

ASSIGNMENT

1. With examples of different programming languages show how programming languages are organized along the given rubrics:
 - i. Unstructured, structured, modular, object oriented, aspect oriented, activity oriented and event oriented programming requirement.
 - ii. Based on domain requirements.
 - iii. Based on requirements i and ii above.
2. Give brief preview of the evolution of programming languages in a chronological order.
3. Vividly distinguish between modular programming paradigm and object oriented programming paradigm.

Answer

1i).

UNSTRUCTURED		
LANGUAGE	DEVELOPER	DATE
Assembly Language		1949
FORTRAN	John Backus	1957
COBOL	CODASYL, ANSI, ISO	1959
JOSS	Cliff Shaw, RAND	1963
BASIC	John G. Kemeny, Thomas E. Kurtz	1964
TELCOMP	BBN	1965
MUMPS	Neil Pappalardo	1966
FOCAL	Richard Merrill, DEC	1968

STRUCTURED

LANGUAGE	DEVELOPER	DATE
ALGOL 58	Friedrich L. Bauer, and co.	1958
ALGOL 60	Backus, Bauer and co.	1960
ABC	CWI	1980
Ada	United States Department of Defence	1980
Accent R	NIS	1980
Action!	Optimized Systems Software	1983
Alef	Phil Winterbottom	1992
DASL	Sun Micro-systems Laboratories	1999-2003

MODULAR		
LANGUAGE	DEVELOPER	DATE
ALGOL W	Niklaus Wirth, Tony Hoare	1966
APL	Larry Breed, Dick Lathwell and co.	1966
ALGOL 68	A. Van Wijngaarden and co.	1968
AMOS BASIC	François Lionet and Constantin Stiropoulos	1990
Alice ML	Saarland University	2000
Agda	Ulf Norell; Catarina coquand(1.0)	2007
Arc	Paul Graham, Robert Morris and co.	2008
Bosque	Mark Marron	2019

OBJECT-ORIENTED		
LANGUAGE	DEVELOPER	DATE

C*	Thinking Machine	1987
Actor	Charles Duff	1988
Aldor	Thomas J. Watson Research Center	1990
Amiga E	Wouter van Oortmerssen	1993
Action Script	Macromedia	1998
BeanShell	JCP	1999
AngelScript	Andreas Jönsson	2003
Boo	Rodrigo B. De Oliveria	2003
Ambient Talk	Software languages lab, University of Brussels	2006
Axum	Microsoft	2009

ASPECT ORIENTED		
LANGUAGE	DEVELOPER	DATE
ML	Robin Milner and others	1973
MATLAB	Math Works	1984
Perl	Lary Wall	1987
e	Yoav Hollander	1992
Lua	Roberto Ierusalimschy and co.	1993
UML	Grady Booch, Ivar Jacobson and James Rumbaugh	1994
Racket	PLT Inc.	1995
LogTalk	Paulo Moura	1998

EVENT-ORIENTED		
LANGUAGE	DEVELOPER	DATE
C#	Microsoft	2000
Visual Basic .Net	Microsoft	2002
Visual C++	Microsoft	2001

ACTIVITY-ORIENTED		
LANGUAGE	AUTHOR	DATE

1ii)

a. Scientific Domain

LANGUAGE	DEVELOPER	DATE
FORTRAN	John Backus and IBM	1950
APT	Douglas T. Ross	1956
PL/I	IBM	1964
AMPL	AMPL Optimization, Inc.	1966
MATLAB	MathWorks	1984
J	Kenneth E. Iverson, Roger Hui	1990
Ch	Harry H. Cheng	2001
Julia	Jeff Bezanson, Alan Edelman and co.	2012
Cuneiform	Jörgen Brandt	2013
F	The Fortran Company	

b. Business Domain

LANGUAGE	DEVELOPER	DATE
FLOW-MATIC	Remington Rand and Grace Hopper	1955
COMTRAN	Bob Bemer	1957
COBOL	CODASYL, ANSI, ISO	1959
APL	Larry Breed, Dick Lathwell and co.	1966
DIBOL	DEC	1970
PL/B	Datapoint	1972
DAX	Microsoft	2009

