

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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Instructors

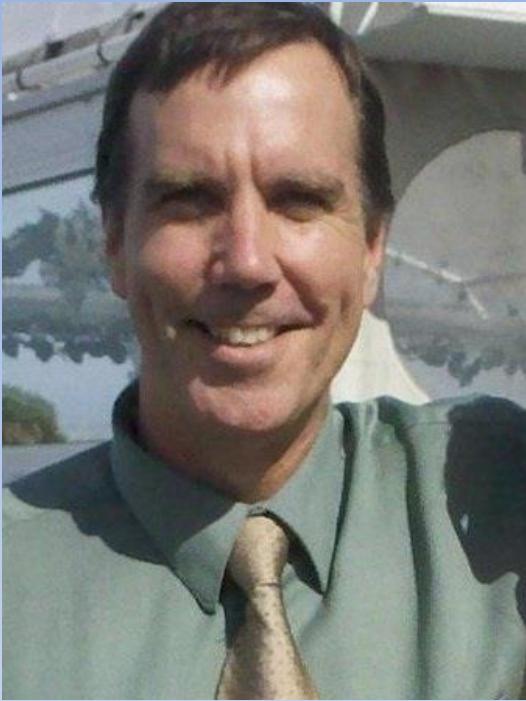
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Students

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 contains a green 'L' icon labeled 'Lab Submission' and the title '1.13.1: Programming 1: Hello, World!'. It also shows the file name 'helloworld.cpp' and a small number '1'.

Development Section: This section includes a 'Develop and submit' button with 'Develop' and 'Submit' tabs. Below it is a 'RUN PROGRAM' button. An input field is labeled 'Enter program input (optional)' with the placeholder 'My Input to Program Goes here...'. The output field is labeled 'Program output displayed here' with the placeholder 'My Output Appears here.....'.

Diagram Labels: Arrows point from the 'Develop' tab to the 'helloworld.cpp (Your program)' box, and from the 'helloworld.cpp (Your program)' box down to the 'My Output Appears here.....' field.

Integrated Development Environments

The image displays two side-by-side screenshots of Integrated Development Environments (IDEs) running on a Mac OS X system.

Xcode Screenshot: This screenshot shows the Xcode interface. On the left, the file browser lists files like AppDelegate.swift, TrailTableViewController.swift, and TrailDetailsViewController.swift. In the center, a storyboard preview shows a landscape scene with a green field and trees. On the right, a large portion of the screen is filled with Swift code for the TrailDetailsViewController.swift file. The code includes imports for UIKit and MapKit, defines a TrailDetailsViewController class, and implements methods for setting up the view and handling user interactions.

```
import UIKit
import MapKit

class TrailDetailsViewController: UIViewController, UITableViewDelegate, UITableViewDataSource {
    @IBOutlet weak var leftTitleView: UIView!
    @IBOutlet weak var centerTitleView: UIView!
    @IBOutlet weak var rightTitleView: UIView!
    @IBOutlet weak var descriptionTextview: UITextView!
    @IBOutlet weak var navigationBarTitleLabel: UILabel!
    @IBOutlet weak var navigationBarSubtitleLabel: UILabel!

    @IBOutlet weak var tableHeaderGreenLineView: UIView!
    @IBOutlet weak var rightBottomContainerView: UIView!
    @IBOutlet weak var mapContainerView: UIView!

    var users: [User] = []
    var displayedReviews: [UserReview] = []
    var trail: Trail?

    func setupWithTrail(trail: Trail) {
        self.trail = trail
        navigationBarTitleLabel.text = trail.name
        navigationBarSubtitleLabel.text = trail.location
        centerImageview.image = UIImage(named: trail.imageName)
    }

    override func viewDidLoad() {
        super.viewDidLoad()
        loadInitialData()
    }

    centerTitleView.layer.transform = CATransform3DMakeTranslation(0.0, leftTitleView.layer.transform = CATransform3DMakeRotation(-0.4, 0.0, 1.0, 0.0)
    rightTitleView.layer.transform = CATransform3DMakeRotation(0.4, 0.0, 1.0, 0.0)

    let supervisor = tableHeaderGreenLineView.superview!
    tableHeaderGreenLineView.translatesAutoresizingMaskIntoConstraints = false
    tableHeaderGreenLineView.leadingAnchor.constraint(equalTo: supervisor.leadingAnchor, constant: 0).isActive = true
    tableHeaderGreenLineView.trailingAnchor.constraint(equalTo: supervisor.trailingAnchor, constant: 0).isActive = true
    tableHeaderGreenLineView.bottomAnchor.constraint(equalTo: supervisor.bottomAnchor, constant: 0).isActive = true
    tableHeaderGreenLineView.heightAnchor.constraint(equalToConstant:
```

Visual Studio Screenshot: This screenshot shows the Microsoft Visual Studio IDE. At the top, there's a navigation bar with links for Microsoft, Technologies, Documentation, Resources, Visual Studio IDE, Features, Offerings, Downloads, Support, and Subscriber Access. Below the navigation bar is a search bar and a "Free Visual Studio" button. The main area features a large banner with the text "Visual Studio IDE" and "Fully-featured integrated development environment (IDE)". To the right of the banner, a photograph shows a person's hands typing on a laptop keyboard. The laptop screen displays a mobile application interface with a map and some data.

ZyBooks Textbook

zyBooks

- 1.10 Problem solving
 - 1.11 C++ example: Salary Calculation
 - 1.12 C++ example: Married-couple names
 - 1.13 Programming 1: Hello, World!**
 - 1.14 Coding Quiz 1
 - 1.15 Chapter 1: In-Class Day 2
 - 1.16 Lab1 -- Ascii Art
2. Variables / Assignments

☰ 1.13 Programming 1: Hello, World!

L

Lab Submission

1.13.1: Programming 1: Hello, World!

helloworld.cpp

zyBooks

☰ 1.13 Programming 1: Hello, World! ..

- 1.10 Problem solving
- 1.11 C++ example: Salary Calculation
- 1.12 C++ example: Married-couple names
- 1.13 Programming 1: Hello, World!**
- 1.14 Coding Quiz 1
- 1.15 Chapter 1: In-Class Day 2
- 1.16 Lab1 -- Ascii Art

2. Variables / Assignments

3. Branches

4. Loops

5. Arrays / Vectors

6. User-Defined Functions

Develop and submit ^

Develop

Submit

RUN PROGRAM

Enter program input (optional)

My Input to Program Goes here...

