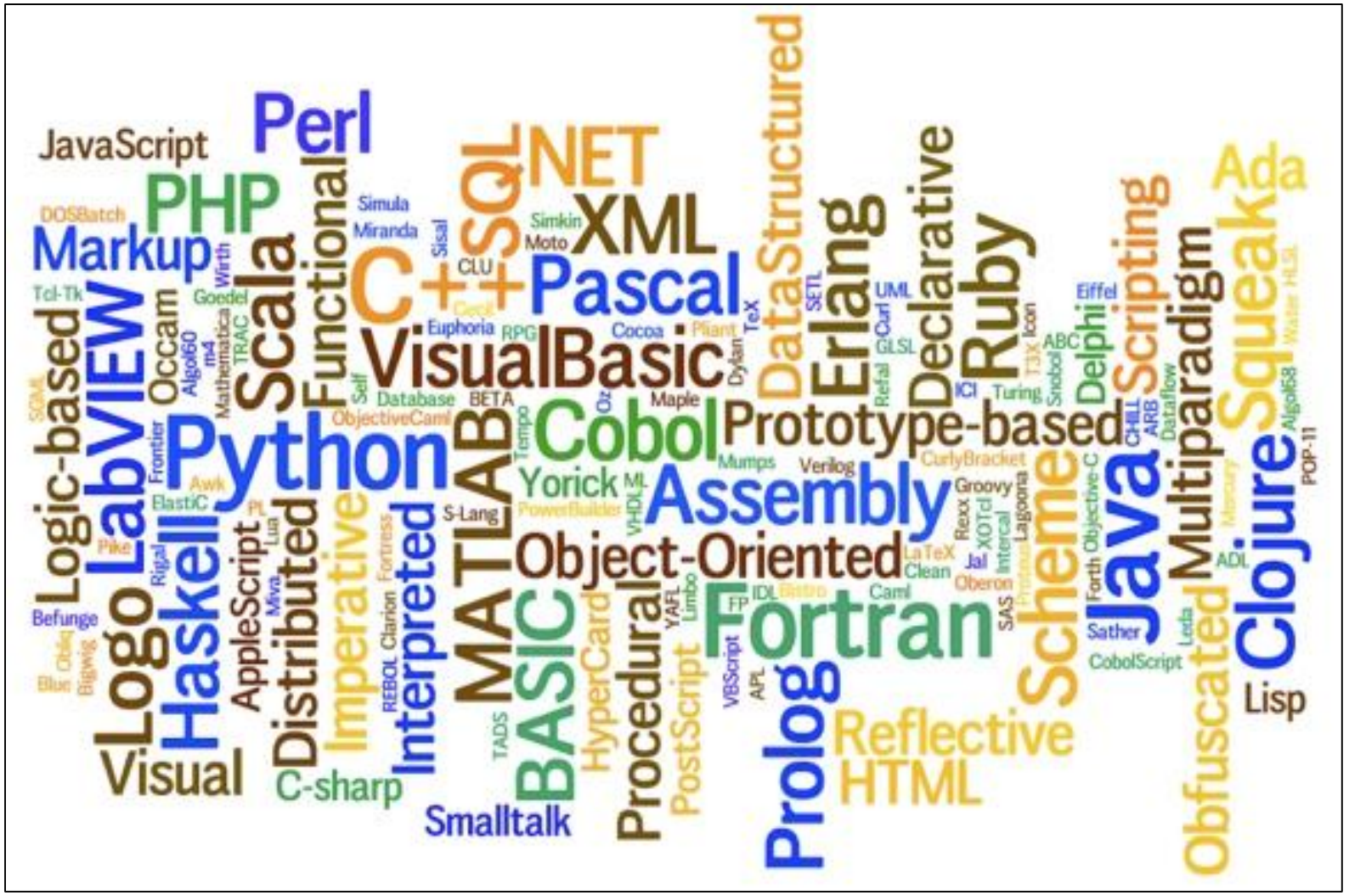
IDE = BlueJ

Programming Languages

Programming Languages

Every operation your computer performs has an instruction that someone wrote using a programming language.

```
import java.util.Random;
import java.util.Scanner;

public class GuessingGame {

    public static void main(String[] args) {

        Random rand = new Random();
        int numberToGuess = rand.nextInt(1000);
        int numberOfTries = 0;
        Scanner input = new Scanner(System.in);
        int guess;

        System.out.println("Guess a number between 1 and 1000: ");
        guess = input.nextInt();

        if (guess == numberToGuess) {

        }
        else if (guess < numberToGuess) {
            System.out.println("Your guess is too low");
        }
        else if (guess > numberToGuess) {
            System.out.println("Your guess is too high");
        }
    }

}
```



