Programming for Non-Programmers
A “Learn-30”

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OPCUG & PATACS

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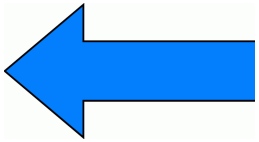
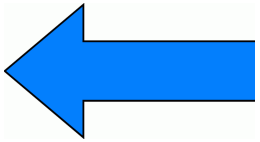
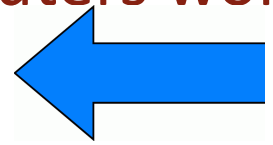
Why program?

1. Start a new career
2. Make money
3. Solve a need for which software isn't available
4. Just for the fun of it
5. Better understand how computers work
6. "Wow" the kids or grandkids

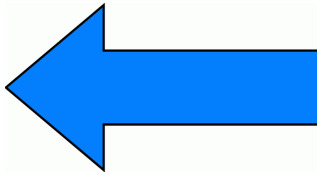






Software Development*

1. Requirements gathering and analysis
2. System analysis
3. System design
4. Coding (programming)
5. Testing & debugging
6. Implementation



*See 

for more information

Down in the weeds!

C++

COMMA OPERATOR

…a binary operator that evaluates its first operand and discards the result and then evaluates the second operand and returns this value (and type)

Huh…???

What is a Computer Language?

- …it's a formal language designed to communicate instructions to a computer
- For more information see 

How many computer languages are there?

- Several thousand
- Those starting with the letter “R” 

. R	. Red	. ROOP
. R++	. Redcode	. RPG
. Racket	. REFAL	. RPL
. RAPID	. Reia	. RSL
. Rapira	. Revolution	. RTL/2
. Ratfiv	. rex	. Ruby
. Ratfor	. REXX	. RuneScript
. rc	. Rlab	. Rust
. REBOL	. RobotC	

Kinds of computer languages

1 Array language
2 Assembly languages
3 Authoring languages
4 Constraint programming
5 Command line interface languages
6 Compiled languages
7 Concurrent languages
8 Curly-bracket language
9 Dataflow languages
10 Data-oriented languag
11 Data-structured languages
12 Decision table languages
13 Declarative languages
14 Embeddable languages
    14.1 In source code
        14.1.1 Server side
        14.1.2 Client side
    14.2 In object code
15 Educational languages
16 Esoteric languages
17 Extension languages
18 Fourth-generation languages
19 Functional languages
    19.1 Pure
    19.2 Impure
20 Hardware description languages
    20.1 HDLs for analog circuit design
23 Interpreted languages
24 Iterative languages
25 List-based languages – LISPs
26 Little languages
27 Logic-based languages
28 Machine languages
29 Macro languages
    29.1 Textual substitution macro languages
    29.2 Application macro languages
30 Metaprogramming languages
31 Multiparadigm languages
32 Numerical analysis
33 Non-English-based languages
34 Object-oriented class-based languages
    34.1 Multiple dispatch
    34.2 Single dispatch
riented prototype-based languag
rule languages
ral languages
38 Reflective languages
39 Rule-based languages
40 Scripting languages
41 Stack-based languages
42 Synchronous languages
43 Syntax handling languages
44 Transformation languages
45 Visual languages
46 Wirth languages
47 XML-based languages

General Purpose Languages

World's Most Popular Program—in "C"

Comment →

```
/* Hello World program */

#include<stdio.h>

main()
{
    printf("Hello World");


}
```

← Read-in standard input/output

← Main part of program, do stuff between braces

→

← Print function

→

Hello World

See  for "Hello World" programs in many languages

World's Most Popular Program–Basic*

```
10 PRINT "HELLO WORLD"
```

*There are many versions of BASIC

World's Most Popular Program–VB

```
' A "Hello, World!" program in Visual Basic.
Module Hello
  Sub Main()
      MsgBox("Hello, World!") ' Display message on computer screen.
  End Sub
End Module
```

World's Most Popular Program–Python

```
print ( “Hello World” )
```

World’s Most Popular Program−APL

‘Hello World’

World's Most Popular Program–Java

```
public class Hello {
        public static void main(String []args) {
                System.out.println("Hello World");
        }
}
```

World's Most Popular Program–PHP

```
<?php
Print "Hello, World!";
?>
```

World's Most Popular Program–Assembler

```
dosseg
.model small
.stack 100h


.data
hello_message db 'Hello, World!',0dh,0ah,'$'


.code
main  proc
mov ax,@data
mov ds,ax


mov ah,9
mov dx,offset hello_message
int 21h


mov ax,4C00h
int 21h
main  endp
end main
```

IBM-PC

i386

A Geek is Born!