In "Develop" mode, you can run your program as often as you'd like, before submitting for grading. Type input values (if desired) in the first box below, then click "Run program" and observe the program's output in the second box.



helloworld.cpp (Your program)

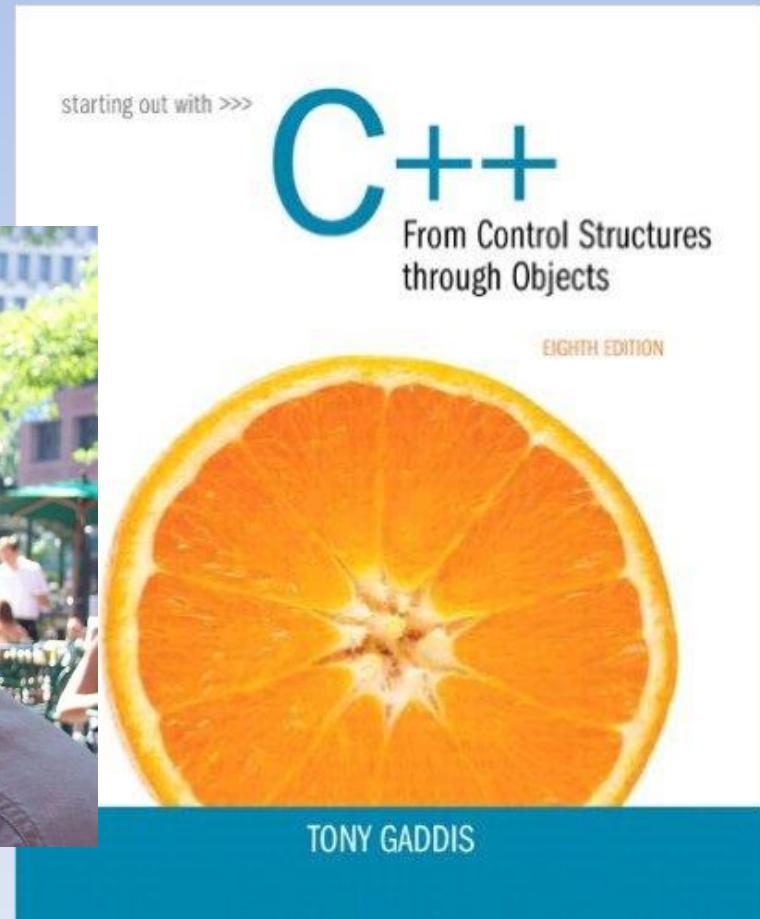
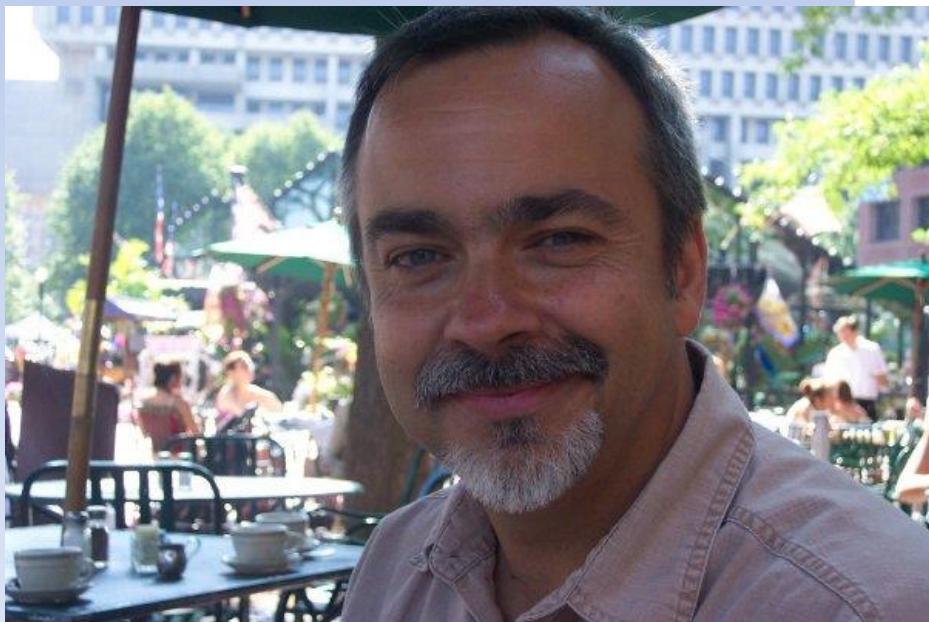


Program output displayed here

My output Appears here.....

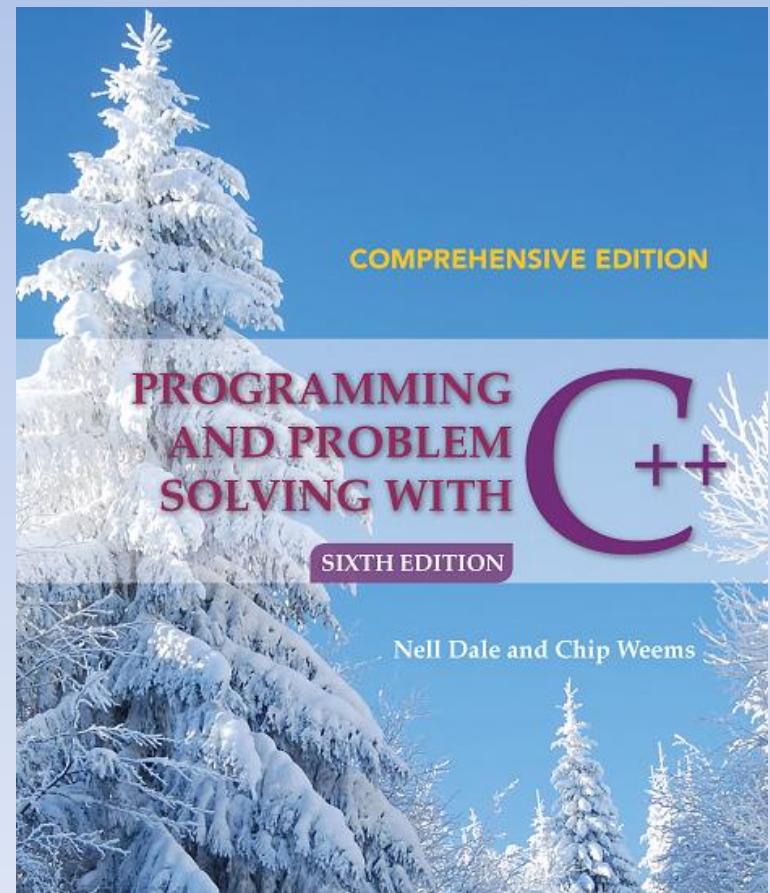
Auxiliary Text - 1

- 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

https://classroom.google.com/h

Search

druby@mail.fresnostate.edu

Google Classroom

≡

SEGMENTS-INTERSECT(p_1, p_2, p_3, p_4)

c174f16 - Advanced Algor... :