There are MANY programming languages:
https://en.wikipedia.org/wiki/List_of_programming_languages

Programming Language - Java

5 million
students study java

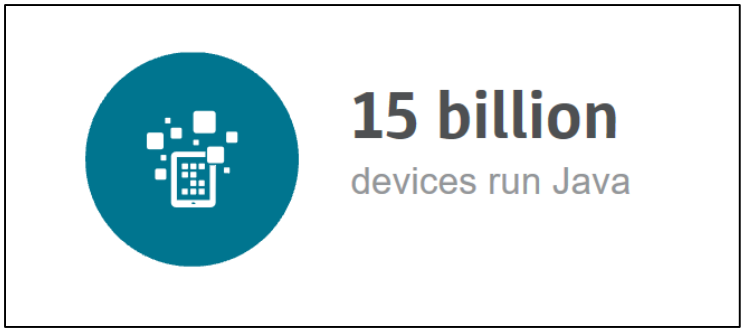
10 million
Java developers worldwide

15 billion
devices run Java

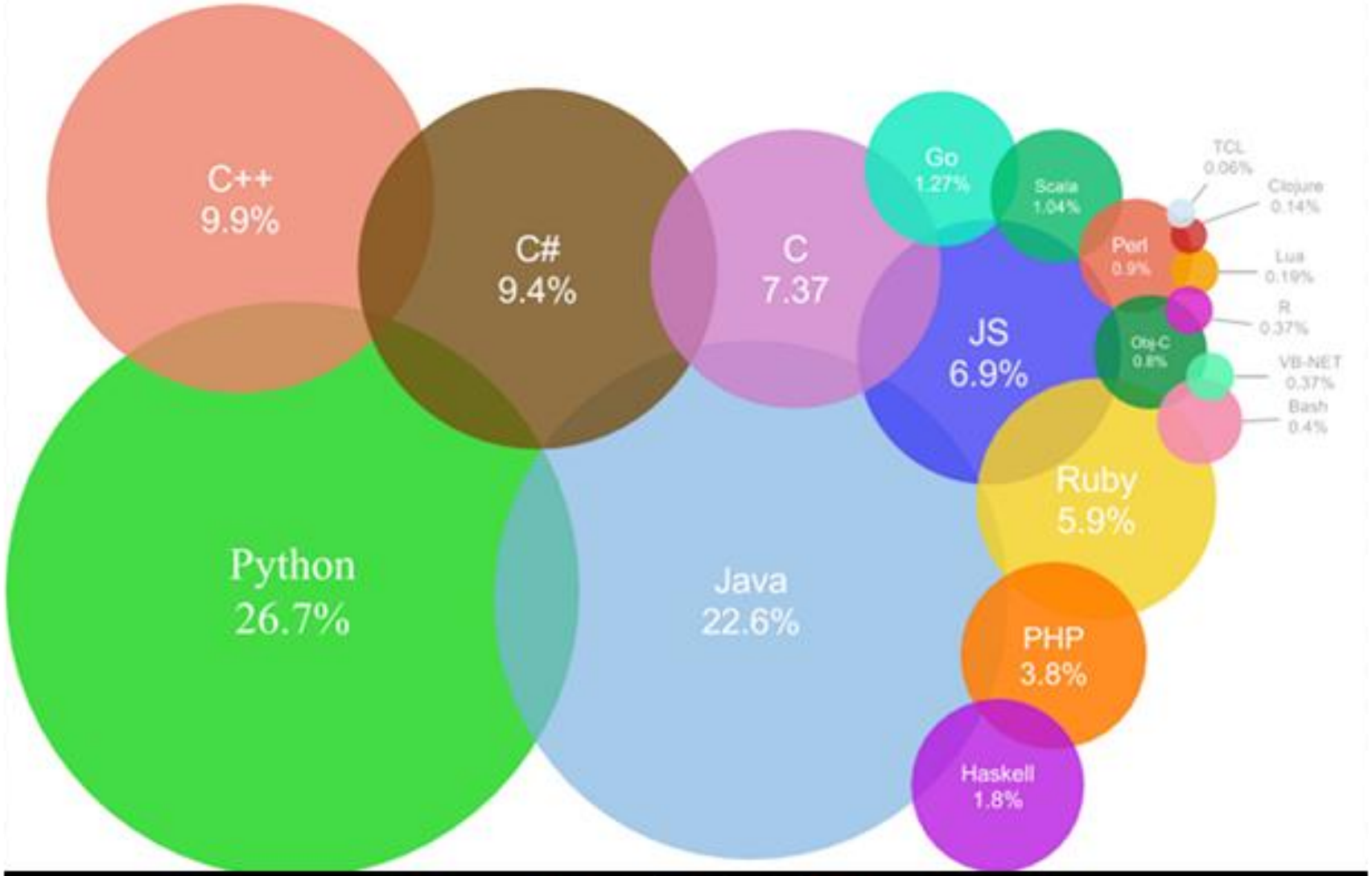
#1 platform
for development in the cloud

