



# CSC 103: How Computers Work

Spring 2016  
Smith College  
Prof. Sheehan

# Class 1: March 21

## Outline

- Syllabus and course overview
- Introductions
- Historical overview and examples of computers
- Binary numbers

# Big Questions

- How should we define “computer”? “computing”?
- What do computers do?
- How do they do it?
- How do computers affect us?
- Are computers intelligent? Do they “think”?
- What will computers be like in the future?

# Syllabus



# Course Overview

## WEEK 1:

binary numbers, Boolean algebra, logic gates

# Course Overview

## WEEK 1:

binary numbers, Boolean algebra, logic gates

## WEEK 2:

building blocks of computers (hardware)  
transistors, memory, CPU, etc

# Course Overview

## WEEK 1:

binary numbers, Boolean algebra, logic gates

## WEEK 2:

building blocks of computers (hardware)  
transistors, memory, CPU, etc

## WEEK 3:

assembly programming (software)

# Course Overview

## WEEK 4:

higher-level programming (Processing, software)

# Course Overview

## WEEK 4:

higher-level programming (Processing, software)

## WEEK 5:

Artificial Intelligence (AI), future of computers

# Course Overview

## WEEK 4:

higher-level programming (Processing, software)

## WEEK 5:

Artificial Intelligence (AI), future of computers

## WEEK 6:

final project presentations

# Course Overview

## Throughout:

- \* history of computers and computing
- \* discussion of file systems and terminal
- \* common computer applications



# Coursework

## 0 Assignments

- Due Monday at the beginning of class
- Include pencil & paper, code, short essay
- One part will often be an in-class lab or quiz

# Coursework

## 0 Assignments

- Due Monday at the beginning of class
- Include pencil & paper, code, short essay
- One part will often be an in-class lab or quiz

## 0 Labs and Participation

- Frequently will have in-class lab (often with a partner)
- Participation and attendance very important

# Coursework

## 0 Assignments

- Due Monday at the beginning of class
- Include pencil & paper, code, short essay
- One part will often be an in-class lab or quiz

## 0 Labs and Participation

- Frequently will have in-class lab (often with a partner)
- Participation and attendance very important

## 0 Final project

- On a topic of your choice
- Presentation (2-3min) + writeup

# Piazza

- Online discussion
- Homework questions (no email!)
- Announcements
- Counts toward participation (asking and answering)

<https://piazza.com/smith/spring2016/csc103/home>

# Honor Code

**Collaboration is encouraged** in this course, but all submitted work must be your own that **you have written and understood**. If you do use any resources from the internet, they must be clearly cited. If you worked with or received help from another student, list them as a collaborator at the top of your assignment. In general, for each assignment, cite your sources (classmates, books, and online resources), as per the Smith College honor code:

*"Smith College expects all students to be honest and committed to the principles of academic and intellectual integrity in their preparation and submission of course work and examinations. **All submitted work of any kind must be the original work of the student who must cite all the sources used in its preparation.**"*

The one exception is in-class labs, which may occasionally be in pairs. In this case, partners are expected to work together; **"divide and conquer" is not an acceptable strategy.**

# Grading

- Assignments (including quizzes): 50%
- Participation: 20%
- Final project and presentation: 30%

# Notes

- **Textbook:** none (any readings will be online)



# Notes

- **Textbook:** none (any readings will be online)
- **Electronic devices:** okay in class as long as you're doing something *directly* related to the class

# Notes

- **Textbook:** none (any readings will be online)
- **Electronic devices:** okay in class as long as you're doing something *directly* related to the class
- **Late work:** each student can take a 24 hour extension on *one* assignment