c. Artificial Intelligence Domain

LANGUAGE	DEVELOPER	DATE
IPL	Allen Newell, Cliff Shaw, Herbert A. Simon	1956
Lisp	Steve Russell, Timothy P. Hart, Mike Levin	1958
PLANNER	Carl Hewitt	1969
STRIPS	Richard Fikes and Nils Nilson	1971
Prolog	Alain Colmerauer, Robert Kowalski	1972
Wolfram	Stephen Wolfram	1988
R	Ross Ihaka and Robert Gentleman	1993
AIML	Dr. Richard S. Wallace	2001

d. General Purpose

LANGUAGE	DEVELOPER	DATE
C	Dennis Ritchie and Bell Labs	1972
C++	Bjarne Stroustrup	1985
Caml	G�rard Huet, Guy Cousineau and co.	1985
Clean	Software Technology Research Group of Radbound University Nijmegen	1987
Cilk	MIT Laboratory for Computer Science	1994
Boo	Rodrigo B. De Oliveria	2003
Citrine	Gabor de Mooji	2014
Ballerina	WSO2	2017

e. Web Programming

LANGUAGE	DEVELOPER	DATE
Apple Script	Apple	1993
Adobe ColdFusion	J. J. Allaire	1995
CSS	Hakon Wium Lie, Bert Bos	1996
ECMAScript	Brendan Erich, Ecma International	1997
Curl	Steve Ward, MIT	1998
COBOL Script	Matthew Dean and Charles Schereda	1999
Coffee Script	Jeremy Ashkenas	2009
Elm	Evan Czaplicki	2012

f. Mobile Programming

LANGUAGE	DEVELOPER	DATE
Java	Sun Micro Systems	1995
JavaFX	Sun Micro Systems	2009
Kotlin	JetBrains	2011
Dart	Lars Bak and Kasper Lund	2011
Delphi	Embarcadero Technologies	2016
DataFlex	Data Access Worldwide	2019

g. Embedded Devices

LANGUAGE	DEVELOPER	DATE
Assembly Language		1949
CMS-2	RAND, Intermetrics	1968

B	Ken Thompson	1969
Fourth	Charles H. Moore	1970
C	Dennis Ritchie and Bell Labs	1972
Verilog	Prabhu Goel, Phil Moorby and Chilai Huang and co.	1983
C++	Bjarne Stroustrup	1985
Lua	Roberto Ierusalimsky and co.	1993
GO	Robert Griesemer, Rob Pike, Ken Thompson	2009
Rust	Graydon Hoare	2010

iii)

Language	Date	Classification	Author	Paradigm	Cases
RPG	1959	Compiled	IBM	Multi-paradigm	Business
JOVIAL	1960	Compiled	System Development Corporation	Structured	Embedded Systems
C	1972	Compiled	Dennis Ritchie	Structured	Embedded Systems
IDL	1977	Hybrid	David Sterns and ITT VIS	Vector Oriented	Science
C++	1985	Compiled	Bjarne Stroustrup	OOP	Web Services
Python	1990	Interpreted	Guido Van Rossum	OOP	General Purpose
KiXtart	1991	Interpreted	Ruud Van Velsen	Scripting	Embedded Systems
Java	1995	Compiled	Sun Micro Systems	OOP	Mobile Applications
Java Script	1995	Compiled	Brendan Eich and co.	Event Oriented	Web Applications
JScript	1996	Interpreted	Microsoft	Scripting	Web Applications

Jython	1997	Hybrid	Python Programs	Multi-paradigm	Web Services
Io	2002	Interpreted	Steve Dekorte	OOP	
Visual Basic .Net	2002	Compiled	Microsoft	Event Oriented	Web Applications
Hop	2006	Interpreted	Manuel Serrano	Multi-paradigm	Web applications
Idris	2007	Compiled	Edwin Brady	Functional	General Purpose
JavaFX	2009	Compiled	Sun Microsystems	Scripting	Desktop and mobile app development
Kojo	2010	Compiled	Lalit Pant	OOP	Educational
Kotlin	2011	Compiled	JetBrains	Multi-paradigm	Mobile Application
Julia	2012	Compiled	Jeff Bezanson and co.	Multi-paradigm	General Purpose