Fall 2016

$d_2 = \text{DIRECTION}(p_3, p_4, p_2)$

$d_3 = \text{DIRECTION}(p_1, p_2, p_3)$

$d_4 = \text{DIRECTION}(p_1, p_2, p_4)$

0 students

$(d_2 < 0 \text{ and } d_3 < 0) \text{ or } (d_1 < 0 \text{ and } d_2 > 0) \text{ and }$

$(d_3 > 0 \text{ and } d_4 < 0) \text{ or } (d_3 < 0 \text{ and } d_4 > 0)$

c040f16 - CSci 40 :

Fall 2016

```
38 int NewMove(int board, int dir){  
39     if ((dir == -1 || dir == -3) && row > 0){  
40         if ((dir == -1 || dir == -3) && col > 0){  
41             if ((dir == 2 || dir == -4) && col < MAXDIM-1){  
42                 Swap(board, row, col, row-1, col);  
43             }  
44             else if ((dir == 3 || dir == -1) && row < MAXDIM-1){  
45                 Swap(board, row, col, row, col+1);  
46             }  
47         }  
48     }  
49 }
```

c191f16 - Machine Learni... :

Fall 2016

0 students

Summer Study :

2 students

```
38 int NewMove(int board, int dir){  
39     if ((dir == -1 || dir == -3) && row > 0){  
40         if ((dir == -1 || dir == -3) && col > 0){  
41             if ((dir == 2 || dir == -4) && col < MAXDIM-1){  
42                 Swap(board, row, col, row-1, col);  
43             }  
44             else if ((dir == 3 || dir == -1) && row < MAXDIM-1){  
45                 Swap(board, row, col, row, col+1);  
46             }  
47         }  
48     }  
49 }
```

ME 162 - Computer Aided... :

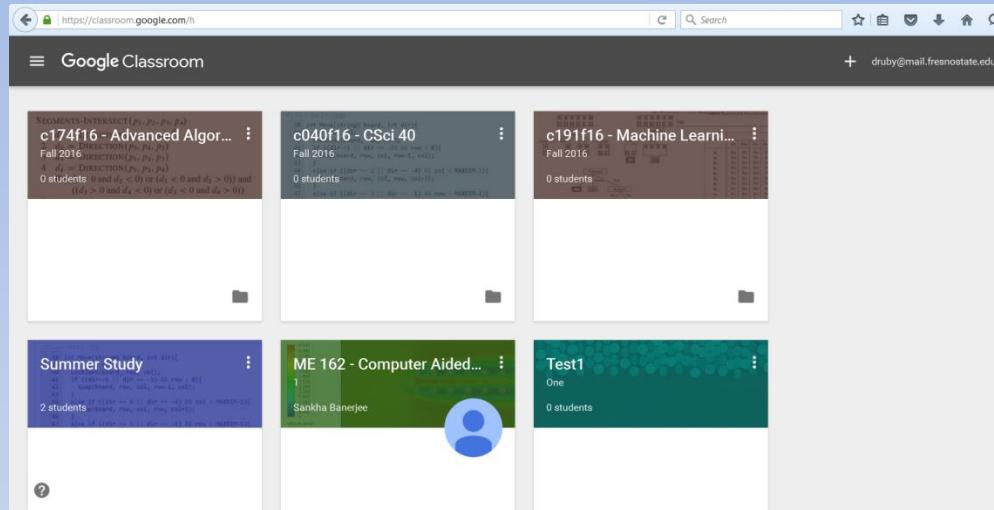
Sankha Banerjee

Test1

One

0 students

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

Dr. Joy Goto, Professor Biochemistry, Fresno State

- https://youtu.be/FXUiEPrK_II



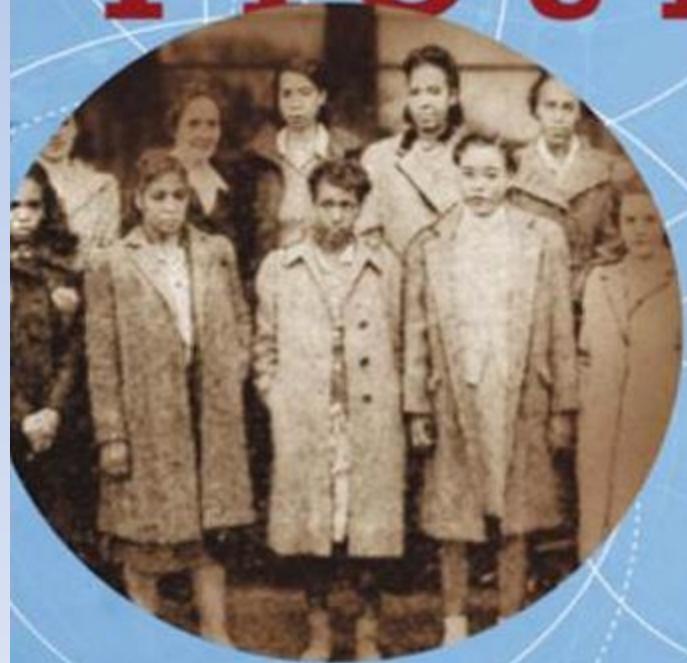
Dr. Joy Goto, Professor Biochemistry, Fresno State



- https://youtu.be/FXUiEPrK_II
- Engaging story of discovering joy in science growing up here in the central valley.

