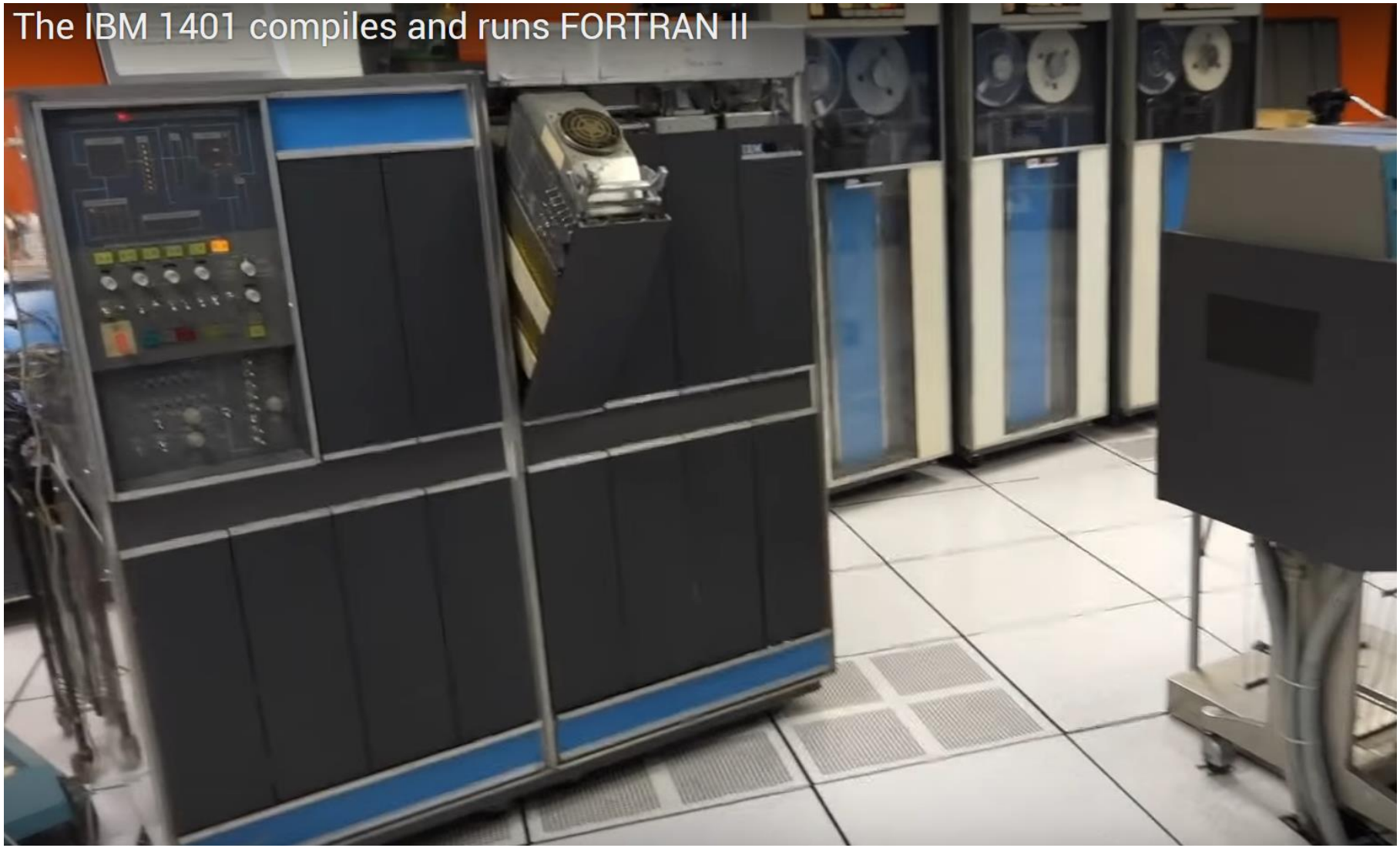
In 1953

IBM

John W. Backus

Fortran

- The first successful programming language.
- FORmula TRAnslation – designed by John Backus in 1956.
- The implementation of this language took 18 years to finish.
  - But, the resulting compiler remained to be the best optimizing compiler for many years.
- FORTRAN-I to FORTARN-IV, FORTRAN-66, FORTRAN-77, FORTRAN-90, FORTRAN-95.