Write it → Compile it → Run it*

```
/* Hello World program */

#include<stdio.h>

main()
{
    printf("Hello World");

}
```

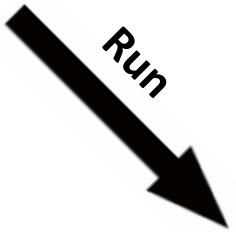
Source Code

Compile

```
10010101010010110010010000
01001110011001110011010001
10000110100011010010011111
10001001010111100101001010
01101100111001001010001010
01001100001001110111110010
10011111001110100101001010
```

Object Code

Run



Hello World

Output

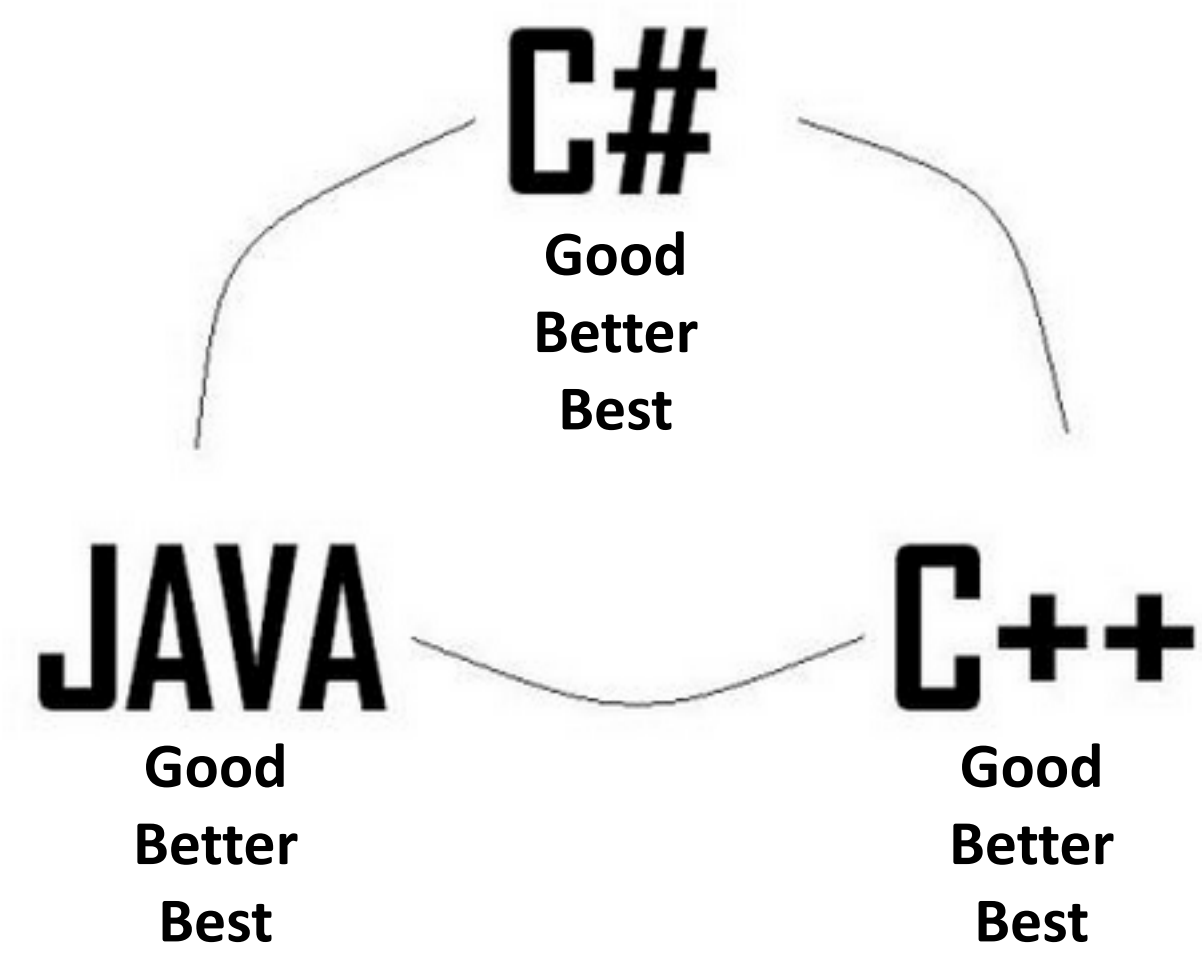
*An over simplification
For more information see 