2)

Assembly language

The history of assembly languages is closely mingled with that of the stored-program computer. When the Electronic Delay Storage Automatic Calculator (EDSAC) was incorporated with an assembler, ‘initial orders’, which used one letter mnemonics in 1949. Stan Poley wrote the Symbolic Optimal Assembly Program or SOAP assembly language for the IBM 650 computer in 1955. Assembly languages started being used widely as they relieved the programmers from tedious tasks such as remembering numeric codes. Their use, however, was reduced substantially by the 1980’s due to the introduction of high-level languages.

Fortran

One of the oldest programming languages, the FORTRAN was developed by a team of programmers at IBM led by John Backus, and was first published in 1957. The name FORTRAN is an acronym for FORmula TRANslation, because it was designed to allow easy translation of math formulas into code.

LISP

Lisp (historically LISP) is a family of programming languages with a long history and a distinctive, fully parenthesized prefix notation . Originally specified in 1958, Lisp is the second-oldest high-level programming language in widespread use today. Lisp was originally created as a practical mathematical notation for computer programs, influenced by the notation of Alonzo Church 's lambda calculus . It quickly became the favored programming language for artificial intelligence (AI) research. As one of the earliest programming languages, Lisp pioneered many ideas in computer science , including tree data structures , automatic storage management ,dynamic typing , conditionals , higher-order functions , recursion , the self-hosting compiler , and the read–eval–print loop.

COBOL

The name means Common Business Oriented Language. ... COBOL has been around since 1959, when it was developed by the Conference on Data Systems Languages (CODASYL). It was one of the first high-level programming languages created. COBOL is run on the mainframe as well as on the PC.

APL

APL (named after the book A Programming Language) is a programming language developed in the 1960s by Kenneth E. Iverson . Its central datatype is the multidimensional array . It uses a large range of special graphic symbols to represent most functions and operators, leading to very concise code. It has been an important influence on the development of concept modeling, spreadsheets ,functional programming , and computer math packages. It has also inspired several other programming languages.

Simula

Simula is the name of two simulation programming languages, Simula I and Simula 67, developed in the 1960s at the Norwegian Computing Center in Oslo, by Ole-Johan Dahl and Kristen Nygaard. ... Also other forms of subtyping (besides inheriting subclasses) were introduced in Simula derivatives.

SNOBOL

SNOBOL ("StriNg Oriented and symBOLic Language") is a series of programming languages developed between 1962 and 1967 at AT&T Bell Laboratories by David J. Polonsky, culminating in SNOBOL4. It was one of a number of text-string-oriented languages developed during the 1950s and 1960s; others included COMIT and TRAC.

CPL

Combined Programming Language (CPL) is multi-paradigm programming language that was developed jointly between the Mathematical Laboratory at the University of Cambridge and the University of London Computer Unit during the 1960s. The collaborative effort was responsible for the "Combined" in the name of the language (previously, the name was Cambridge Programming Language). The predecessor of the language BCPL, which, in turn, is a precursor of the C language.

BASIC

BASIC (Beginners' All-purpose Symbolic Instruction Code or Beginners All-purpose Symbolic Instruction Code) is a family of general-purpose , high-level programming languages whose design philosophy emphasizes ease of use. The original version was designed by John G. Kemeny and Thomas E. Kurtz and released at Dartmouth College in 1964. They wanted to enable students in fields other than science and mathematics to use computers. At the time, nearly all use of computers required writing custom software, which was something only scientists and mathematicians tended to learn.

PL/1

PL/I (Programming Language One , sometimes written PL/1) is a procedural , imperative computer programming language developed and published by IBM . It is designed for scientific, engineering, business and system programming. It has been used by academic, commercial and industrial organizations since it was introduced in the 1960s, and is still used.

BCPL

BCPL ("Basic Combined Programming Language") is a procedural , imperative, and structured programming language. Originally intended for writing compilers for other languages, BCPL is no longer in common use. However, its influence is still felt because a stripped down and syntactically changed version of BCPL, called B , was the language on which the C

programming language was based. BCPL introduced several features of many modern programming languages, including using curly braces to delimit code blocks. BCPL was first implemented by Martin Richards of the University of Cambridge in 1967.