The IBM 1401 compiles and runs FORTRAN II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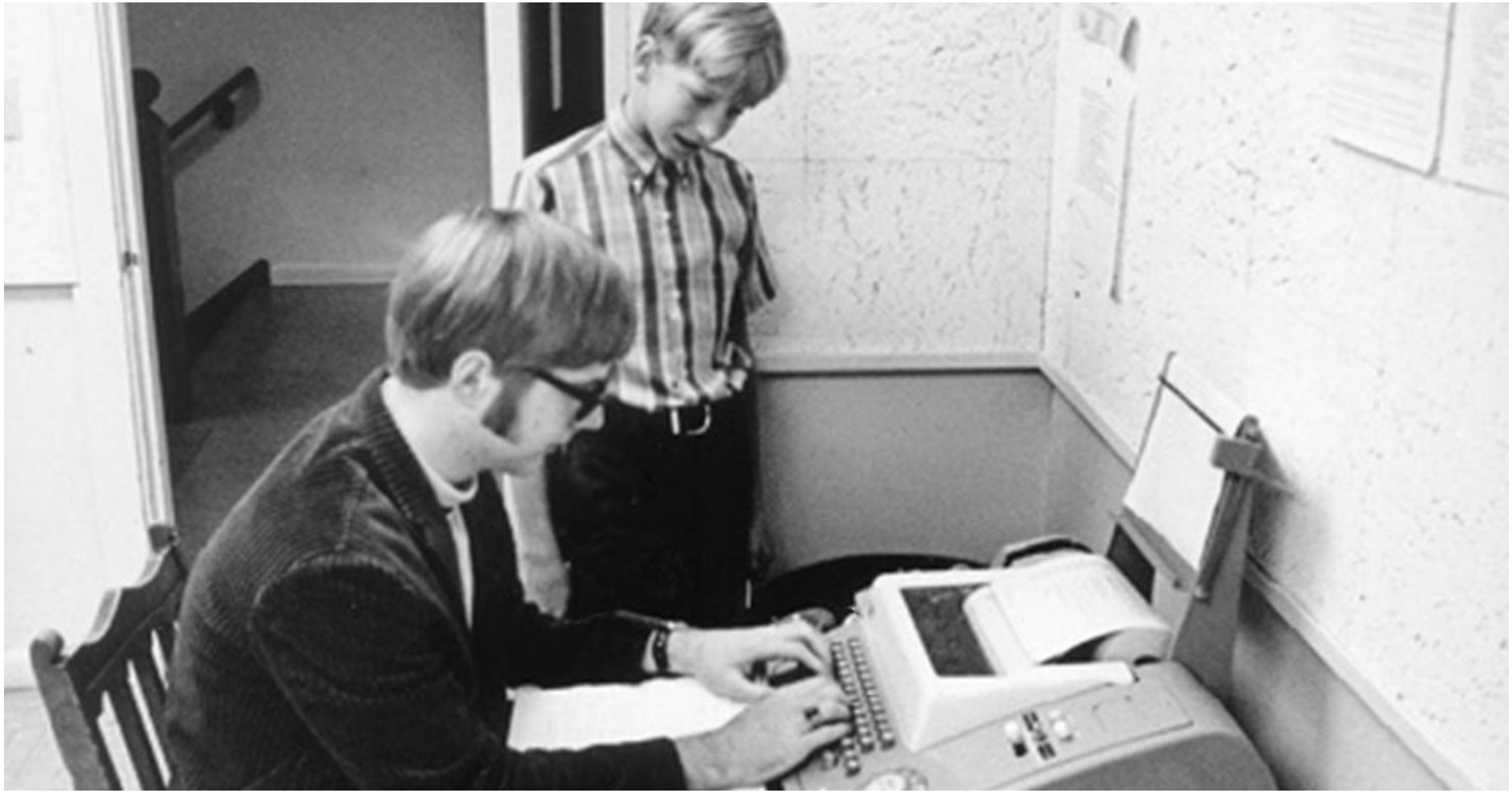