Rivalry Between Apple & Microsoft

VS

Mac **PC**

My Language is Wonderful—Yours Stinks!



Linus Torvalds—Progenitor of Linux

- “YOU are full of [deleted]. C++ is a horrible language. It’s made more horrible by the fact that a lot of substandard programmers use it…”

Edsger Dijkstra—Professor & Computer Scientist

- “The use of COBOL cripples the mind; its teaching should, therefore, be regarded as a criminal offense.”
- “Object-oriented programming is an exceptionally bad idea which could only have originated in California.”

What is **O**bject **O**riented **P**rogramming (OOP)?

- …a programming language model organized around:
  - objects rather than “actions”
  - **data** rather than logic
- Traditional program languages are viewed as sequences of logical procedures
  - takes input data
  - **processes** it
  - produces output data

Programmers: emotional, compulsive &

About BASIC…

- **B**eginner's **A**ll-purpose **S**ymbolic **I**nstruction **C**ode
- Developed in 1964 by Kemeny & Kurtz at Dartmouth College 

- Widely distributed on microcomputers in 1980s and 1990s
- "The language that made computers personal" 

- 300+ variations of BASIC 

- Visual Basic widely used within Visual Studio 

- Relatively easy to learn

About “C”…

- First there was “A”, then “B”, then…
- Developed in 1969-1973 by Dennis Ritchie & colleagues at Bell Labs
- A widely used general purpose language 

- “C” is the Latin of computer languages
- Not the easiest language to learn
- Has many functions 

- Powerful and fast

Representing Information: Letters & Numbers

Character	Decimal Value	Binary Value
A	65	01000001
a	97	01100001
1	49	00110001
2	50	00110010
null	0	00000000
† (dagger)	134	10000110
Œ (OE ligature)	140	10001100

ASCII **A**merican **S**tandard **C**ode for **I**nformation **I**nterchange

0 ➔ 255 (decimal); 256 objects

Storing Information: Variables*

Type	Examples	Explanation
char	A, a, 1, 2	1 byte, characters (not a number)
short	1, 2, 3…	2 bytes -32,767 to + 32,767, integers
int	1, 2, 3…	2 bytes or more, integers
long	1, 2, 3…	4 bytes or more, ±2,147,483,647, integers
float	3.14…	4 bytes, floating point (numeric decimal)
double	3.1415…	8 bytes, floating point (numeric decimal)
long double	3.1415926…	16 bytes, floating point (numeric decimal)

*An over simplification in “C”
For more information see 

Computer Languages: C Standard Library*

Name	Description
<assert.h>	Used to detect logical errors and other types of bugs
<errno.h>	For testing error codes reported by library functions
<fenv.h>	Defines a set of functions for controlling floating-point environment
<math.h>	Defines common mathematical functions
<signal.h>	Defines signal handling functions
<stdio.h>	Defines input and output functions
<string.h>	Defines string handling functions
<time.h>	Defines date and time handling functions

*8 examples from the “C” Standard Library
For more information see 

IDE: **I**ntegrated **D**evelopment **E**nvironment

- "Good old days": an editor and compiler
- IDE—a programming environment application with:
  - Code editor
  - Compiler(s)
  - Debugger(s)
  - Graphical user interface (GUI)

Visual Studio 2015 Product Offerings

Visual Studio Community

Free, full-featured and extensible tool for developers building non-enterprise applications

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For more information see 

Xcode

By Apple

Essentials

Open the Mac App Store to buy and download apps.