Programming Language - Java

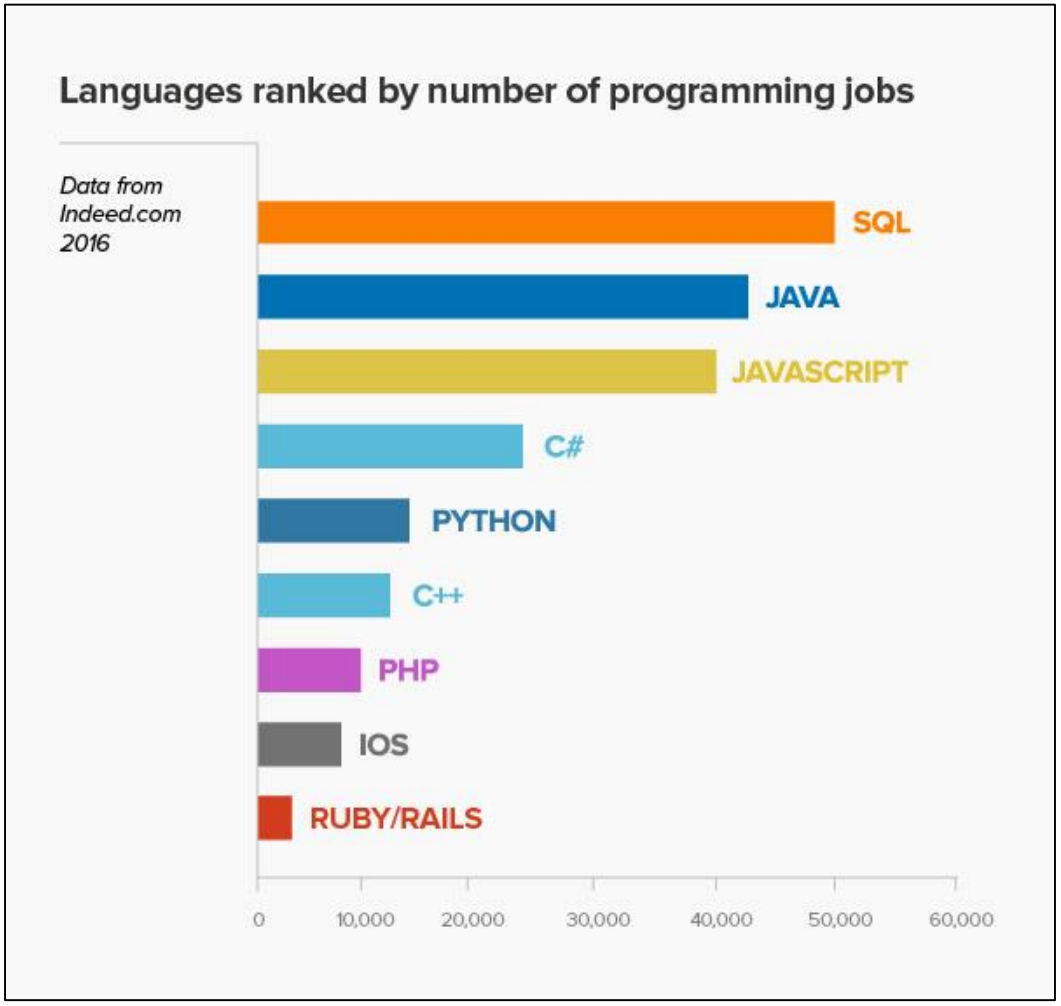
- Mobile Phones
- Web Apps
- Desktop Apps
- Printers
- Medical Equipment
- Navigation Controls for NASA’s Mars Rover
- Washing Machines
- Cars
- Jet Engines
- etc.



