

WELCOME

Spring 2018

```
41 if ((dir==1 || dir == -3) && row > 0){  
42     Swap(board, row, col, row-1, col);  David Roby  
43 }  
44 else if ((dir == 2 || dir == -4) && col < MAXDIM-1){  
45     Swap(board, row, col, row, col+1);
```

STREAM STUDENTS ABOUT

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No work due soon

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Welcome to your class!

Do you want to take a tour to learn more?

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STREAM

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zyBooks 

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Interactive textbook replacements

Less text, more action.TM

Proven to improve college STEM grades.

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Use a zyBook in your class instead of a textbook

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Students

Use zyBooks in your classes, or study on your own

[Get started](#)



David Ruby

Class Instructor

- Office
 - Science II – 273
- Email:
 - druby@csufresno.edu

Welcome to 40

- Introduction to :
 - Programming & Problem Solving
- Computational Thinking
 - Way of Solving Problems so computers can help us more!
- Language w/ Computers
 - C++

Our Textbook

- Online Textbook – Browser Based
 - Zybook from Zyante

The screenshot shows the homepage of the zyBooks website. At the top, there's a navigation bar with the zyBooks logo, 'About us', 'Catalog', 'Create account', and 'Sign in'. The main heading is 'Interactive textbook replacements' with the tagline 'Less text, more action.™ Proven to improve college STEM grades.' Below this is a large orange button labeled 'Look inside a zyBook'. To the right, there's a cartoon illustration of a smiling woman holding a tablet that displays the zyBooks logo. A pink heart is floating near her. On the left side, there's a large white owl icon. The bottom section is divided into two main sections: 'Instructors' on the left and 'Students' on the right. The 'Instructors' section includes the text 'Use a zyBook in your class instead of a textbook' and a 'Find out more' button. The 'Students' section includes the text 'Use zyBooks in your classes, or study on your own' and a 'Get started' button.

Coding In Cloud w/ Online Textbook

The screenshot displays the zyBooks platform interface, specifically the '1.13 Programming 1: Hello, World!' section.

Top Navigation: The top bar shows the zyBooks logo and the title '1.13 Programming 1: Hello, World!'. A sidebar on the left lists other chapters: 1.10 Problem solving, 1.11 C++ example: Salary Calculation, 1.12 C++ example: Married-couple names, 1.13 Programming 1: Hello, World!, and 1.14 Coding Quiz 1.

Lab Submission Section: This section is titled '1.13.1: Programming 1: Hello, World!' and includes a 'Lab Submission' button. It shows a file named 'helloworld.cpp' with a preview area containing the number '1'.

Development Section: Titled 'Develop and submit', it features a 'Develop' button (which is currently active) and a 'Submit' button. A descriptive text explains that in 'Develop' mode, users can run their program multiple times before submission, entering input in the first box and observing output in the second.

Run Program Section: Contains a 'RUN PROGRAM' button, an input field labeled 'Enter program input (optional)' with the placeholder 'My Input to Program Goes here...', and an output field labeled 'Program output displayed here' with the placeholder 'My Output Appears here.....'.

Code Preview: A large box labeled 'helloworld.cpp (Your program)' contains the code:

```
1 #include <iostream>
2
3 int main()
4 {
5     std::cout << "Hello, World!" << std::endl;
6 }
```

Page Number: The bottom right corner of the interface shows the number '5'.

Integrated Development Environments

The image is a collage of screenshots illustrating different Integrated Development Environments (IDEs) and development environments:

- Visual Studio IDE (Top Left):** A screenshot of the Microsoft Visual Studio website, showing the IDE interface with code editor, navigation bar, and search bar.
- Xcode (Bottom Left):** A screenshot of the Xcode IDE on macOS, showing the file structure, storyboard preview, and code editor with Swift code for a trail details view controller.
- Visual Studio Code (Bottom Center):** A screenshot of the Visual Studio Code interface, showing multiple tabs of code and a dark-themed UI.
- Android Studio (Bottom Right):** A screenshot of the Android Studio IDE, showing the layout editor, code editor with Java/Kotlin code, and the run tab.
- macOS Home Screen (Bottom Left):** A screenshot of a macOS desktop showing the Dock with various application icons and the Control Center.
- macOS Desktop (Bottom Right):** A screenshot of a person's hands typing on a MacBook keyboard.

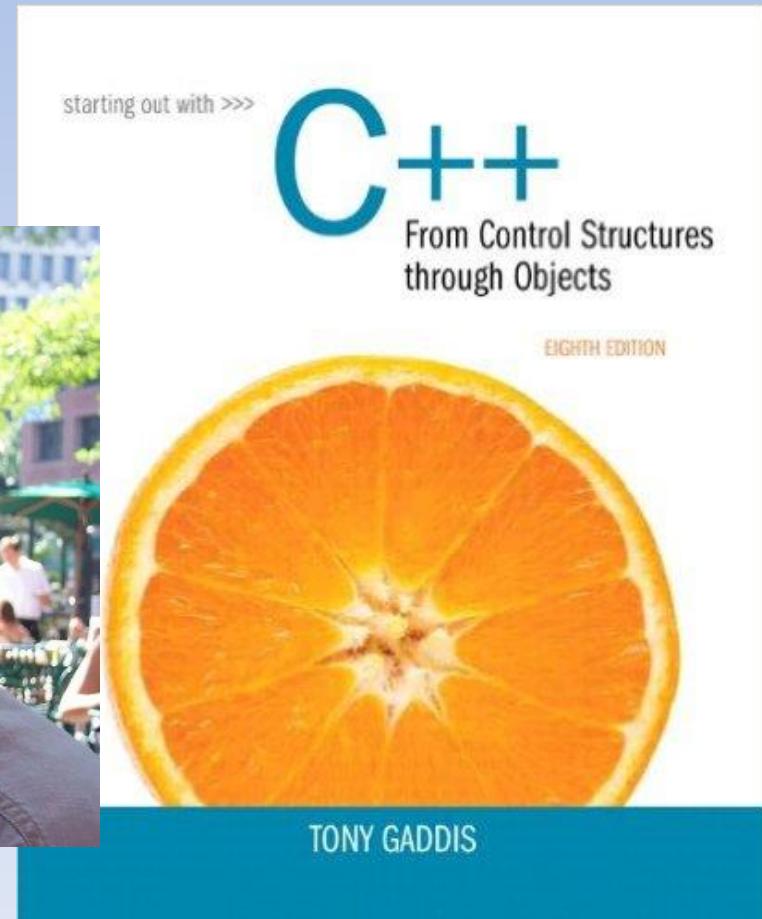
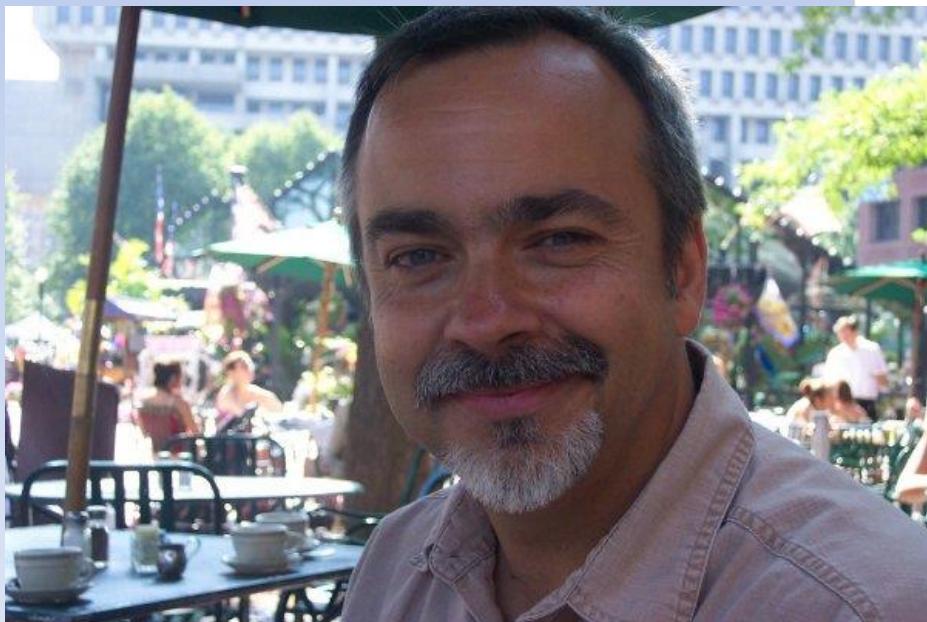
ZyBooks Textbook