For more information see URL

View in Mac App Store

Free

Category: Developer Tools
Updated: Jun 30, 2015
Version: 6.4
Size: 2.61 GB
Language: English
Seller: Apple Inc.
© 1999-2014 Apple Inc.
Rated 4+

Compatibility: OS X 10.10 or later

Customer Ratings

We have not received enough ratings to display an average for the current version of this application.

All Versions:
★★★ 4002 Ratings

More by Apple

Description

Xcode provides everything developers need to create great applications for Mac, iPhone, and iPad. Xcode brings user interface design, coding, testing, and debugging all into a unified workflow. The Xcode IDE combined with the Cocoa and Cocoa Touch frameworks, and the Swift programming language make developing apps easier and more fun than

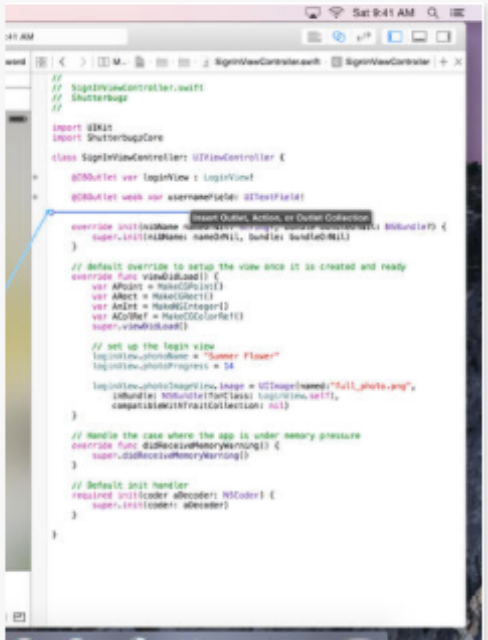
Apple Web Site ▸ Xcode Support ▸ Application License Agreement ▸ ...More