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

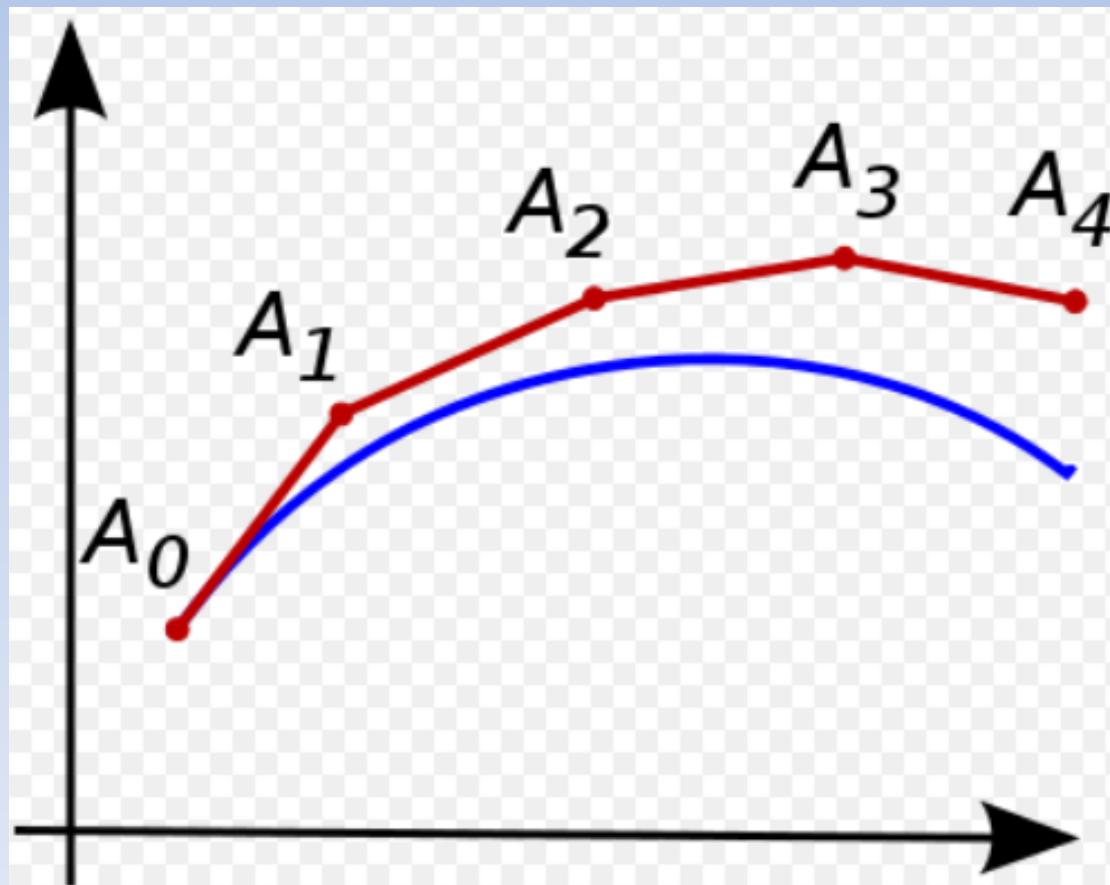
Current Computing Importance



Alternative Approaches

Euler's Method

- Approximation algorithms



Bombe (Hut 1: 18 March 1940)