The screenshot shows a navigation menu on the left with items like "1.10 Problem solving", "1.11 C++ example: Salary Calculation", etc., and sections "2. Variables / Assignments" and "3. Branches". The main area displays a "Lab Submission" interface for "1.13.1: Programming 1: Hello, World!". It includes a file list with "helloworld.cpp", a code editor window with the number "1", and a status bar indicating "helloworld.cpp".

The screenshot shows a programming development environment for "1.13 Programming 1: Hello, World!". It features a sidebar with chapters 1 through 6. The main area has a "Develop and submit" section with "Develop" and "Submit" buttons, a "RUN PROGRAM" button, an input field for "Enter program input (optional)", and an output field for "Program output displayed here". A large callout box highlights the "helloworld.cpp (Your program)" section where the user's input is processed.

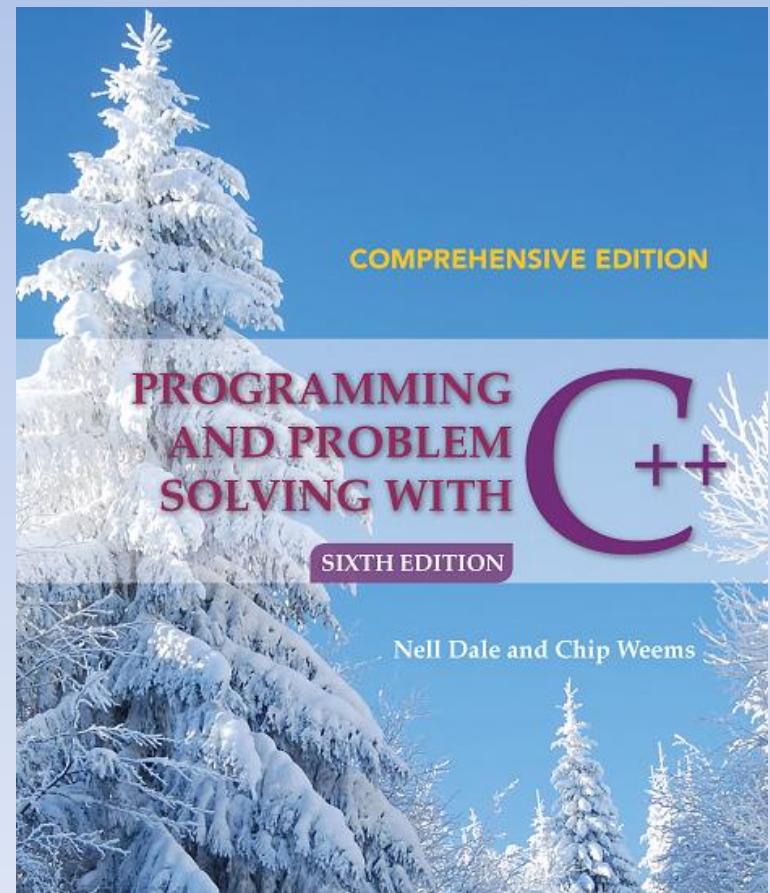
Auxiliary Text - 1

- Starting Out With C++ From Control Structures Through Objects (8th)
 - by Tony Gaddis



Auxiliary Text - 2

- Programming and Problem Solving w/ C++ (6th)
 - by Nell Dale & Chip Weems



Google Classroom

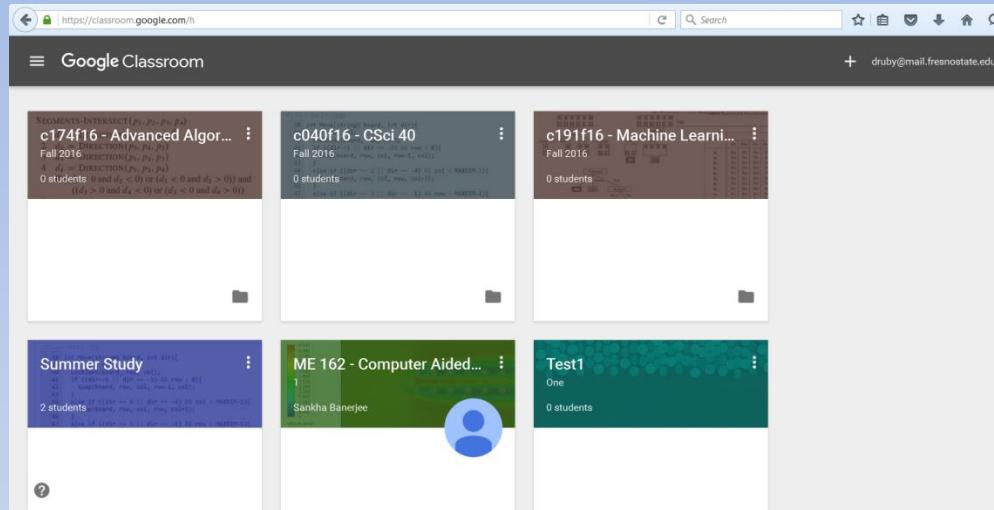
The screenshot shows the Google Classroom interface with six course streams displayed in a grid:

- c174f16 - Advanced Algor...**: Fall 2016, 4 students. Description: SEGMENTS-INTERSECT(p_1, p_2, p_3, p_4).
Code snippet:

```
38 int Move(string board, int dir){  
39     if((dir==1 || dir == -3) && row > 0){  
40         if((dir==1 && col == 0) || (dir == -3 && col == 3)){  
41             Swap(board, row, col, row-1, col);  
42         }  
43         else if ((dir == 2 || dir == -4) && col < MAXDIM-1){  
44             Swap(board, row, col, row, col+1);  
45         }  
46         else if ((dir == 3 || dir == -1) && row < MAXDIM-1){  
47             Swap(board, row, col, row+1, col);  
48         }  
49     }
```
- c040f16 - CSci 40**: Fall 2016, 0 students.
- c191f16 - Machine Learni...**: Fall 2016, 0 students.
- Summer Study**: 2 students. Description: ME 162 - Computer Aided...
Code snippet:

```
38 int Move(string board, int dir){  
39     if((dir==1 || dir == -3) && row > 0){  
40         if((dir==1 && col == 0) || (dir == -3 && col == 3)){  
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44             Swap(board, row, col, row, col+1);  
45         }  
46         else if ((dir == 3 || dir == -1) && row < MAXDIM-1){  
47             Swap(board, row, col, row+1, col);  
48         }  
49     }
```
- ME 162 - Computer Aided...**: Sankha Banerjee
- Test1**: One student.