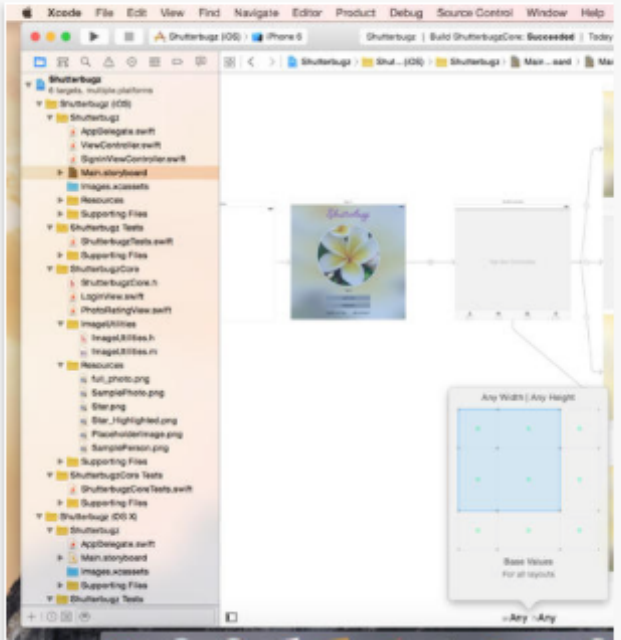
What's New in Version 6.4

Xcode 6.4 adds support for iOS 8.4

Xcode 6.4 includes Swift 1.2 and SDKs for OS X 10.10 Yosemite and iOS 8.4

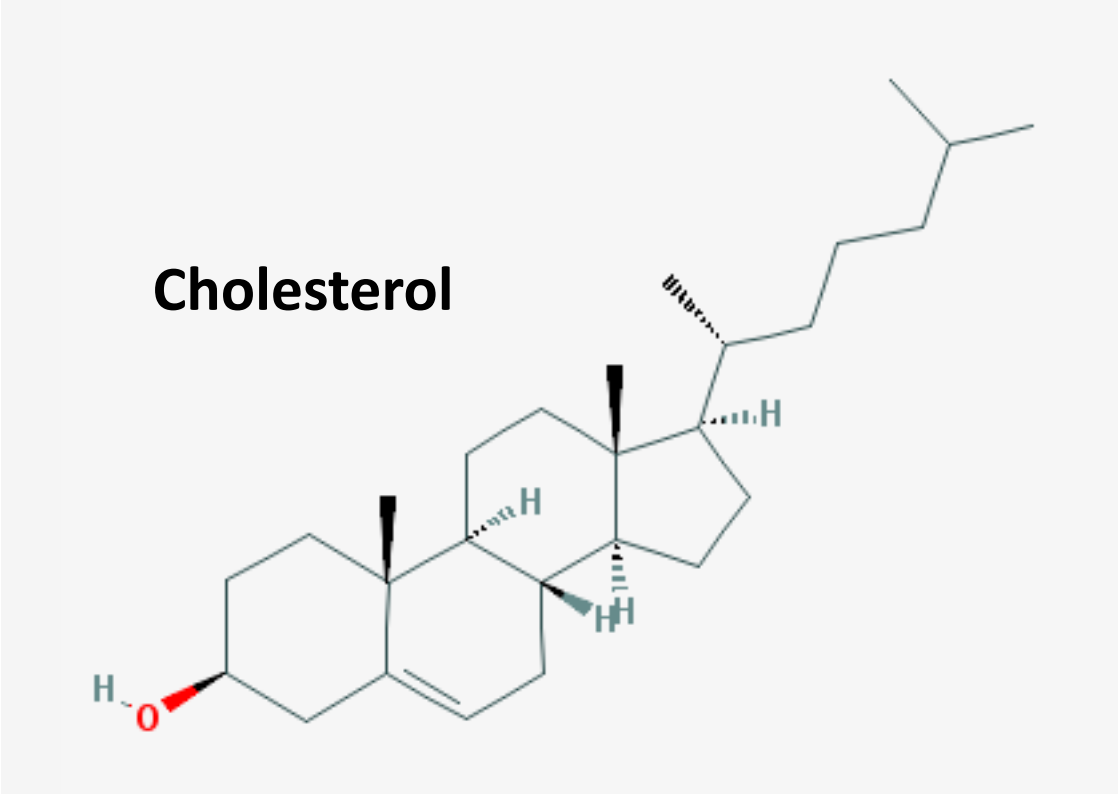
Screenshots