The IBM 1401 compiles and runs FORTRAN II
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HD

- FORTRAN-I -> is considered a milestone in the history of computing. Had a very limited memory (about 150,000 bits only).
- FORTRAN-II -> added separate compilation of program modules and assembly modules.
- FORTRAN-III -> Had a inclusion of assembly language instructions (inline assembly).
- FORTRAN-IV -> Was like FORTRAN-II without problems.
- FORTRAN-66 -> Was declared by a committee of American Standards Association as the FORTRAN standard.

- FORTRAN-77 -> standard replacing FORTRAN-66.
- FORTRAN-77 added the following:
  - DO loops
  - IF THEN ELSE END IF
  - CHARACTER datatype
  - Main program termination without STOP statement.

Algol-60

- A committee composed of European and Americans was formed to produce a universal programming language in 1958.
- ALGOrithmic Language – an attempt to improve FORTRAN.
- It did not get widespread acceptance.

Sample Code of Algol-60

```
begin
   integer procedure ackermann(m,n);value m,n;integer m,n;
   ackermann:=if m=0 then n+1
         else if n=0 then ackermann(m-1,1)
                     else ackermann(m-1,ackermann(m,n-1));
   integer m,n;
   for m:=0 step 1 until 3 do begin
      for n:=0 step 1 until 6 do
         outinteger(1,ackermann(m,n));
      outstring(1,"0)
   end
end
```

Lisp

- One of the most used language in 1950's
- Developed by John McCarthy
- Based on two existing language during that time: mathematics, and ideas of McCarthy himself.
- The algebraic syntax was borrowed from FORTRAN.
- The use of list.

Lisp (cont..)

- The first major language to support list processing.
- The first major language to support recursion.
- The first functional language.
- Uses variables (largely) to represent parameters, rather than storage.
- Uses the lambda calculus notation.

COBOL

- COmmon Business Oriented Language.
- Proponents of COBOL claim that COBOL is self-documenting.
- This is a belief in the data processing area that data are seldom changed. They are simply moved around from one file to another or get printed out. Hardly is arithmetic computation done on them

COBOL (cont…)

- Handles large files of data safely
- Moves data around safely
- Structures data explicitly
- No need for complex mathematical functions
- Easy to program

APL

- A Programming Language
- Designed by Kenneth Iverson of Hardvard University, 1950’s
- But the first language implementation was in 1960s.
- All operators have the same priority, evaluated from left to right.

SNOBOL

- String-Oriented Symbolic Language
- Designed in 1962 by a research group at Bell Laboratories.
- Based on pattern matching to solve string manipulation problems.
- SNOBOL3
- SNOBOL4

BASIC

- BASIC – designed at Dartmouth College by two professors Thomas Kurtz and John Kemny.
- Beginner's All Purpose Symbolic Instruction Code.
- It did not require from the programmer, technical mathematics background.
- Syntax and vocabulary was simple.

Basic (cont..)

- It lacks structured programming support.
  - No declaration of variables, hence poor error checking.
  - Single character variable names
  - Poor control structures
  - Limited data structuring capabilities

Algol-W

- Nicklaus Wirth's contribution to Algol-68.
- Block structured and recursive

PL/I

- PL/I was introduced in 1966 to replace all previous programming language.
- PL/I = FORTRAN + COBOL + Algol.
  - Included nested block structure and recursion of Algol
  - Error handling of COBOL
  - Formatted IO of FORTRAN

SIMULA-67

- SIMUlation Language.
- For discrete event simulation but later expanded to become a general-purpose programming language.
- First to introduce object-oriented concepts like classes and objects, inheritance and dynamic binding.

SIMULA-67 (cont…)

- coroutines – subprogram that restart where they last stopped
- objects – packaging together data structures and routines with primacy to the data objects.
- the class construct – describing a class of objects, so instances can be created at will
- class inheritance – allowing a hierarchy of classes to be developed and reused.