Google Classroom



- Seamlessly Integrated with Google Docs.
- Allows easy interaction with class.
- Lecture Notes Posted
- A few Questions, Surveys, Reflections

Class Participation w/ Google Classroom

- Join class w/ Class Code: **s1v5y1**
- PLEASE RECORD CODE!
- Try to join now!

Grading

Course Item	Percentage
In-Class Participation	2%
Lab Participation	2%
Zyante Participation Activities	5%
Zyante Challenge Activities	5%
Quizzes	5%
Lab Programming Assignments	5%
Programming Projects	10%
Midterm exam I (in Classroom)	10%
Midterm exam II (in Classroom)	16%
Final exam (in Classroom)	40%

Blackboard

- Google Classroom will not replace Blackboard
- Blackboard Quizzes
- 5%

Quizzes w/ Blackboard

- Quizzes will be in Blackboard.

Coding Labs (Weekly)

- Coding labs are longer coding challenges.
- Coding labs conducted primarily in lab session.
- 5%

Coding Assignments

- Will build off of coding labs.
- 10%

Midterms

- Midterm 1: 10%
- Midterm 2: 16%

Final

- Cumulative
- 40%

Scale

- A: 85-100
- B: 70-84
- C: 55-69
- D: 40-54
- F: <40

Who I Am

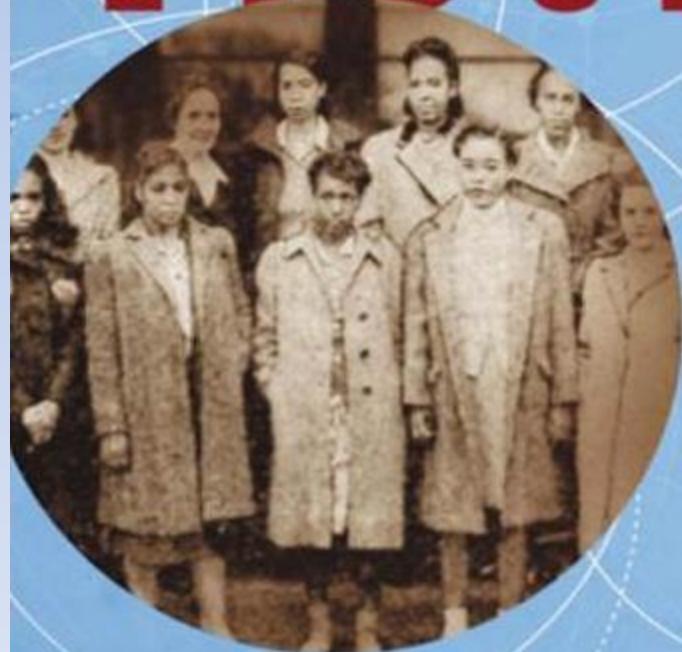
- I am first-generation student from Fresno
 - Lane Elementary->Sequoia->Roosevelt (80)
 - Fresno State (84 – Math/CS Option)
- I am a Programmer
 - Edwards AFB ‘84, UCI ‘86, US Amada ‘94, Xerox ‘96, Hewitt (AON) ‘06
- I am a Lecturer
 - Fresno State ‘13
 - 40, 126, 164, 166, 174, 191T, 226, 264

Current Context: Information Age Arrival

- Computers Driving Change
- Data Insanely Important
- Change Is Coming
- Social Impacts Significant

During World War II, America's fledgling aeronautics industry hired black female mathematicians to fill a labor shortage. These "human computers" stayed on to work for NASA and make sure America won the Space Race. They fought for their country's future, and for their share of the American Dream. This is their untold story.

HIDDEN FIGURES



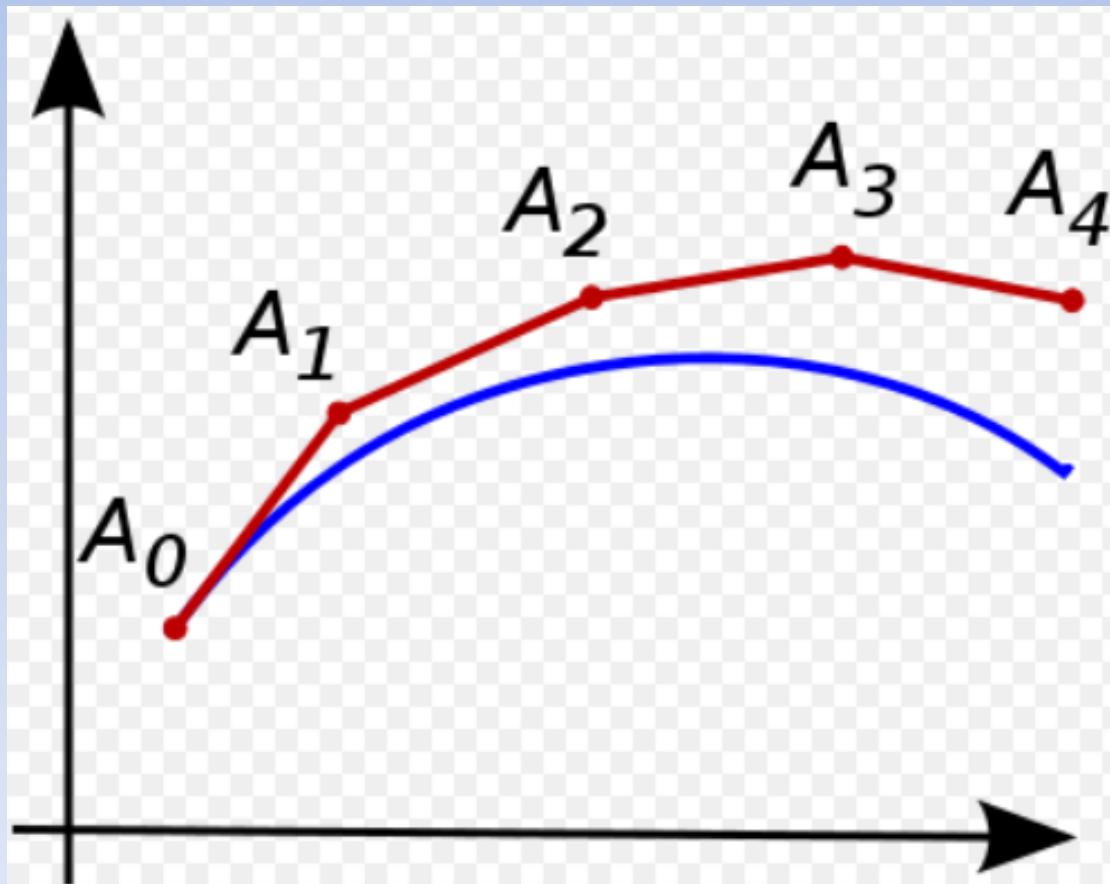
MARGOT LEE SHETTERLY

Early Computing



Euler's Method

- Approximation algorithms



Bombe (Hut 1: 18 March 1940)