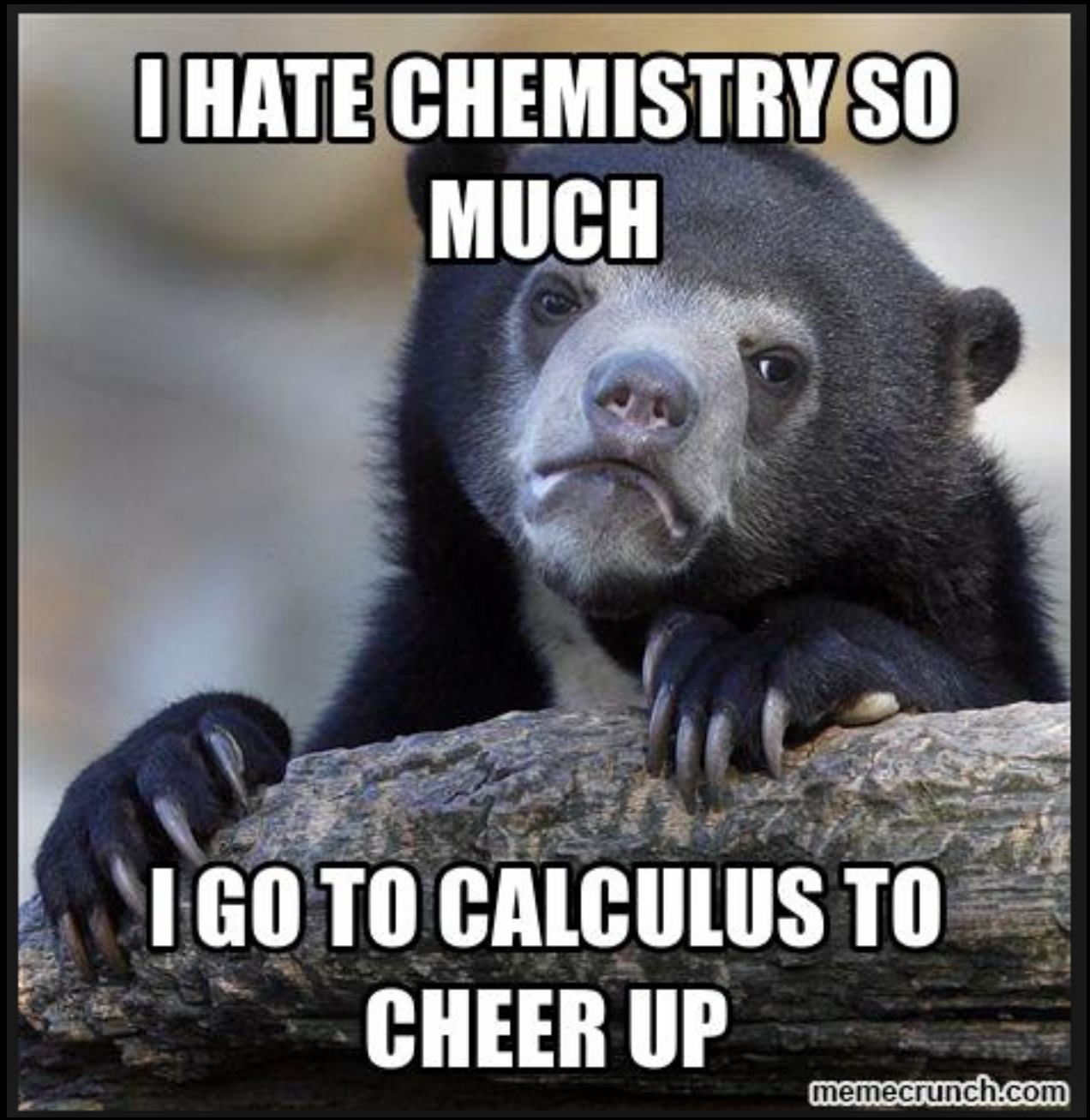


Cannabis sativa L.

How do you represent, store and retrieve this…



Chemistry?


I HATE CHEMISTRY SO MUCH
I GO TO CALCULUS TO CHEER UP
memecrunch.com

Representations for Cholesterol