B

B was derived from BCPL, and its name may be a contraction of BCPL. Thompson's coworker Dennis Ritchie speculated that the name might be based on Bon, an earlier, but unrelated, programming language that Thompson designed for use on Multics. [note 1] B was designed for recursive, non-numeric, machine-independent applications, such as system and language software. It was a typeless language, with the only data type being the underlying machine's natural memory word format, whatever that might be. Depending on the context, the word was treated either as an integer or a memory address.

Pascal

Pascal is an imperative and procedural programming language, designed by Niklaus Wirth as a small, efficient language intended to encourage good programming practices using structured programming and data structuring. It is named in honour of the French mathematician, philosopher and physicist Blaise Pascal.

C

C was originally developed at Bell Labs by Dennis Ritchie between 1972 and 1973 to make utilities running on Unix. Later, it was applied to re-implementing the kernel of the Unix operating system. During the 1980s, C gradually gained popularity. It has become one of the most widely used programming languages, with C compilers from various vendors available for the majority of existing computer architectures and operating systems. C has been standardized by the ANSI since 1989 (see ANSI C) and by the International Organization for Standardization.

Smalltalk

Smalltalk is an object-oriented, dynamically typed reflective programming language. Smalltalk was created as the language underpinning the "new world" of computing exemplified by "human-computer symbiosis". It was designed and created in part for educational use, specifically for constructionist learning, at the Learning Research Group (LRG) of Xerox PARC

by Alan Kay , Dan Ingalls , Adele Goldberg , Ted Kaehler , Diana Merry , Scott Wallace, and others during the 1970s.

Prolog

Prolog has its roots in first-order logic , a formal logic , and unlike many other programming languages , Prolog is intended primarily as a declarative programming language: the program logic is expressed in terms of relations, represented as facts and rules . A computation is initiated by running a query over these relations. The language was developed and implemented in Marseille, France, in 1972 by Alain Colmerauer with Philippe Roussel, based on Robert Kowalski 's procedural interpretation of Horn clauses .Prolog was one of the first logic programming languages and remains the most popular such language today, with several free and commercial implementations available. The language has been used for theorem proving, expert systems , term rewriting, type systems , and automated planning , as well as its original intended field of use, natural language processing .Modern Prolog environments support the creation of graphical user interfaces , as well as administrative and networked applications. Prolog is well-suited for specific tasks that benefit from rule-based logical queries such as searching databases, voice control systems, and filling templates.

ML

Standard ML (SML) is a general-purpose, modular , functional programming language with compile-time type checking and type inference . It is popular among compiler writers and programming language researchers , as well as in the development of theorem provers .SML is a modern dialect of ML , the programming language used in the Logic for Computable Functions (LCF) theorem-proving project. It is distinctive among widely used languages in that it has a formal specification, given as typing rules and operational.

Scheme

Scheme is a minimalist dialect of the Lisp family of programming languages. ... It was the first dialect of Lisp to choose lexical scope and the first to require implementations to perform tail-call optimization, giving stronger support for functional programming and associated techniques such as recursive algorithms.

SQL

SQL (Structured Query Language) is a domain-specific language used in programming and designed for managing data held in a relational database management system (RDBMS), or for

stream processing in a relational data stream management system (RDSMS). It is particularly useful in handling structured data , i.e. data incorporating relations among entities and variables.

C++

The C++ programming language has a history going back to 1979, when Bjarne Stroustrup was doing work for his Ph. D. thesis. One of the languages Stroustrup had the opportunity to work with was a language called Simula, which as the name implies is a language primarily designed for simulations.

Ada

Ada is a structured , statically typed, imperative, and object-oriented high-level programming language, extended from Pascal and other languages. It has built-in language support for design by contract (DbC), extremely strong typing , explicit concurrency, tasks, synchronous message passing, protected objects, and non-determinism . Ada improves code safety and maintainability by using the compiler to find errors in favor of runtime errors.