Decoding Enigma

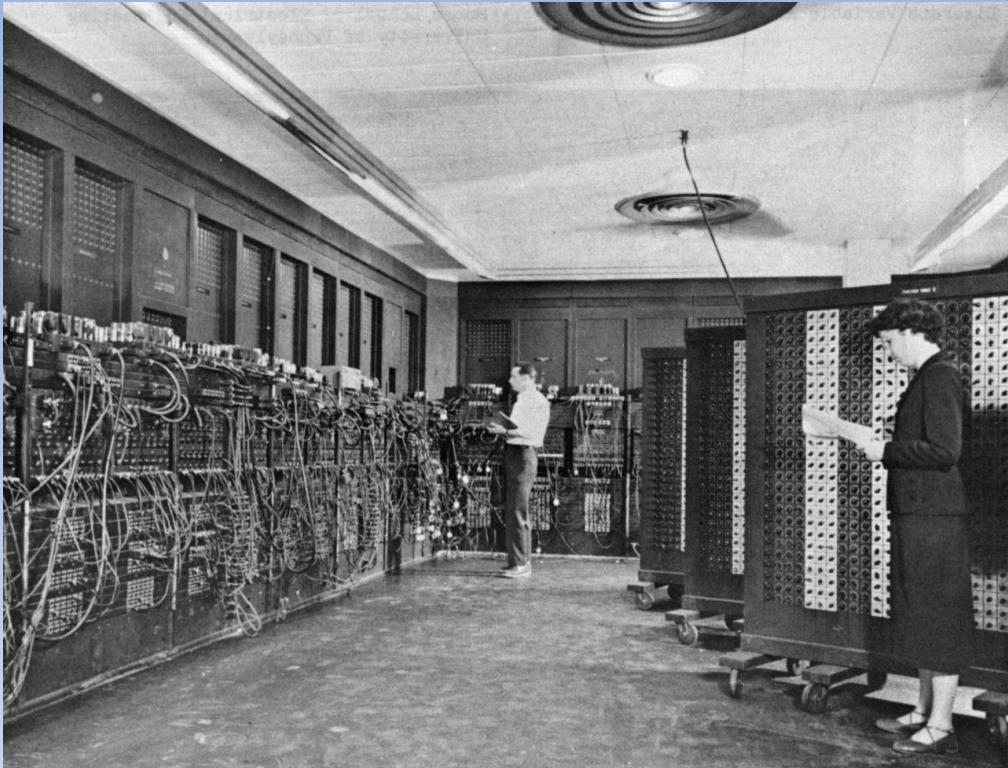


Heath Robinson

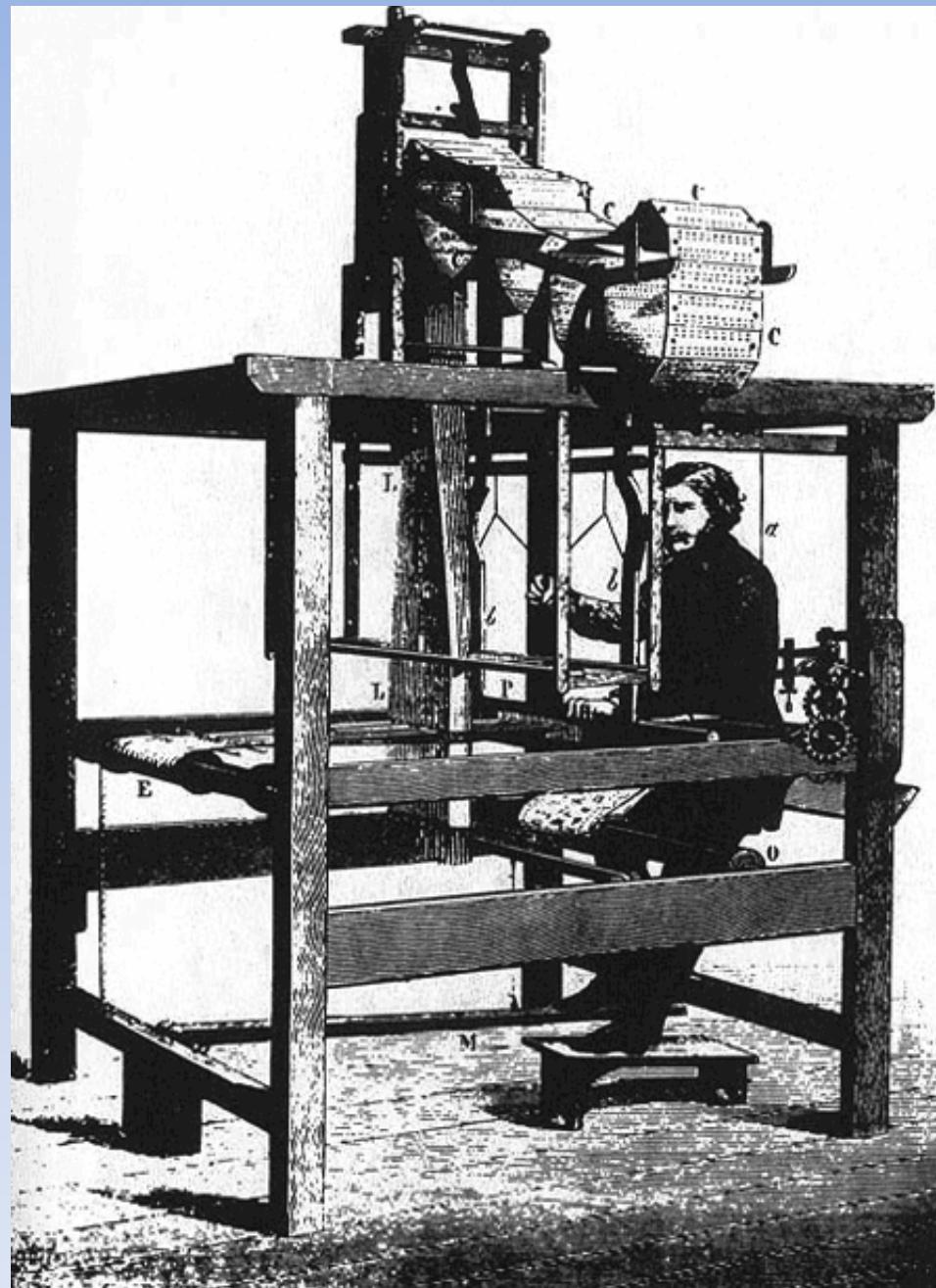
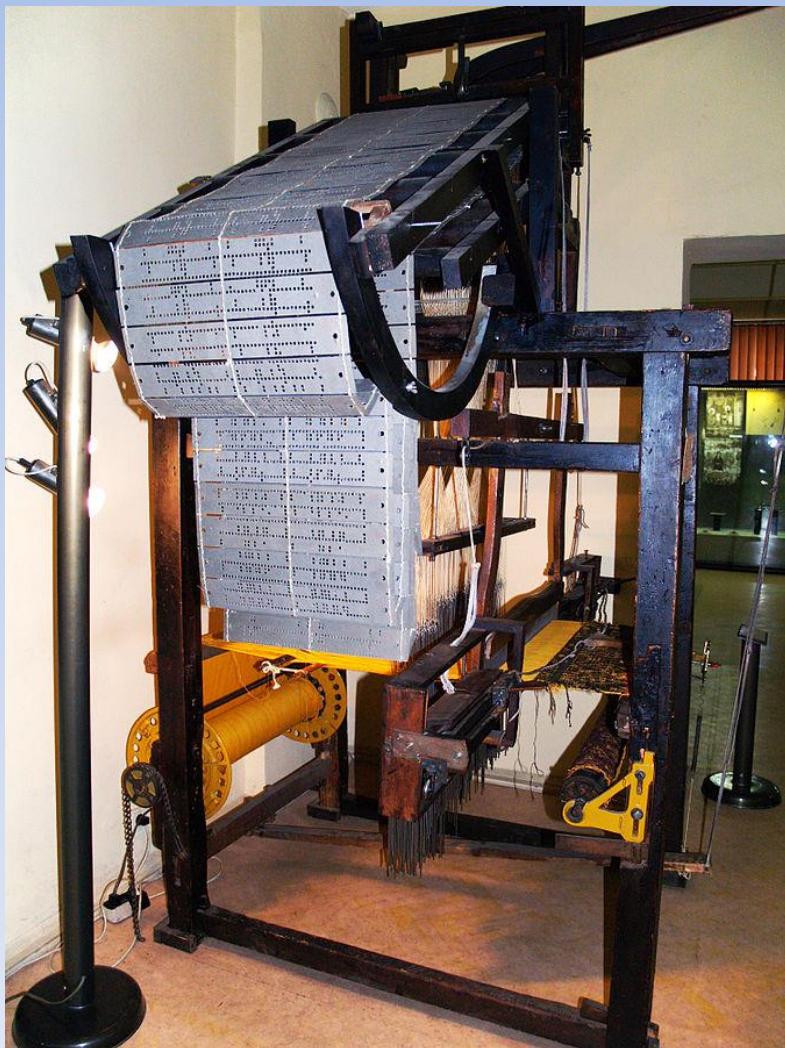
- June 1943