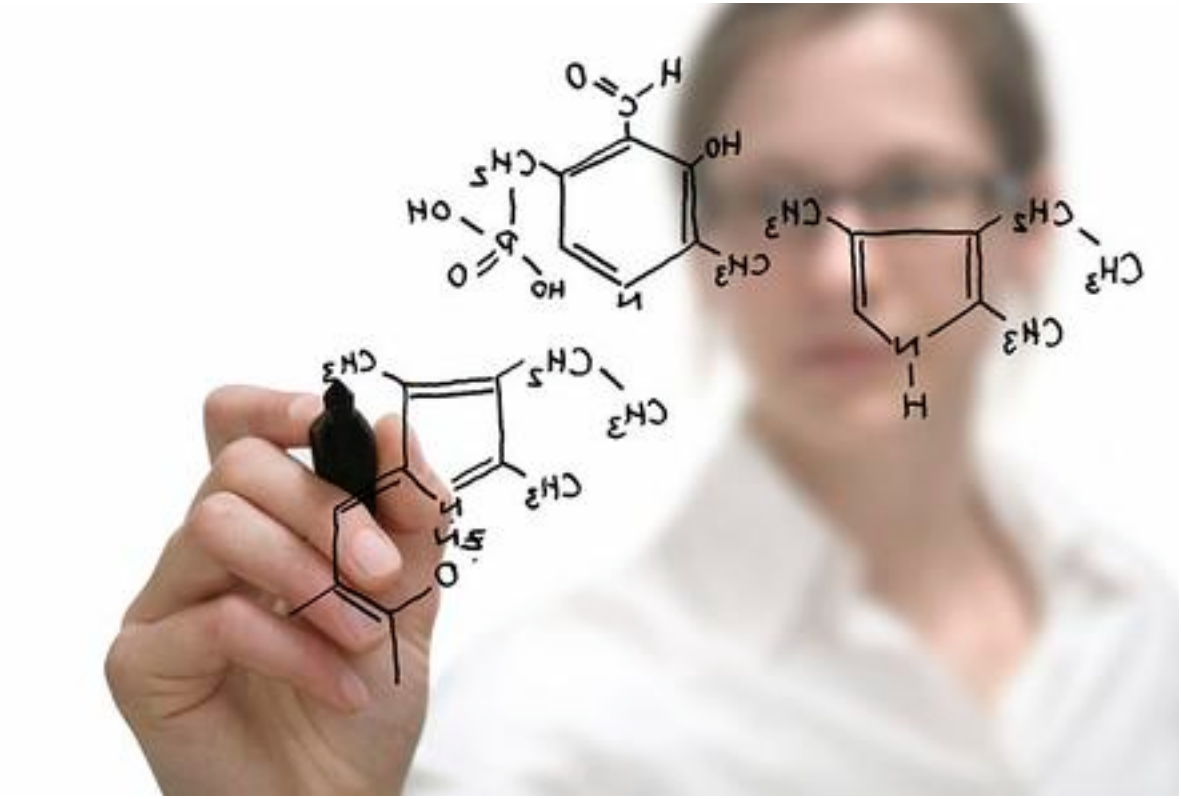
- Cholesterol
- HDL cholesterol (good cholesterol)
- LDL cholesterol (bad cholesterol)
- (3β)-cholest-5-en-3-ol
- $C_{27}H_{46}O$
- CAS Number: 57-88-5 (>101 million substances) 