Most Popular Coding Languages of 2016



Programming Language - Java



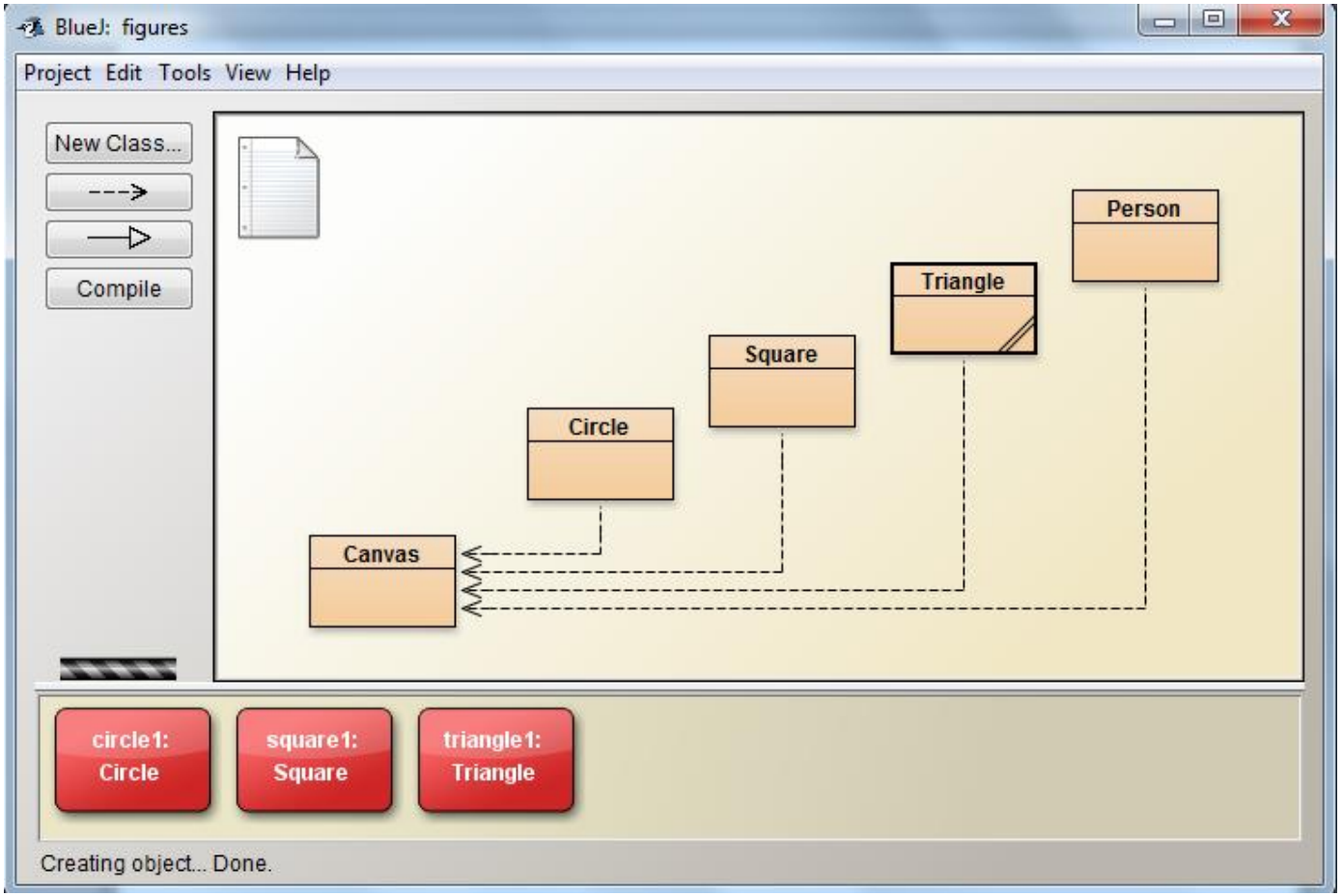
http://www.codingdojo.com/blog/wp-content/uploads/Programming-Languages-for-2016_graph.jpg