1946 Coding ENIAC



Jacquard Loom (1801)



First Computer Program by Ada Lovelace (1843)

- Diagram of Analytical Engine algorithm for Bernoulli numbers,

- Sketch of The Analytical Engine Invented by Charles Babbage*
by Luigi Menabrea

Number of Operation.	Nature of Operation.	Variables acted upon.	Variables receiving results.	Indication of change in the value on any Variable.	Statement of Results.	Data			
						w_1	w_2	w_3	w_4
1	\times	$IV_2 \times IV_4$	IV_4, IV_6, IV_8	$\{IV_4 = IV_2\}$ $\{IV_6 = IV_4\}$ $\{IV_8 = IV_6\}$	$= 2n$	2	n	2n	
2	-	$IV_4 - IV_1$	IV_4	$\{IV_4 = IV_1\}$	$= 2n - 1$	1	0	0	$2n - 1$
3	+	$IV_2 + IV_1$	IV_2	$\{IV_2 = IV_1\}$	$= 2n + 1$	1	0	0	
4	+	$IV_4 + IV_4$	IV_1	$\{IV_4 = IV_1\}$ $\{IV_1 = IV_4\}$	$= 2n + 1$	0	0	0	
5	-	$IV_{12} - IV_2$	IV_{12}	$\{IV_{12} = IV_2\}$ $\{IV_2 = IV_{12}\}$	$= 2 - 2n - 1$	2	0	0	
6	-	$IV_{12} - IV_{11}$	IV_{12}	$\{IV_{12} = IV_{11}\}$ $\{IV_{11} = IV_{12}\}$	$= -2 - 2n + 1 = A_0$	0	0	0	
7	-	$IV_2 - IV_1$	IV_{10}	$\{IV_2 = IV_1\}$ $\{IV_1 = IV_2\}$	$= n - 1 (= 3)$	1	0	n	
8	+	$IV_2 + IV_2$	IV_7	$\{IV_2 = IV_7\}$ $\{IV_7 = IV_2\}$	$= 2 + 0 = 2$	2	0	0	
9	-	$IV_6 - IV_2$	IV_1	$\{IV_6 = IV_2\}$ $\{IV_2 = IV_1\}$	$= 2 = A_1$	0	0	0	
10	\times	$IV_{21} \times IV_{12}$	IV_{12}	$\{IV_{21} = IV_{12}\}$ $\{IV_{12} = IV_{21}\}$	$= B_1 \cdot \frac{2n}{2} = B_1 A_1$	0	0	0	
11	+	$IV_{12} + IV_{13}$	IV_8	$\{IV_{12} = IV_{13}\}$ $\{IV_{13} = IV_{12}\}$	$= -\frac{1}{2} \cdot 2n - 1 + B_1 \cdot \frac{2n}{2}$	0	0	0	
12	-	$IV_{10} - IV_1$	IV_{10}	$\{IV_{10} = IV_1\}$	$= n - 2 (= 2)$	1	0	0	
13	-	$IV_6 - IV_1$	IV_6	$\{IV_6 = IV_1\}$	$= 2n - 1$	1	0	0	$2n - 1$
14	+	$IV_1 + IV_2$	IV_5	$\{IV_1 = IV_2\}$	$= 2 + 1 = 3$	1	0	0	
15	-	$IV_6 + IV_7$	IV_8	$\{IV_6 = IV_7\}$ $\{IV_7 = IV_6\}$	$= 2n - 1$	0	0	0	$2n - 1$
16	\times	$IV_6 \times IV_1$	IV_1	$\{IV_6 = IV_1\}$ $\{IV_1 = IV_6\}$	$= \frac{2n}{2} \cdot \frac{2n - 1}{3}$	0	0	0	$\frac{2n(2n-1)}{2 \cdot 3}$
17	-	$IV_6 - IV_6$	IV_6	$\{IV_6 = IV_6\}$	$= 2n - 2$	1	0	0	
18.	+	$IV_1 + IV_2$	IV_2	$\{IV_1 = IV_2\}$	$= 3 + 1 = 4$	1	0	0	4
19.	+	$IV_6 + IV_7$	IV_9	$\{IV_6 = IV_7\}$ $\{IV_7 = IV_6\}$	$= 2n - 2$	0	0	0	$2n - 2$
20.	\times	$IV_6 \times IV_1$	IV_1	$\{IV_6 = IV_1\}$ $\{IV_1 = IV_6\}$	$= \frac{2n}{2} \cdot \frac{2n - 1}{3} \cdot 2n - 2 = A_3$	0	0	0	$\frac{2n(2n-1)(2n-2)}{2 \cdot 3}$
21	\times	$IV_{12} \times IV_{11}$	IV_{11}	$\{IV_{12} = IV_{11}\}$ $\{IV_{11} = IV_{12}\}$	$= B_2 \cdot \frac{2n}{2} \cdot \frac{2n - 1}{3} \cdot \frac{2n - 2}{3} = B_2 A_2$	0	0	0	$B_2 A_2$
22	+	$IV_{12} + IV_{10}$	IV_{12}	$\{IV_{12} = IV_{10}\}$ $\{IV_{10} = IV_{12}\}$	$= A_2 + B_1 A_1 + B_2 A_2$	0	0	0	$A_2 + B_1 A_1 + B_2 A_2$
23	-	$IV_{10} - IV_1$	IV_{10}	$\{IV_{10} = IV_1\}$	$= n - 3 (= 1)$	1	0	0	$n - 3$
Here follows a repetition of Operations thirteen to twenty-three.									
24	$+$	$IV_{13} + IV_{20}$	IV_{24}	$\{IV_{13} = IV_{20}\}$ $\{IV_{20} = IV_{13}\}$	$= B_7$	0	0	0	
25	$+$	$IV_1 + IV_2$	IV_5	$\{IV_1 = IV_2\}$ $\{IV_2 = IV_1\}$	$= n + 1 = 4 + 1 = 5$	1	0	0	
by a Variable-card.									
by a Variable-card.									
B7									



Why Code?

- Computational Thinking...