Common LISP

The Common Lisp language was developed as a standardized and improved successor of MacLisp . By the early 1980s several groups were already at work on diverse successors to MacLisp: Lisp Machine Lisp (aka ZetaLisp), Spice Lisp , NIL and S-1 Lisp . Common Lisp sought to unify, standardise, and extend the features of these MacLisp dialects. Common Lisp is not an implementation, but rather a language specification . Several implementations of the Common Lisp standard are available, including free and open-source software and proprietary products. Common Lisp is a general-purpose, multi-paradigm programming language. It supports a combination of procedural , functional , and object-oriented programming paradigms. As a dynamic programming language, it facilitates evolutionary and incremental software development , with iterative compilation into efficient run-time programs. This incremental development is often done interactively without interrupting the running application.

MATLAB

Cleve Moler, the chairman of the computer science department at the University of New Mexico, started developing MATLAB in the late 1970s. They rewrote MATLAB in C and founded MathWorks in 1984 to continue its development.

Foxpro

FoxPro. Originally developed by Fox Software and known as FoxPro or FoxBASE, Fox Software was acquired by Microsoft in June 1992 and is now known as VFP (Visual FoxPro). FoxBASE was originally released in 1984 by Fox Software and is a programming language used to develop database applications.

Eiffel

Eiffel is an object-oriented programming language designed by Bertrand Meyer (an object-orientation proponent and author of Object-Oriented Software Construction) and Eiffel Software . Meyer conceived the language in 1985 with the goal of increasing the reliability of commercial software development; the first version becoming available in 1986. In 2005, Eiffel became an ISO -standardized language.

Objective C

The Objective-C programming language has had a humble history. Created by Brad Cox in the early 1980s as an extension of the venerated C, pioneered a decade earlier by Dennis Ritchie, the language was based on another called SmallTalk-80. ... Because NeXTSTEP was built from Objective-C, iOS mirrors the language choice.

Erlang

The sequential subset of the Erlang language supports eager evaluation, single assignment, and dynamic typing. It was originally proprietary software within Ericsson, developed by Joe Armstrong, Robert Virding, and Mike Williams in 1986, but was released as free and open-source software in 1998.

Perl

Perl was originally developed by Larry Wall in 1987 as a general-purpose Unix scripting language to make report processing easier. Since then, it has undergone many changes and revisions. Raku, which began as a redesign of Perl 5 in 2000, eventually evolved into a separate language.

Python

Python was conceived in the late 1980s by Guido van Rossum at Centrum Wiskunde & Informatica (CWI) in the Netherlands as a successor to the ABC language (itself inspired by SETL), capable of exception handling and interfacing with the Amoeba operating system. Its implementation began in December 1989.

Haskell

Type classes, which enable type-safe operator overloading, were first proposed by Philip Wadler and Stephen Blott for Standard ML but were first implemented in Haskell between 1987 and version 1.0. The first version of Haskell ("Haskell 1.0") was defined in 1990.

Visual basic

Visual Basic 1.0 was introduced in 1991. The drag and drop design for creating the user interface is derived from a prototype form generator developed by Alan Cooper and his company called Tripod. ... Microsoft decided to combine Ruby with the Basic language to create Visual Basic.

LUA

Lua was created in 1993 by Roberto Ierusalimschy, Luiz Henrique de Figueiredo, and Waldemar Celes, members of the Computer Graphics Technology Group (Tecgraf) at the Pontifical Catholic University of Rio de Janeiro, in Brazil. ... Those reasons led Tecgraf to implement the basic tools it needed from scratch.

R

R is an implementation of the S programming language combined with lexical scoping semantics, inspired by Scheme. S was created by John Chambers in 1993, while at Bell Labs. There are some important differences, but much of the code written for S runs unaltered.

Ruby

Ruby is an interpreted, high-level, general-purpose programming language. It was designed and developed in the mid-1990s by Yukihiro "Matz" Matsumoto in Japan. Ruby is dynamically typed and uses garbage collection. ... According to the creator, Ruby was influenced by Perl, Smalltalk, Eiffel, Ada, Basic, and Lisp.

Java

Java was started as a project called "Oak" by James Gosling in June 1991. Gosling's goals were to implement a virtual machine and a language that had a familiar C-like notation but with greater uniformity and simplicity than C/C++. The first public implementation was Java 1.0 in 1995.