Decoding Enigma

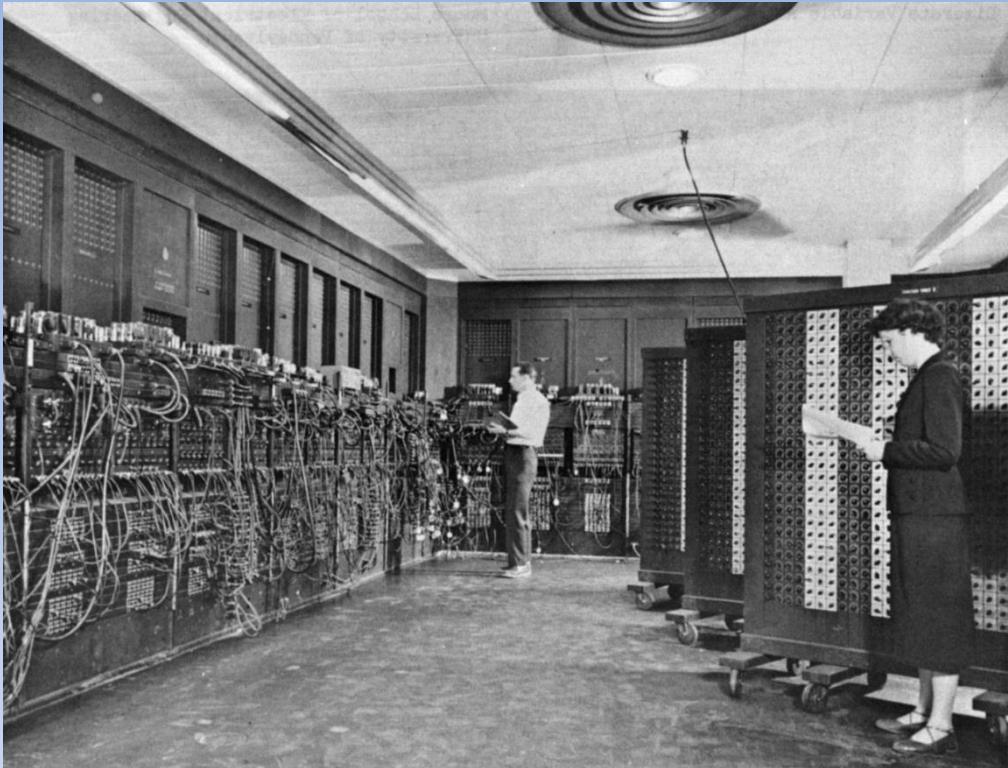


Heath Robinson

- June 1943



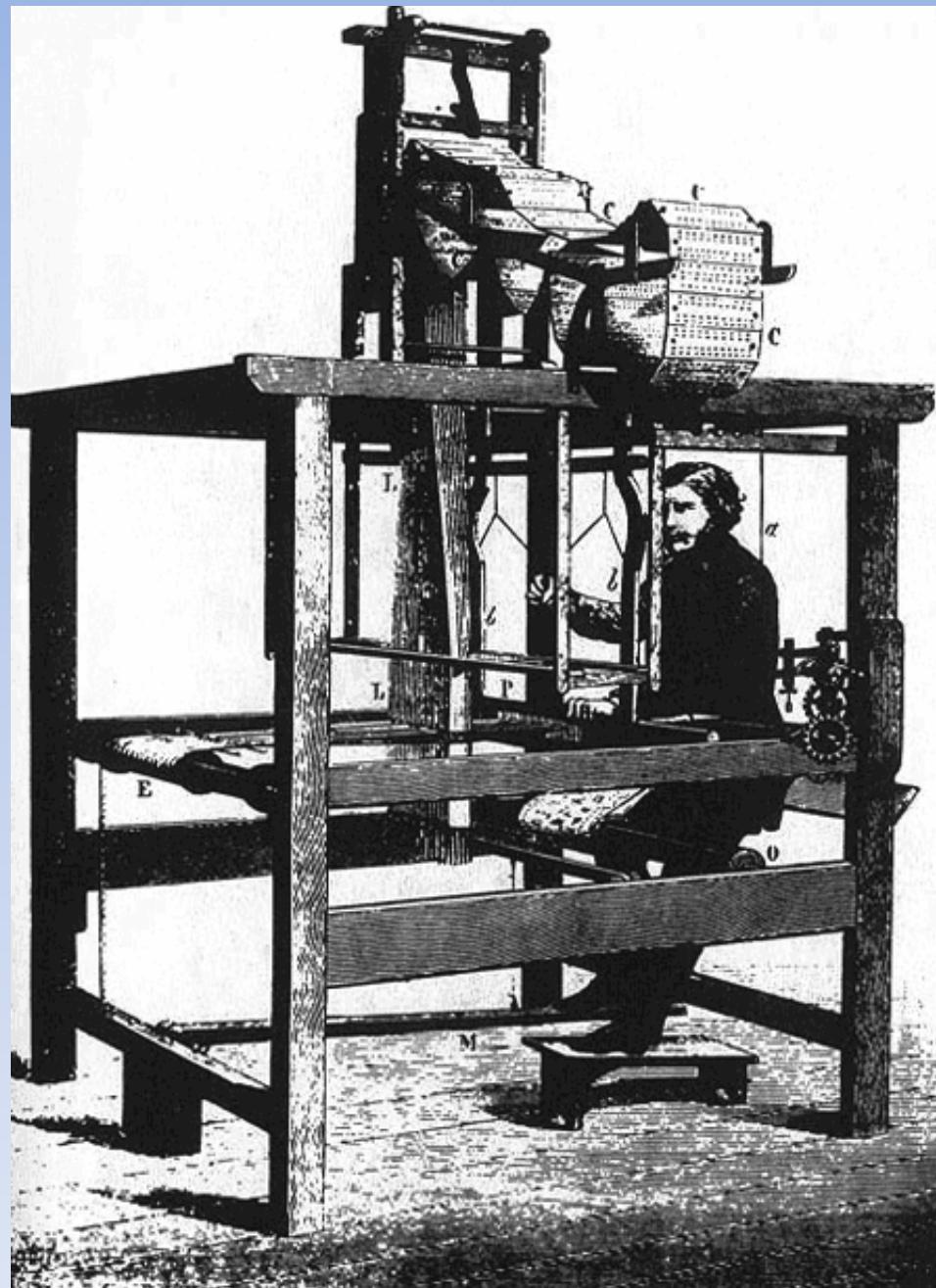
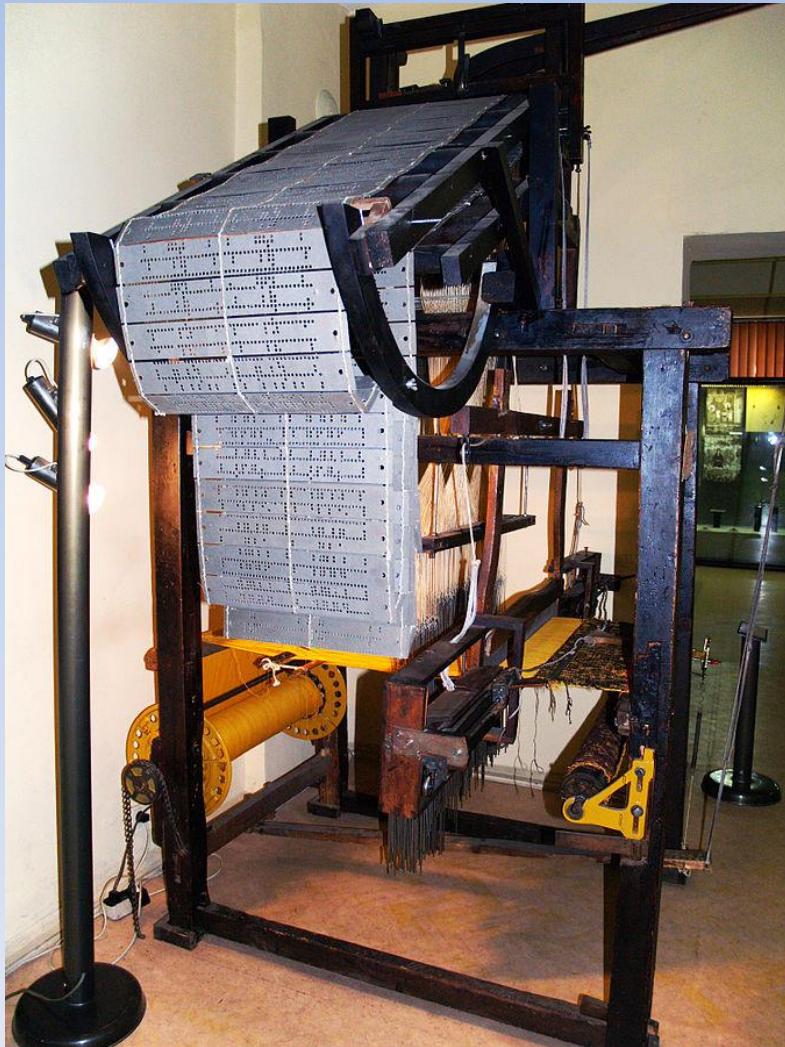
1946 Coding ENIAC



ENIAC



Jacquard Loom (1801)

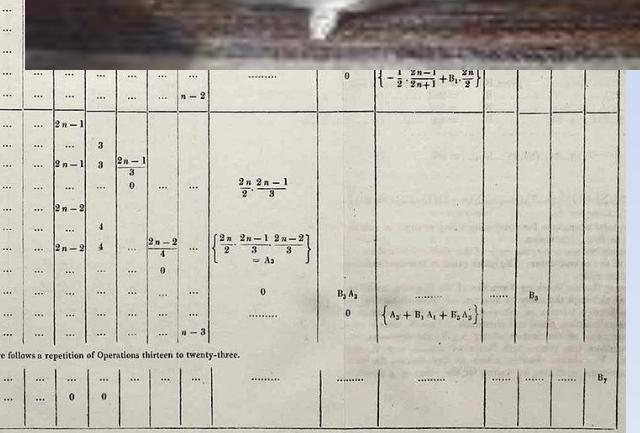


First Computer Program by Ada Lovelace (1843)