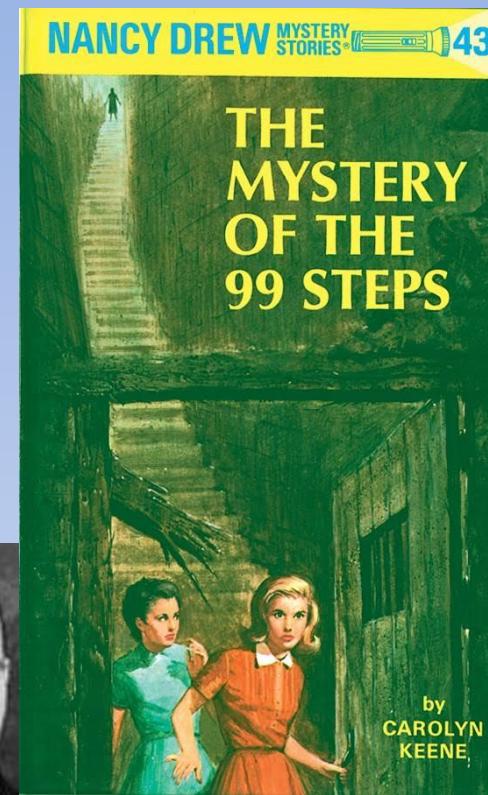
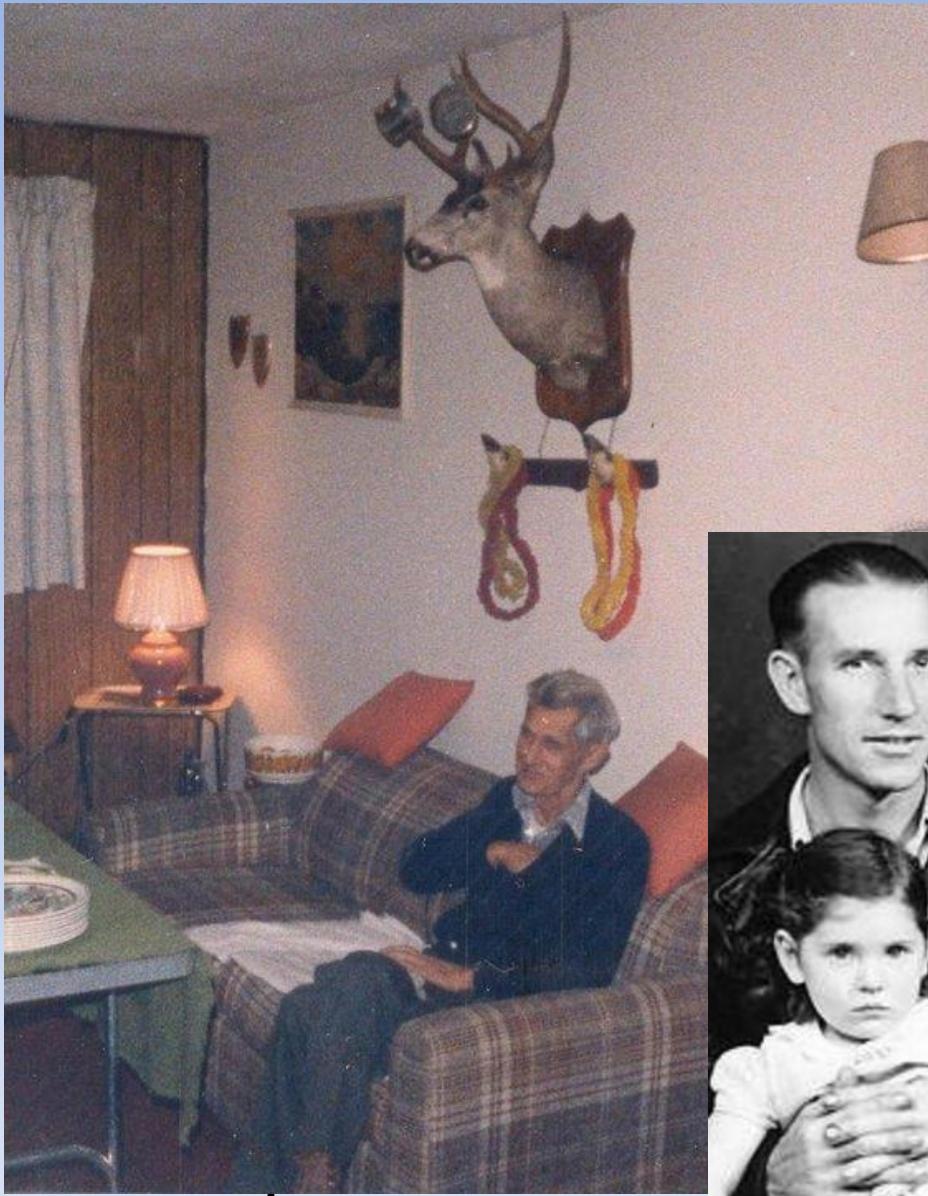
Structured thinking compatible with computer implementations through:

- Abstraction: Alternate representations w/ information hiding.
- Automation: Utilizing constructs compatible w/ machine execution.
- Analysis: Solution execution and evaluation.

Why Code?

- Code is Everywhere!
 - It powers our world!
 - It drives our future!

Interest In Puzzles



- Family
Memories

Memories.. eXciting Puzzles !

- Home Hedges Maze Crawwwwwl !
- Also – First time w/ Sliding Tile Puzzle



PhD Thesis:

Tile-Sliding Puzzle

Start State

1	2	3
4		6
7	5	8



1	2	3
4	5	6
7		8



1	2	3
4	5	6
7	8	

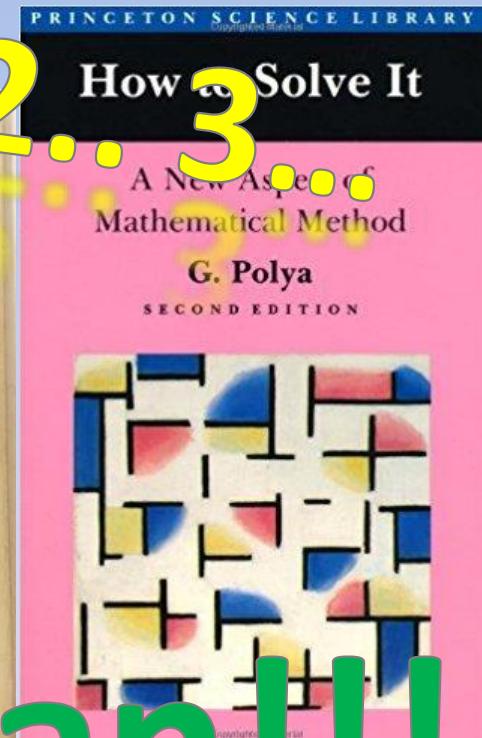
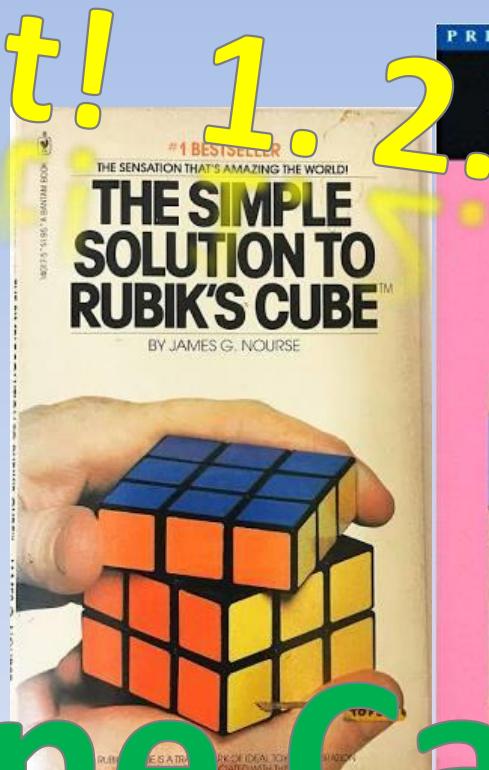
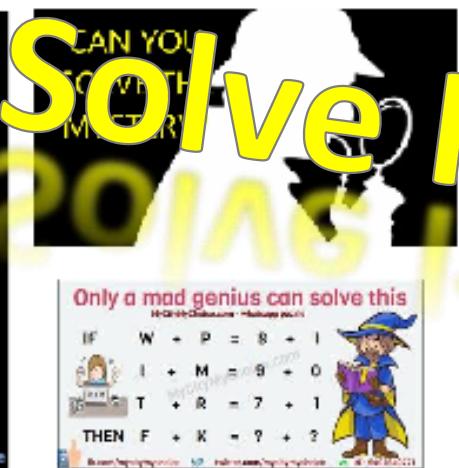
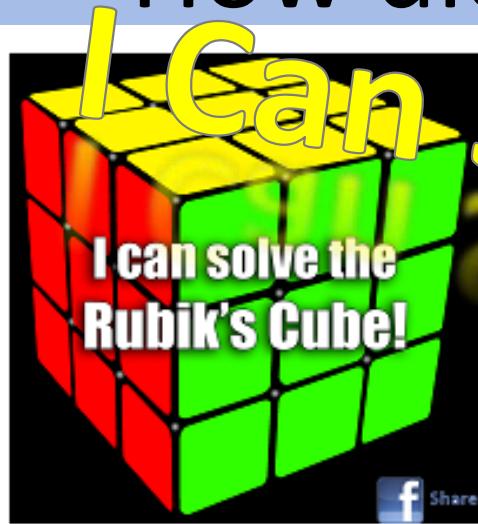
Goal State