Algol-68

- It is no a variant of Algol-60. It is a very complex language, difficult to compile and has intricate syntax rules. But otherwise, it is an outstanding language.
- Although considered a great language, it never gained wide acceptance in the programming world.

Algol-68 (cont…)

- It has automatic type conversion (“coercion”).
- flexible arrays, case statement and goto statements; user-defined operators, procedure parameters; concurrent execution(cobegin/coend)
- It had no abstract data types

Pascal

- Created by Nicklaus Wirth in 1969.
  - His objectives where:
    - Can be used to teach proper programming techniques
    - Is simple and logical for students
    - Can enforce the principles of structured programming
  - The language is known as Standard Pascal. It is used throughout the world for teaching programming.
  - Pascal is considered as one of the very best well design language that exist today.

Pascal (cont…)

- Some of the important features of Pascal are:
  - case statement, user-defined types, sets, records, pointers. It is also highly portable.

- The popular implementation of this language is from Borland in the 80's (Turbo Pascal). By Anders Hejlsberg. He was also the key role in the development of C# at Microsoft.

C

- A joint committee from the University of London and Cambridge University sat down to design a language that is both high and low-level. High enough that it did not need to be tied down to a specific computer but low enough to allow manipulation of bits.
- The resulting language was Combined Programming Language (CPL).

C (cont…)

- CPL never became very popular due to its size and complexity.
- Thus, a smaller version, Basic CPL (BCPL) attracted a sizable number of users.
- Back at Bell Laboratories, Ken Thompson created an even smaller version of BCPL called B language.
- B just like BCPL is typeless.

C (cont…)

- Dennis Ritchie later transformed B into C in 1972 by restoring some of the CPL features, such as file rich data typing. E.g. int, float, char etc.
- All the operators of B were carried over to C.
- UNIX was then rewritten to C.
- Today, C has been the basis of most object-oriented languages like C++, Java and C#.

Prolog

- Programming in Logic.
- Prolog is a programming language centered around a small set of basic mechanisms, including pattern matching, tree-based data structuring and automatic backtracking.
- A powerful language for artificial intelligence and non-numerical programming.

Smalltalk

- Designed by the Learning Research Group at Xerox Palo Alto Research Center.
- Graphics primitives and drawing programs are part of the language. It is basically very versatile.
- It is a “pure” object oriented programming language unlike C++ and Java.

Objective-C

- Developed by Brad Cox and Tom Love in early 80's.
- Influenced by Smalltalk
- After Steve Jobs left Apple and founded NeXT, he licensed Objective-C. Apple bought NeXT and used Objective-C to write MAC OS X and all of iPhone software.

Modula-2

- By Nicklaus Wirth.
- It was derived from Pascal and Modula.
- It has features on multiprogramming.
- The procedure type which allows procedures to be dynamically assigned to variables.

Ada

- In 1974, the US Department of Defense (DoD) realized it was spending too much on software, especially in the embedded systems area.
- The original version of Ada is called Ada83.
- One main feature of Ada (Ada83) is its reliability.

C++

- Was designed by Bjarne Stroustrup in the early 1980s.
- Known as C with Classes.
- The idea of C++ was to allow the use of the C language for simulation for which Simula67 would have been ideal.
- Since C++ is basically an extension to C, it is possible to program it in a C-like style or using extensions in an object-oriented style.