IDE

IDE

- IDE = Integrated Development Environment
- Software used by programmers to develop applications.
- BlueJ, an IDE specifically designed for education, will help us write Java apps by providing:
  - Source code editor
  - Compiler
  - Debugger
  - Unit testing support
  - Etc.

IDE – BlueJ


BlueJ: figures
Project Edit Tools View Help
New Class...
Compile
Person
Triangle
Square
Circle
Canvas
circle1:
Circle
square1:
Square
triangle1:
Triangle
Creating object... Done.

Book

David J. Barnes & Michael Kölling

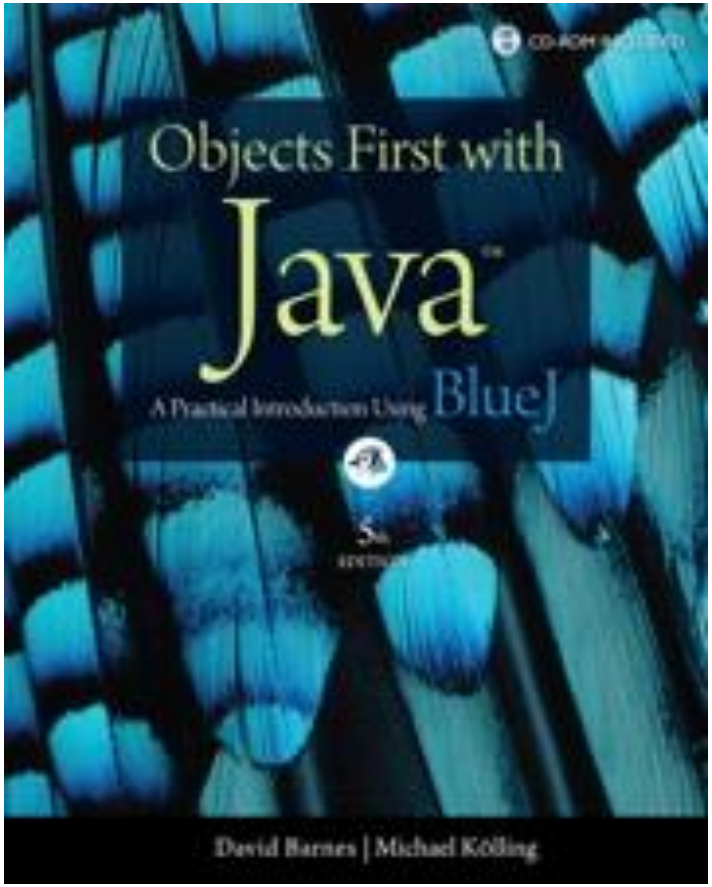
Objects First with Java:
A Practical Introduction using BlueJ