- 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			
						v_1	v_2	v_3	v_4
1	\times	$v_2 \times v_4$	v_{14}, v_{16}, v_{18}	$\{v_{14} = v_{16}\}$ $\{v_{16} = v_{18}\}$	$= 2n$	2	n	$2n$	
2	$-$	$v_4 - v_1$	v_4	$\{v_4 = v_1\}$	$= 2n - 1$	1			$2n - 1$
3	$+$	$v_5 + v_1$	v_5	$\{v_5 = v_1\}$	$= 2n + 1$	1			
4	$+$	$v_5 + v_4$	v_{11}	$\{v_5 = v_4\}$ $\{v_{11} = v_5\}$	$= 2n + 1$				0
5	$-$	$v_{11} - v_2$	v_{11}	$\{v_{11} = v_2\}$ $\{v_{11} = v_2\}$	$= 2 - 2n - 1$	2			
6	$-$	$v_{13} - v_{11}$	v_2	$\{v_{13} = v_{11}\}$ $\{v_2 = v_{13}\}$	$= -2 - 2n + 1 = A_0$				
7	$-$	$v_2 - v_1$	v_{10}	$\{v_{10} = v_2\}$ $\{v_1 = v_{10}\}$	$= n - 1 (= 3)$	1		n	
8	$+$	$v_2 + v_5$	v_7	$\{v_7 = v_2\}$ $\{v_7 = v_5\}$	$= 2 + 0 = 2$		2		
9	$-$	$v_6 - v_1$	v_1	$\{v_6 = v_1\}$	$= 2$				A_1
10	\times	$v_{21} \times v_{13}$	v_{12}	$\{v_{21} = v_{13}\}$ $\{v_{12} = v_{21}\}$	$= B_1 \cdot \frac{2n}{2} = B_1 A_1$				
11	$+$	$v_{13} + v_1$	v_3	$\{v_{13} = v_1\}$ $\{v_3 = v_{13}\}$	$= -\frac{1}{2} \cdot 2n - 1 + B_1 \cdot \frac{2n}{2}$				
12	$-$	$w_{10} - v_1$	v_{10}	$\{v_{10} = v_1\}$	$= n - 2 (= 2)$	1			
13	$-$	$v_6 - v_1$	v_6	$\{v_6 = v_1\}$	$= 2n - 1$	1			
14	$+$	$v_1 + v_2$	v_2	$\{v_1 = v_2\}$	$= 2 + 1 = 3$	1			
15	$-$	$v_6 + v_7$	v_8	$\{v_6 = v_7\}$ $\{v_8 = v_6\}$	$= 2n - 1$				
16	\times	$v_6 \times v_1$	v_1	$\{v_6 = v_1\}$	$= \frac{2n}{2} \cdot \frac{2n - 1}{3}$				
17	$-$	$v_6 - v_1$	v_6	$\{v_6 = v_1\}$	$= 2n - 2$	1			
18.	$+$	$v_1 + v_2$	v_2	$\{v_1 = v_2\}$	$= 3 + 1 = 4$	1			
19	$+$	$v_6 + v_7$	v_9	$\{v_6 = v_7\}$ $\{v_9 = v_6\}$	$= 2n - 2$				
20	\times	$v_6 \times v_1$	v_1	$\{v_6 = v_1\}$	$= \frac{2n}{2} \cdot \frac{2n - 1}{3} \cdot 2n - 2 = A_3$				
21	\times	$v_{13} \times v_1$	v_{11}	$\{v_{13} = v_1\}$ $\{v_{11} = v_{13}\}$	$= B_3 \cdot \frac{2n}{2} \cdot \frac{2n - 1}{3} \cdot \frac{2n - 2}{3} = B_3 A_3$				
22	$+$	$v_1 + v_2$	v_1	$\{v_1 = v_2\}$	$= A_3 + B_1 A_1 + B_3 A_3$				
23	$-$	$v_{10} - v_1$	v_{10}	$\{v_{10} = v_1\}$	$= n - 3 (= 1)$	1			
24	$+$	$w_{13} + v_2$	v_{24}	$\{v_{24} = v_{13}\}$ $\{v_{24} = v_2\}$	$= B_7$				
25	$+$	$v_1 + v_2$	v_3	$\{v_1 = v_2\}$ $\{v_3 = v_1\}$	$= n + 1 = 4 + 1 = 5$	1		$n + 1$	
				by a Variable-card.				0	
				by a Variable-card.				0	
Here follows a repetition of Operations thirteen to twenty-three.									
26	$+$	$v_{13} + v_2$	v_{24}						
27	$+$	$v_1 + v_2$	v_3						



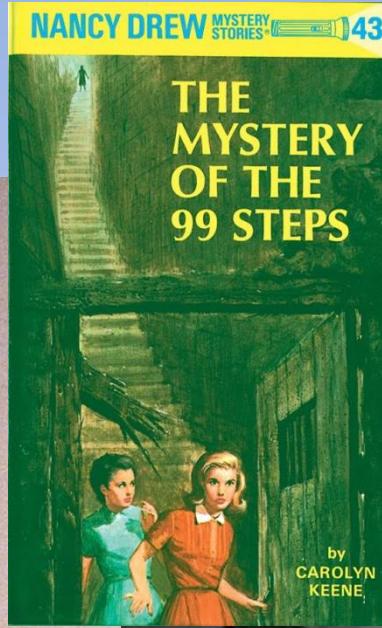
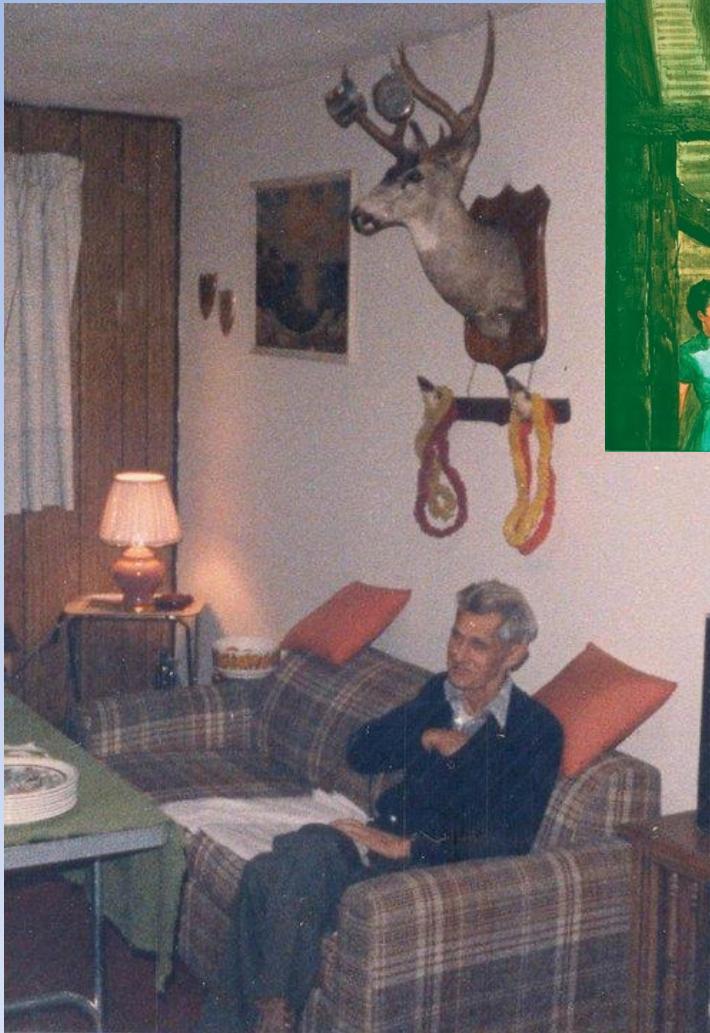
Why Code?

- 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!