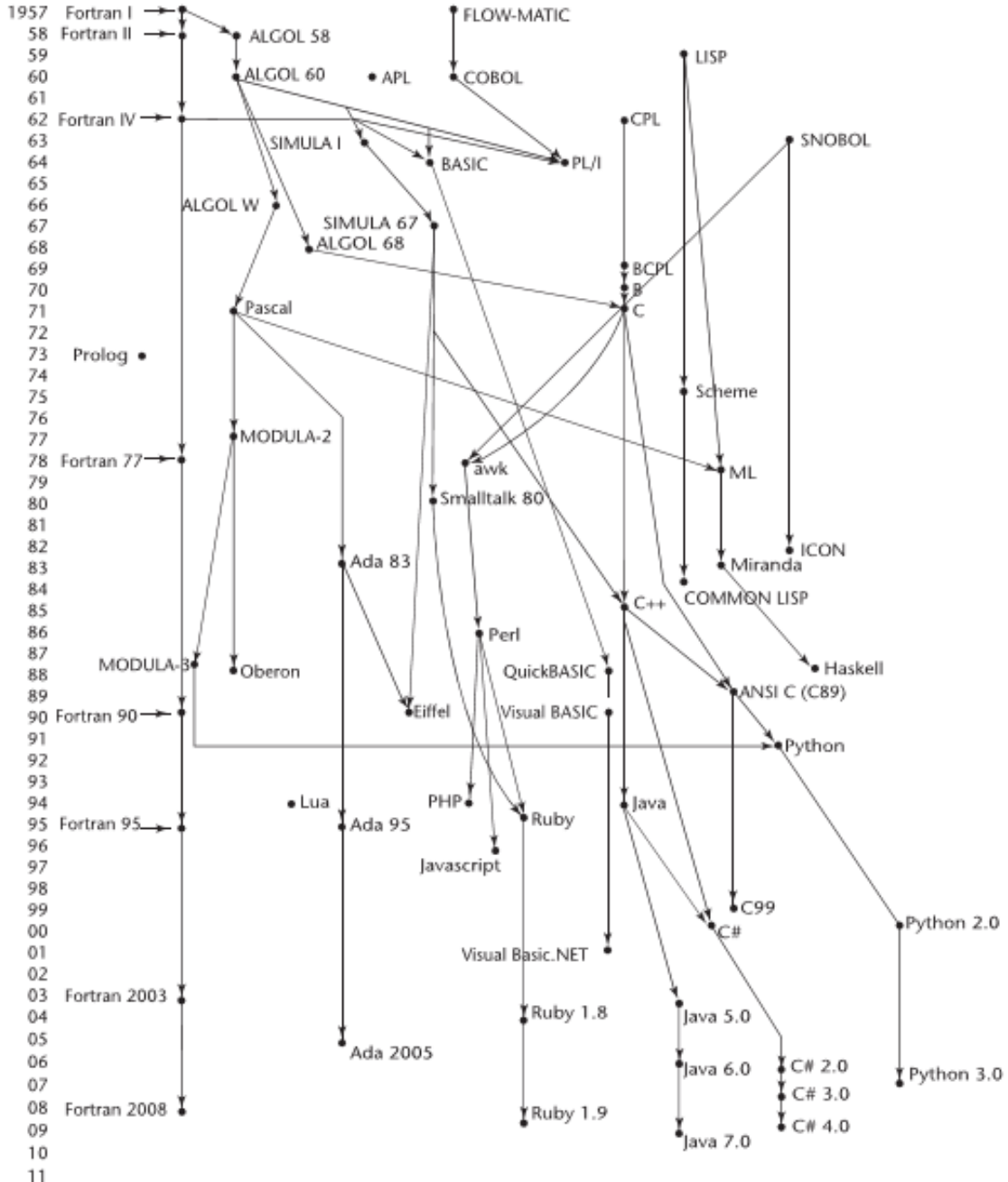
Java

- In 1991 a group of Sun Microsystems engineers led by James Gosling designed Java.
- The aim was to develop a language for consumer devices (cable boxes, etc) that is hardware-independent because different computers would be using different CPU's.
- Sun uses UNIX for their computers thus the developers based their language to C++.
- Originally named Oak.

C#

- **C#** is a modern object-oriented programming language developed in 2000 by Anders Hejlsberg at Microsoft as a rival to Java (which it is quite similar to). It was **created** because Sun, (later bought by Oracle) did not want Microsoft to make changes to Java, so Microsoft chose to create their own language instead.

Ancestry of PL



Activity 1-3

- Give at least three differences between C and C++, and between C++ and Java.

Thank You