Delphi

Delphi (later known as Delphi 1) was released in 1995 for the 16-bit Windows 3.1, and was an early example of what became known as Rapid Application Development (RAD) tools. ... Delphi has always used Object Pascal, which continued to be developed, as its underlying object-oriented language.

Java script

JavaScript was created by Brendan Eich in 1995 during his time at Netscape Communications. It was inspired by Java, Scheme and Self. Netscape, for a time, made the best browser in the world and enjoyed market dominance.

PHP

The History of PHP. PHP is an "HTML-embedded scripting language" primarily used for dynamic Web applications. ... PHP was written in the C programming language by Rasmus Lerdorf in 1995 for use in monitoring his online resume and related personal information. For this reason, PHP originally stood for "Personal Home Page".

Action script

ActionScript is an object-oriented programming language originally developed by Macromedia Inc. (later acquired by Adobe Systems) in 1998. It is influenced by HyperTalk, the scripting language for HyperCard. ... ActionScript is also used with Scaleform GfX for the development of 3D video game user interfaces and HUDs.

C#

C# was developed by Microsoft within its .NET framework initiative and later approved as a standard by ECMA (ECMA-334) C# programming language is a general-purpose, OOPS based programming language. C# development team was lead by "Anders Hejlsberg" in 2002.

Scratch

The MIT Media Lab's Lifelong Kindergarten group, led by Mitchel Resnick, in partnership with the Montreal-based consulting firm, the Playful Invention Company, co-founded by Brian Silverman and Paula Bonta, together developed the first desktop-only version of Scratch in 2003.

Groovy

Apache Groovy. Apache Groovy is a Java-syntax-compatible object-oriented programming language for the Java platform. ... Groovy 1.0 was released on January 2, 2003 and Groovy 2.0 in July, 2012. Since version 2, Groovy can be compiled statically, offering type inference and performance near that of Java.

Scala

Scala is a general purpose programming language. It was created and developed by Martin Odersky. Martin started working on Scala in 2001 at the Ecole Polytechnique Federale de Lausanne (EPFL). It was officially released on January 20, 2004.

Clojure

Lisp is one of the oldest of all programming languages, invented by John McCarthy in 1958. ... Clojure (pronounced "closure") is a new dialect of Lisp created by Rich Hickey in 2007. Like Scheme, Clojure is a functional dialect, meaning that it supports and encourages programming in a "functional style".

Go

Go is a procedural programming language. It was developed in 2007 by Robert Griesemer, Rob Pike, and Ken Thompson at Google but launched in 2009 as an open-source programming language. Programs are assembled by using packages, for efficient management of dependencies.

Rust

Rust (programming language) Rust is syntactically similar to C++, but provides memory safety without using garbage collection. Rust was originally designed by Graydon Hoare at Mozilla Research, with contributions from Dave Herman, Brendan Eich, and others it was created in 2010

Dart

Dart is an open-source, object-oriented, general-purpose programming language developed by Google in 2011. Dart uses a 'C' style syntax and optionally transcompiles into JavaScript. It is used for both client side and server-side web development. Dart is also being used for Native and Cross-platform mobile development.

Kotlin

Kotlin is an OSS statically typed programming language that targets the JVM, Android, JavaScript and Native. It's developed by JetBrains. The project started in 2010 and was open source from very early on. The first official 1.0 release was in February 2016.

Swift

Development of Swift started in July 2010 by Chris Lattner, with the eventual collaboration of many other programmers at Apple. Swift took language ideas "from Objective-C, Rust, Haskell, Ruby, Python, C#, CLU, and far too many others to list". It was out for official use in 2014

3. An object-oriented program usually contains different types of objects, each corresponding to a particular kind of complex data to manage, or perhaps to a real-world object or concept such as a bank account, a hockey player, or a bulldozer. Modular programming (also called "top-down design" and "stepwise refinement") is a software design technique that emphasizes separating the functionality of a program into independent, interchangeable modules, such that each contains everything necessary to execute only one aspect of the desired functionality. Last modified: 7:17 pm