Learning to Code: How did you do it???



How did you do it??? Read Books.



2 5 2 8 ? 7
Only genius can solve this?
8 5 9 3 5 7

And Anyone can!!!

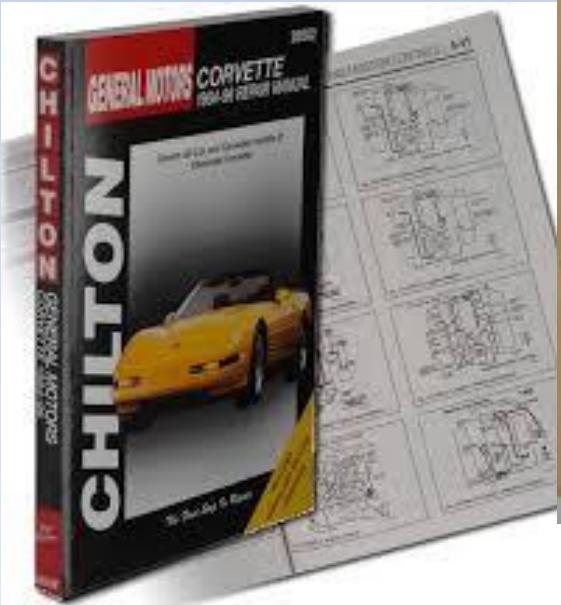
I C(K)an Easily Assemble

- Sometimes Confusing!
- Where's the part?
- Doesn't Match Picture!
- Not Shown in Picture!



Repair Manuals

- Sometimes Confusing!
- Where's the part?
- Doesn't Match Picture!
- Not Shown in Picture!



I Can Code

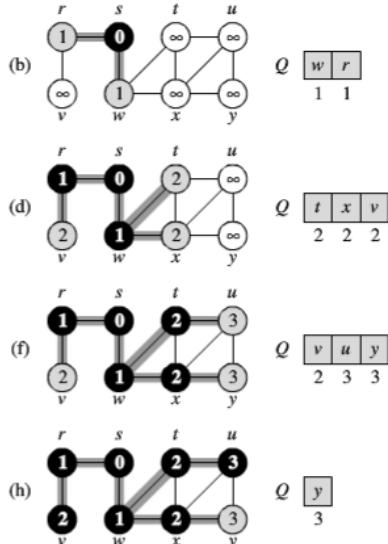
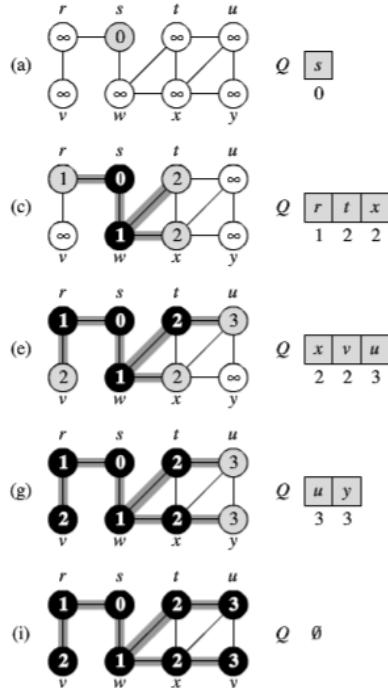
- Sometimes Confusing!
- What Components?
- Doesn't Match Required Output!
- Errors Not Shown In Instructions!

```
1 #include <iostream>
2 using namespace std;
3
4 int main() {
5     int x, y, z;
6
7     cin >> x;    // Read user-entered value into x
8     cin >> y;    // Read user-entered value into y
9
10    z = x+y;   // Calculate x + y and store into z
11    cout << "x + y = " << z << endl;
12
13    return 0;
14 }
15
```

(LATER) I Can Code w/ Advanced Algorithms & Data Structures

596

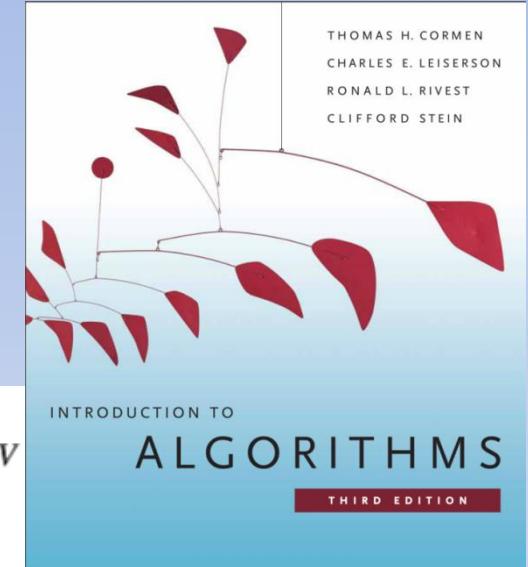
Chapter 22 Elementary Graph Algorithms



BFS(G, s)

```

1  for each vertex  $u \in G.V$ 
2       $u.color = \text{WHITE}$ 
3       $u.d = \infty$ 
4       $u.\pi = \text{NIL}$ 
5   $s.color = \text{GRAY}$ 
6   $s.d = 0$ 
7   $s.\pi = \text{NIL}$ 
8   $Q = \emptyset$ 
9  ENQUEUE( $Q, s$ )
10 while  $Q \neq \emptyset$ 
11      $u = \text{DEQUEUE}(Q)$ 
12     for each  $v \in G.Adj[u]$ 
13         if  $v.color == \text{WHITE}$ 
14              $v.color = \text{GRAY}$ 
15              $v.d = u.d + 1$ 
16              $v.\pi = u$ 
17             ENQUEUE( $Q, v$ )
18          $u.color = \text{BLACK}$ 
```



Why Code?

- The characteristics that define computational thinking are:
 - Decomposition
 - Pattern Recognition / Data Representation
 - Generalization/Abstraction
 - Algorithms

An Algorithm

- How to Bake A Cookie:

Figure 1.1.1: A program is like a recipe.



Bake chocolate chip cookies:

- Mix 1 stick of butter and 1 cup of sugar.
- Add egg and mix until combined.
- Stir in flour and chocolate.
- Bake at 350F for 8 minutes.