Fifth Edition

Prentice Hall / Pearson Education

2012

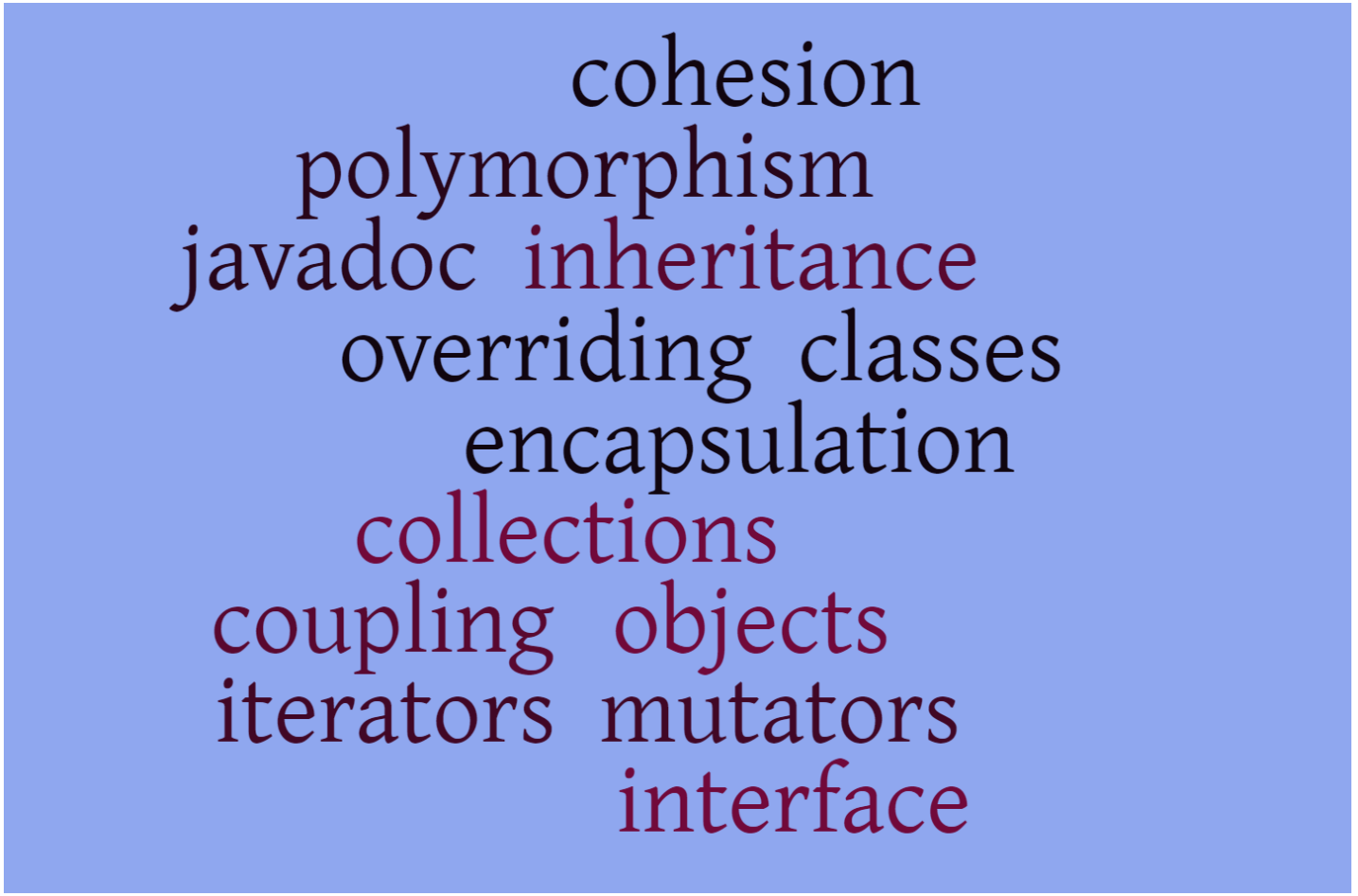
ISBN: 978-013-249266-9



Course overview

- Objects and Classes
- Encapsulation
- Abstraction and Modularization
- Grouping objects
- Testing and Debugging
- Searching and Sorting
- Interfaces
- Inheritance and Polymorphism