- EC Number: 200-353-2 

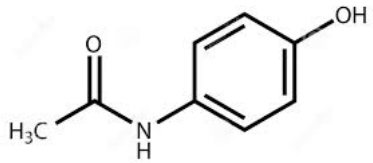
- InChi Key: HVYWMOMLDIMFJA-DPAQBDIFSA-N 

- UNII: 97C5T2UQ7J 

Chemists think in terms of pictures…

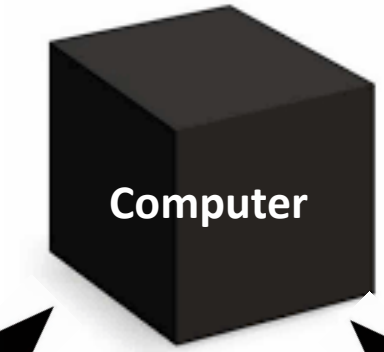


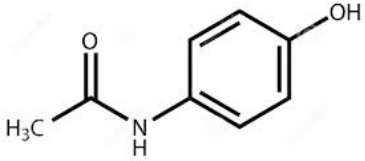
Key it → Store it → Search it → Retrieve it*



Acetaminophen

Keyboarder enters data





+84,000 others

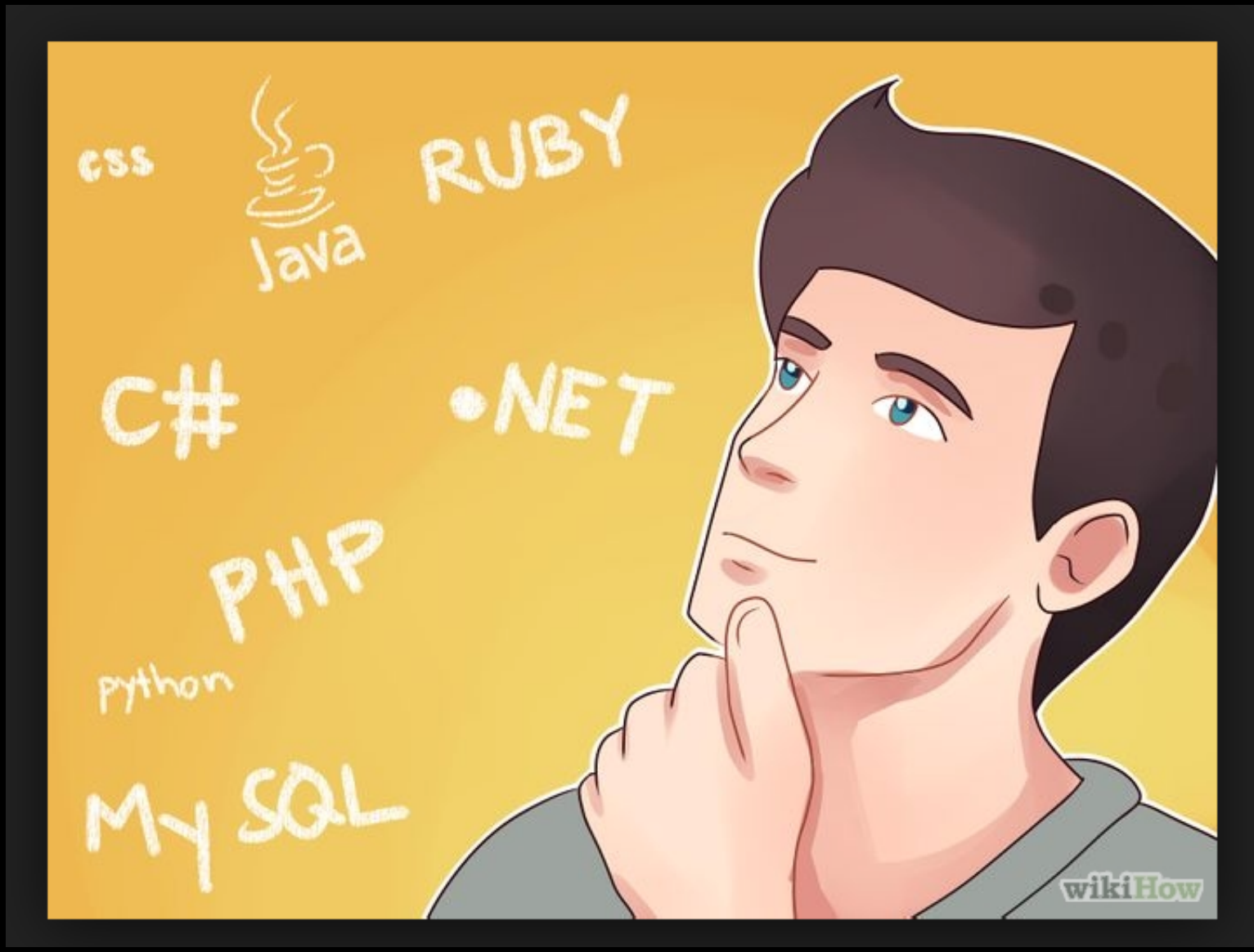
Scientist searching

***Another over simplification**

Sometimes you need to be specific

I said RED NOT tris(4-dimethylamino)phenyl)methylium chloride!

So you want to start programmng…



How do you learn?

- Read books
- Take a traditional course
- Take an online course
- Work with a friend or colleague
- Here's some advice 

Beyond “Hello World”

- Think before coding (design first)
- Programs don’t work the first time (debugging & error handling)
- Programs “wear out”
- Comments & documentation essential
- Patience, patience, patience

Best for First-Time Learners

Widely Used	Language	Comments
1	Java	General purpose, object oriented, portable, slow
2	Ruby	General purpose, object oriented, portable, slow
3	Python	General purpose, object oriented, portable, slow
4	JavaScript	Web programming only
5	C	General purpose, portable, very fast, modular
6	C++	General purpose, object oriented, fast, rather antiquated
7	C#	General purpose, Microsoft only, fairly fast
8	PHP	Easy to learn, for Web applications, scripting language
9	Objective C	General purpose, Apple oriented, superset of C

Microsoft–Windows Environment

- C#, Visual Basic or Python with Visual Studio Community 2013* (free) 

  - Supports code in Visual Basic, C++, Python, F#, C# and JavaScript
  - Advantages of VB & Python:
    - Simple structure
    - “Easy to learn”
    - Applicable to several versions of Windows OS
  - Disadvantages
    - VB & C# are proprietary Microsoft languages; not portable to other OS systems
  - Many good tutorials on Web
  - Lots of good books

*Operates within the .NET Framework

Apple Environment: OS X, iOS & watchOS

- Java, Ruby, Python or Swift* with Xcode 6.4 (free) 

  - Supports code in Swift, C, C++, Objective-C, Objective C++, Java, Python, Ruby, Rez and AppleScript
  - Advantages:
    - Applicable to Mac computers, iPads, iPhones and Apple Watches
    - Java, Ruby and Python are reasonably portable to other operating systems
  - About Swift:
    - Swift is a new language with fewer resources/help*
    - Swift is not portable to other operating systems
  - Tutorials available on Web (for Swift, Java, Ruby & Python)
  - Good books (for Swift, Java, Ruby & Python)

*Swift will probably dominate the Apple environment, but is more difficult to learn


The End!
printf (“Thank you!”);