My Story



- Family Memories



Interest
In
Puzzles

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	

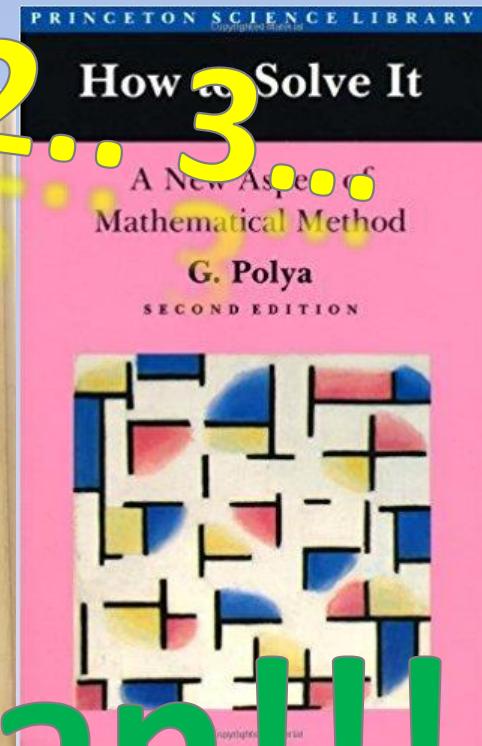
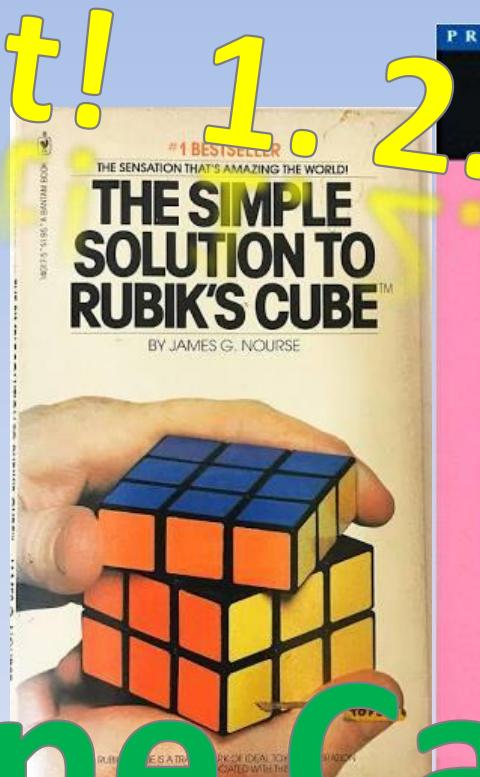
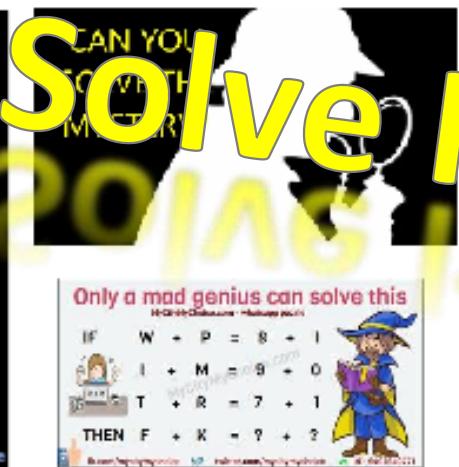
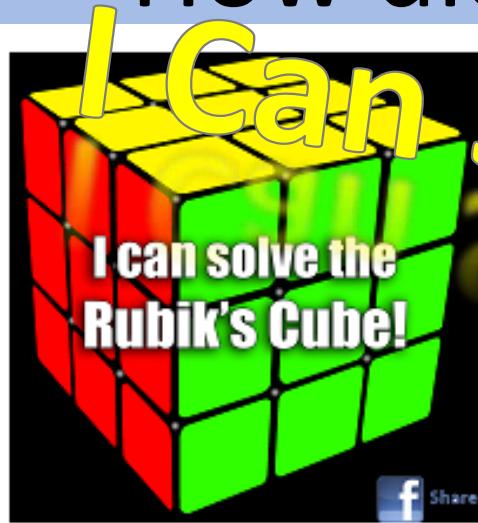
Goal State



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



How did you do it??? Read Books.



And Anyone can!!!