Some Buzzwords



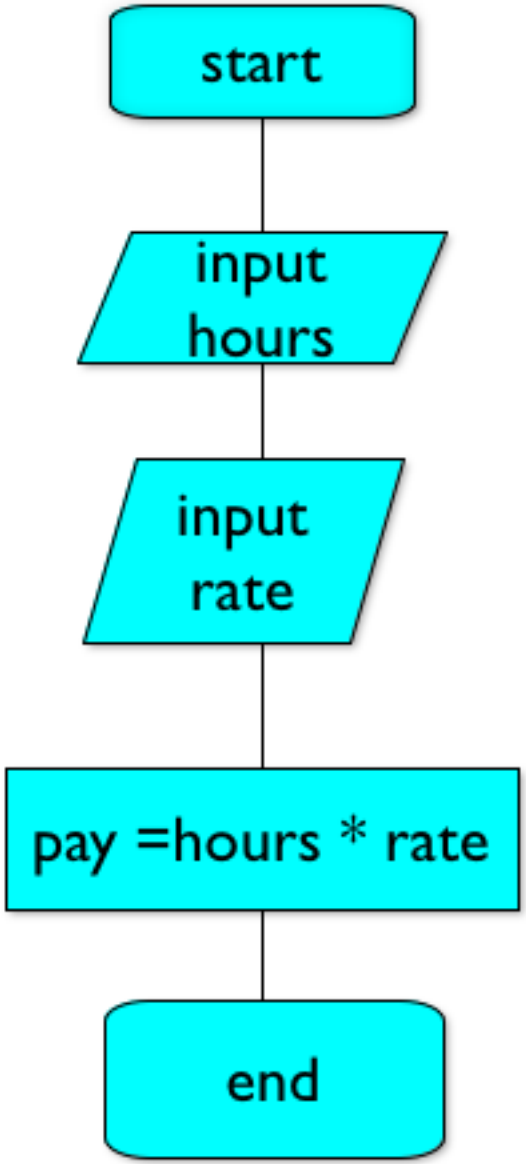
Learning Outcomes

1. Apply core problem solving approaches suitable to the programming discipline to build algorithms.
2. Write small applications using standard sequence, conditional and iterative control structures.
3. Modify and expand small applications.
4. Write small applications that use simple UI, computation and data structures.
5. Develop techniques to effectively test, debug and document small applications.
6. Analyse and explain how the above applications work.
7. Apply problem-solving strategies to various computing problems of increasing complexity.
8. Design, develop, test and document applications using advanced programming constructs and data structures.
9. Develop applications consistent with UX best practice.
10. Develop persistent applications.
11. Consider maintainability and robustness when designing applications.

Some required terminology before we start coding

Pseudocode and Algorithms

Flowchart



Pseudocode

```
BEGIN
    input hours
    input rate
    pay = hours * rate
    print pay
END
```

Pseudocode

- For example, for making a cup of tea:

```
Organise everything together;
Plug in kettle;
Put teabag in cup;
Put water into kettle;
Wait for kettle to boil;
Add water to cup;
Remove teabag with spoon/fork;
Add milk and/or sugar;
Serve;
```

Pseudocode

- Pseudocode is a form of structured English.
- It has features that resemble real programming language code.
- But it retains sufficient natural language to allow solutions to be expressed without needing to understand the precise details of a programming language.

Algorithm

- Pseudocode helps programmers develop algorithms.

- Algorithms are a finite set of steps, executed in a particular order, for solving a particular problem / computing a result / etc.