Algorithms & Data

Run program

```
m = 5
```

```
m = 3  
print m
```

```
m = m *  
2  
print m
```

```
m = m +  
10  
print m
```

```
m = m *  
m  
print m
```

m: 256

```
3  
6  
16  
256
```

C++ Program: A Text File (.cpp)

```
/* Basic Output */

#include <iostream>      // Input/Ouput Header File
using namespace std;    // Simplifies Naming

// Main Routine
int main() {
    cout << "Keep calm";
    cout << "and";
    cout << "carry on";

    return 0;    // ends main & program.
}
```

C++ Program w/ Data: A Text File (.cpp)

```
#include <iostream>
using namespace std;

int main() {
    int wage = 20;

    cout << "Salary is ";
    cout << wage * 40 * 50;
    cout << endl;

    return 0;
}
```

C++ Program w/ Data

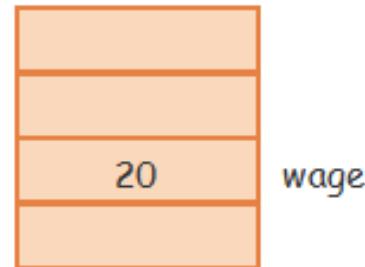
- 1 2 3 4 5 ►

```
#include <iostream>
using namespace std;

int main() {
    int wage = 20;

    cout << "Salary is ";
    cout << wage * 40 * 50;
    cout << endl;

    return 0;
}
```



Program begins at main(). 'int wage = 20' stores 20 in location wage.

C++ Program w/ Data

Memory!

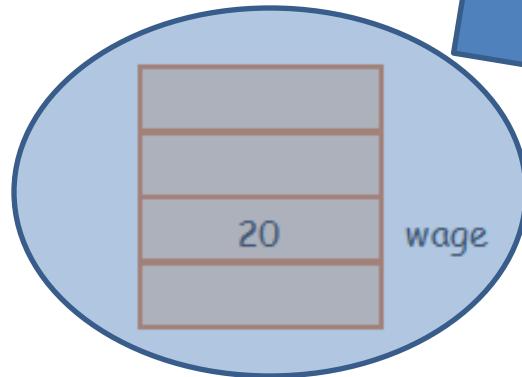
- 1 2 3 4 5 ►

```
#include <iostream>
using namespace std;

int main() {
    int wage = 20;

    cout << "Salary is ";
    cout << wage * 40 * 50;
    cout << endl;

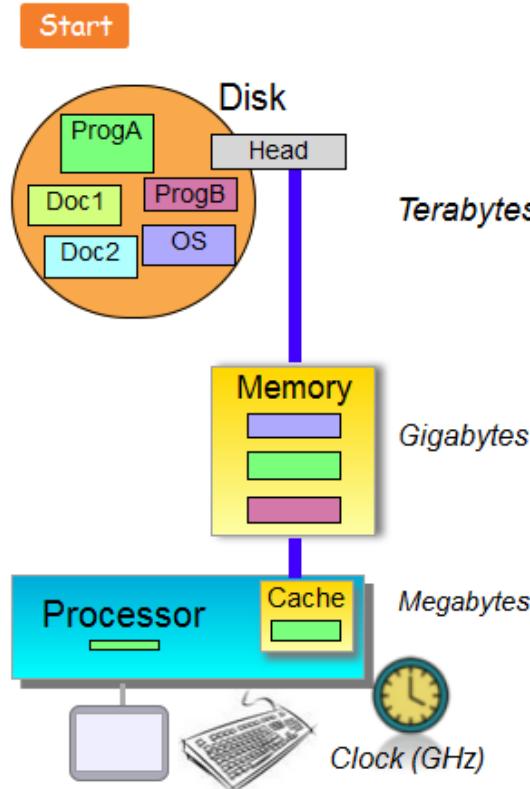
    return 0;
}
```



Program begins at main(). 'int wage = 20' stores 20 in location wage.

Computer Components

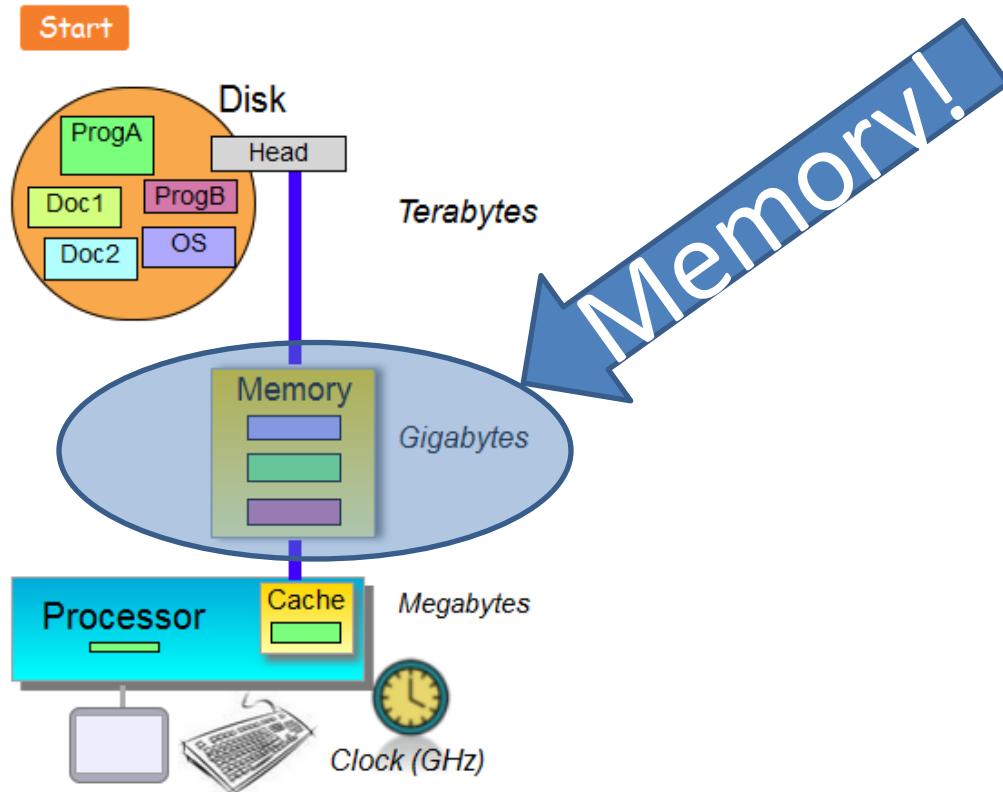
Participation activity 1.9.1: Some computer components.



Feedback?

Computer Components

Participation activity 1.9.1: Some computer components.



Feedback?

Coding in Class w/ zyLabs

12.1 Chapter 1 - zyLabs

 Edit lab  Note

Simple example for running code in zyLabs.

LAB
ACTIVITY

12.1.1: Chapter 1 - zyLabs

0 / 2

main.cpp

[Load default template...](#)

```
1 #include <iostream>
2 using namespace std;
3
4 int main(){
5     cout << "Welcome to 40!" << endl;
6     return 0;
7 }
```

Programming 1: Hello World!

Hello, World!

In this first program you will write a simple program in C++ that outputs the string "Hello, World! I can code!!"

Good Luck!



LAB ACTIVITY | 13.1.1: Programming 1: Hello, World! 0 / 2

helloworld.cpp

1 |

- Get used to writing code
 - Compiling Code
 - Running Code
- Submit the code to the textbook for grading.
 - Textbook will also compile your code
 - Textbook will run your code, and compare w/ desired output!

First Day Quiz

- password: day1