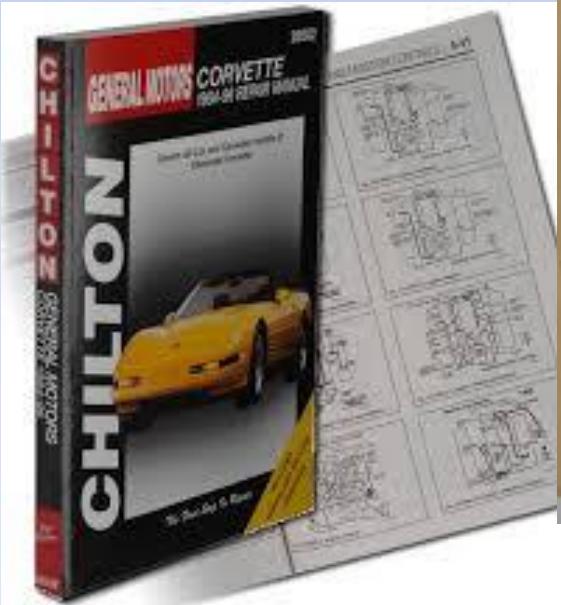
I C(K)an Easily Assemble

- 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

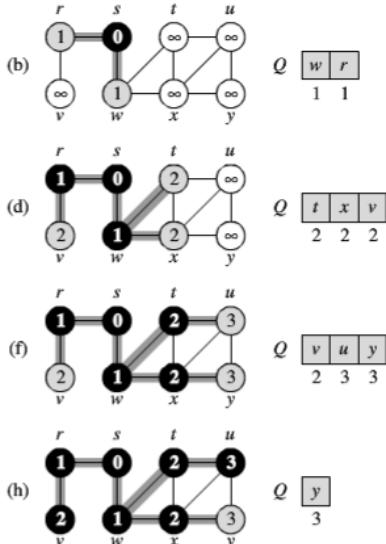
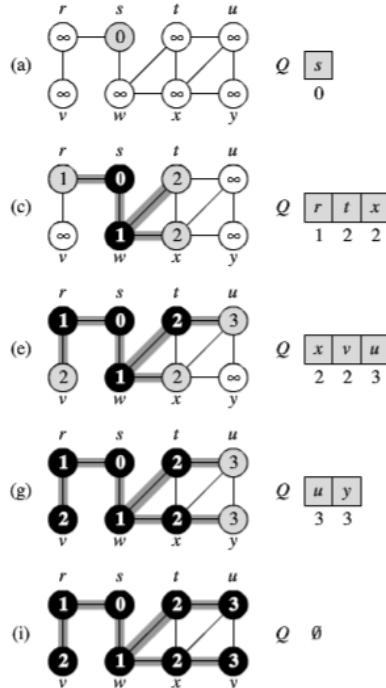
- Sometimes Confusing!
- What Components?
- Doesn't Match Required Output!
- Errors Not Shown In Instructions!

```
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

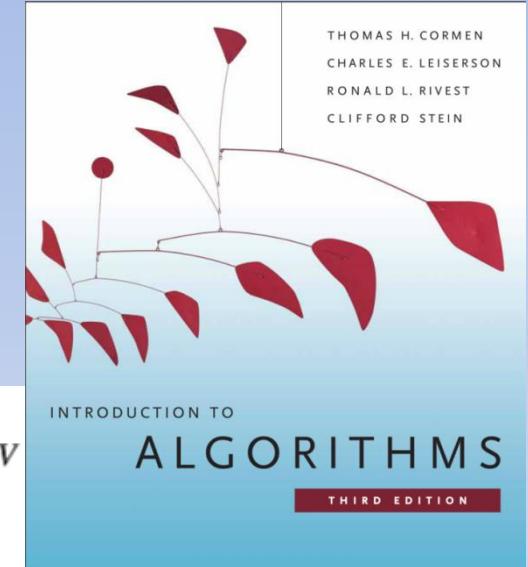
Chapter 22 Elementary Graph Algorithms



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

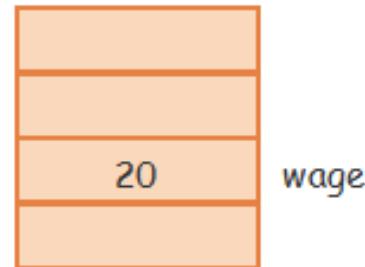
- 1 2 3 4 5 ►

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#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!

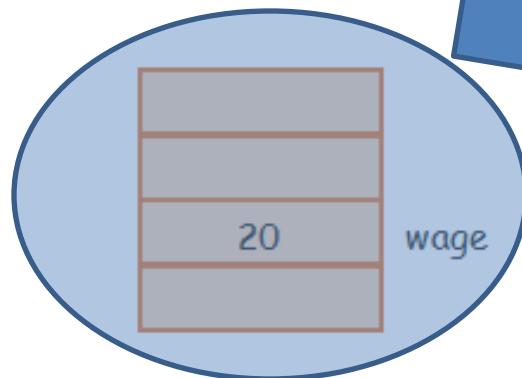
- 1 2 3 4 5 ►

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#include <iostream>
using namespace std;

int main() {
    int wage = 20;

    cout << "Salary is ";
    cout << wage * 40 * 50;
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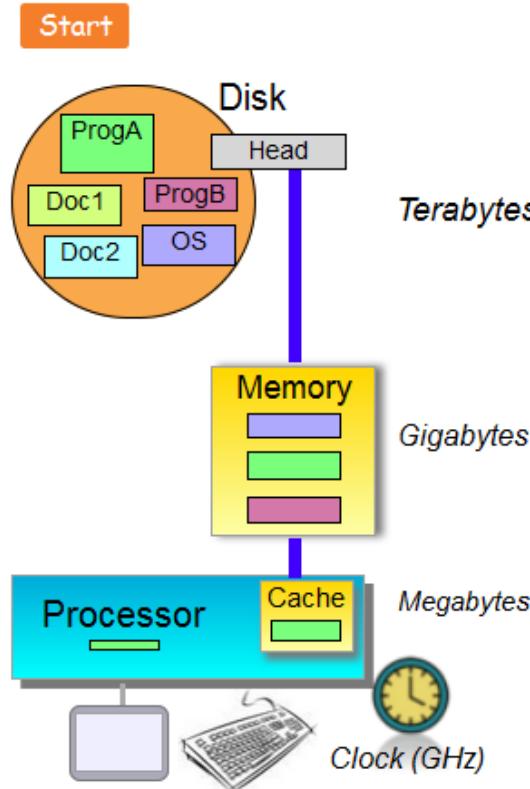
    return 0;
}
```



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

Computer Components

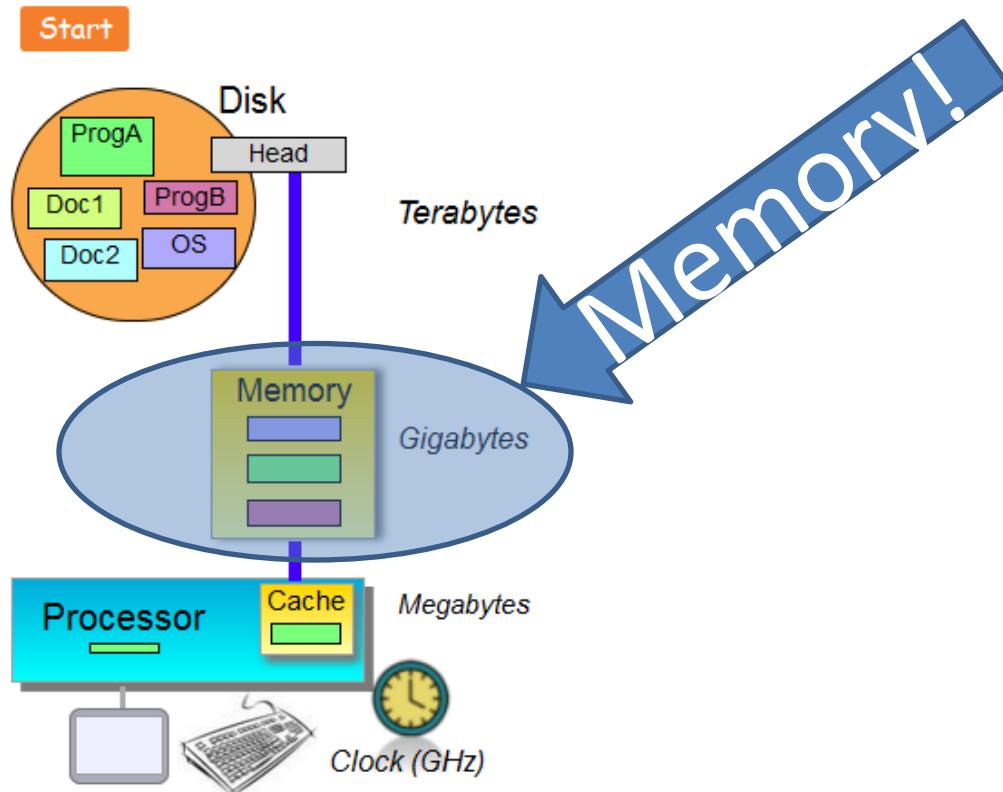
Participation activity 1.9.1: Some computer components.



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 // This is a comment.
```

- 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