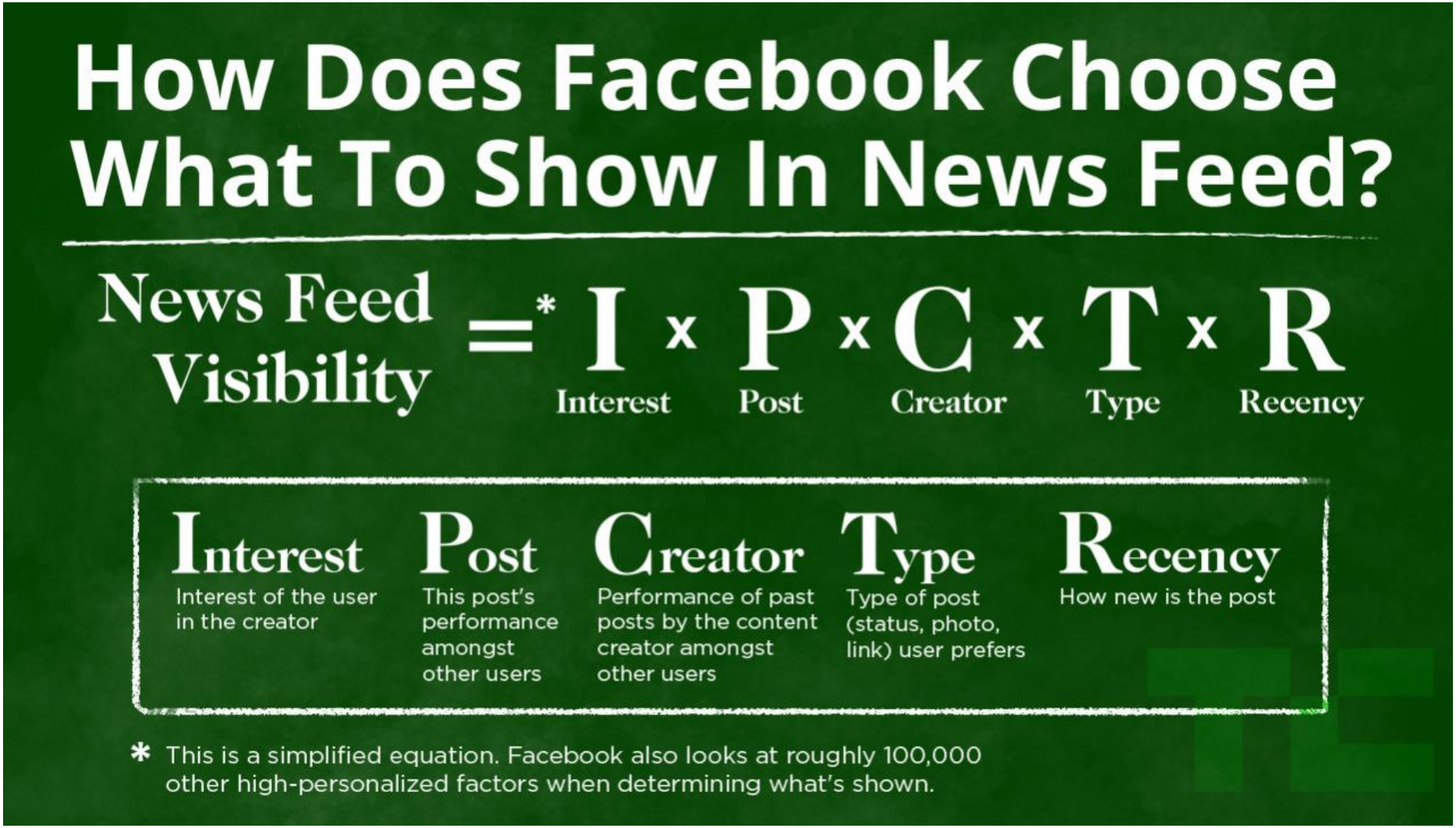
Pseudocode

- For example, for making a cup of tea:

```
Organise everything together;
Plug in kettle;
Put teabag in cup;
Put water into kettle;
Wait for kettle to boil;
Add water to cup;
Remove teabag with spoon/fork;
Add milk and/or sugar;
Serve;
```

The Algorithm for making a cup of tea, expressed in Pseudocode.

Algorithm examples


How Does Facebook Choose What To Show In News Feed?
News Feed Visibility =* I x P x C x T x R
Interest
Post
Creator
Type
Recency
Interest
Interest of the user in the creator
Post
This post's performance amongst other users
Creator
Performance of past posts by the content creator amongst other users
Type
Type of post (status, photo, link) user prefers
Recency
How new is the post
* This is a simplified equation. Facebook also looks at roughly 100,000 other high-personalized factors when determining what's shown.

source

source

ALGORITHMS

FIRST LAYER SECOND LAYER THIRD LAYER

Cross can be solved intuitively.
1 Special case is when the piece is flipped use the following Algorithm.

1> Fi U Li Ui

Orientation of the corner Pieces.
Algorithm Used: **2> Ri Di R D**

Left Insertion

Your text here

Algorithm Used:
3> Ui Li U L U F Ui Fi

Right Insertion

Algorithm Used:
4> U R Ui Ri Ui Fi U F

This is what the cube will look like..

Algorithm Used: 5> F R U Ri Ui Fi

Your goal is to get the cross done.
Hold the cube as shown in fig.
The Sequence is Dot->L->Line->Cross

After the cross you need to align the Edge pieces.
Case 1: Opposite alignment
Case 2: Adjacent alignment
Algorithm used:
6> R U Ri U R U U Ri U.

Now without rotating the top layer, find a corner piece which is in right postition (the orientation doesn't matter)
Then apply
7> U R Ui Li U Ri Ui L.
Apply this till all the corner pieces are placed correctly.
Then apply **Ri Di R D** to orient them.

Graphics by: Swarnim Sinha
via www.rubiks.com

Questions?

Study aid: Can you answer these questions?

- What is a programming language?
- What is an IDE?
- What is pseudocode?
- What is an algorithm?
- How are pseudocode and algorithms related?

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