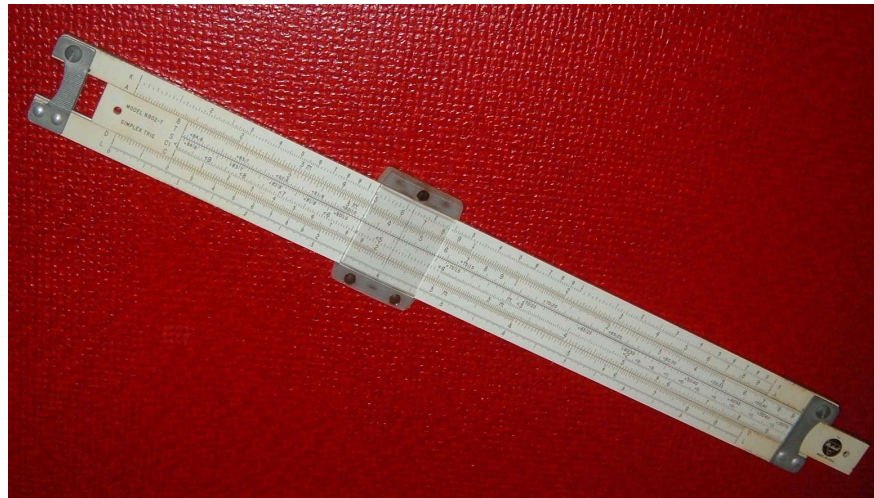
# Notes

- **Textbook:** none (any readings will be online)
- **Electronic devices:** okay in class as long as you're doing something *directly* related to the class
- **Late work:** each student can take a 24 hour extension on *one* assignment
- **Accommodations:** please give letters to me as soon as possible so we can discuss how to best meet accommodations

# Examples of Computers

# Analog Computers

- Uses continuous values/quantities for computation
  - Electric, hydraulic, mechanical
- Simple analog computer: slide rule



Credit: ArnoldReinhold (wikipedia)

# Antikythera mechanism



Ancient (first?) analog computer

Greek, around 200 BC

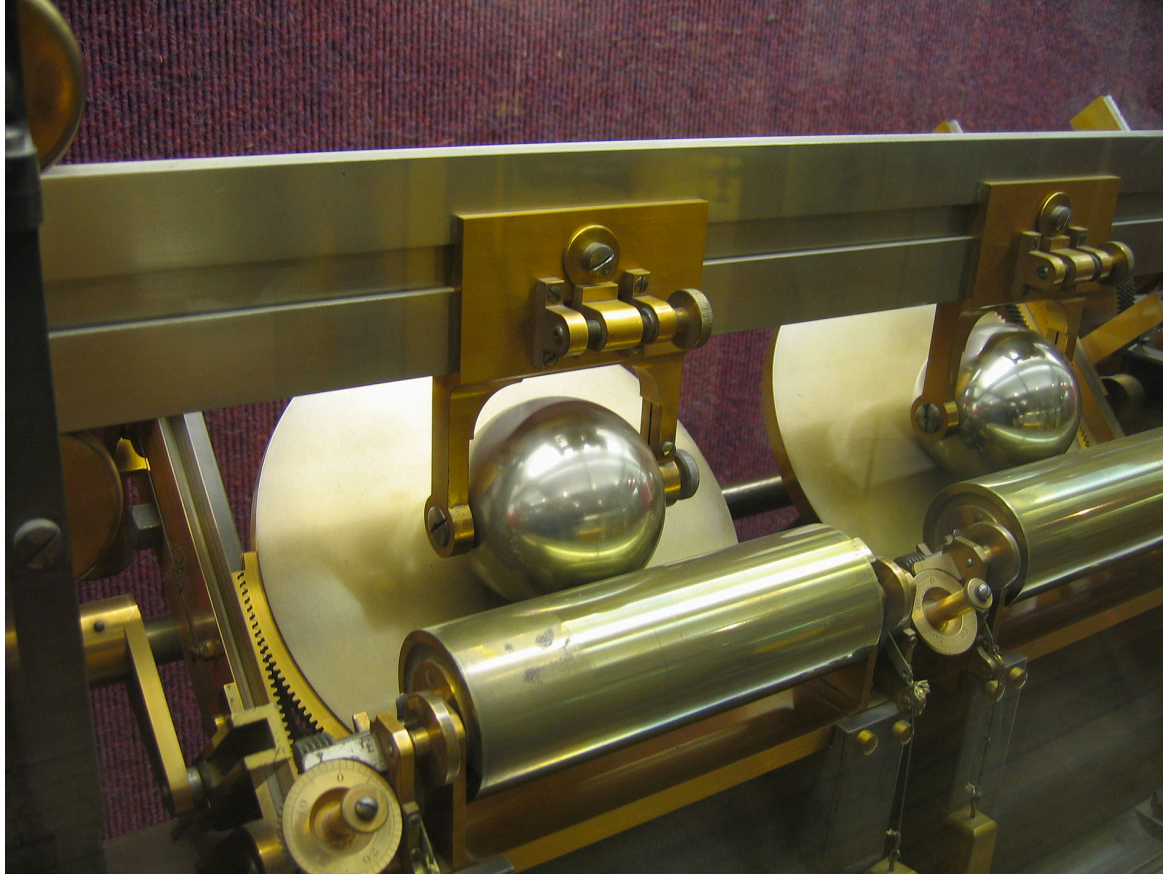
Used for predicting astronomical events (eclipses, etc)

Made of (30?) bronze gears

Credit: Marsyas, wikipedia



# Differential analyser



Another analog computer  
(mechanical)

Used for solving differential equations  
through integration

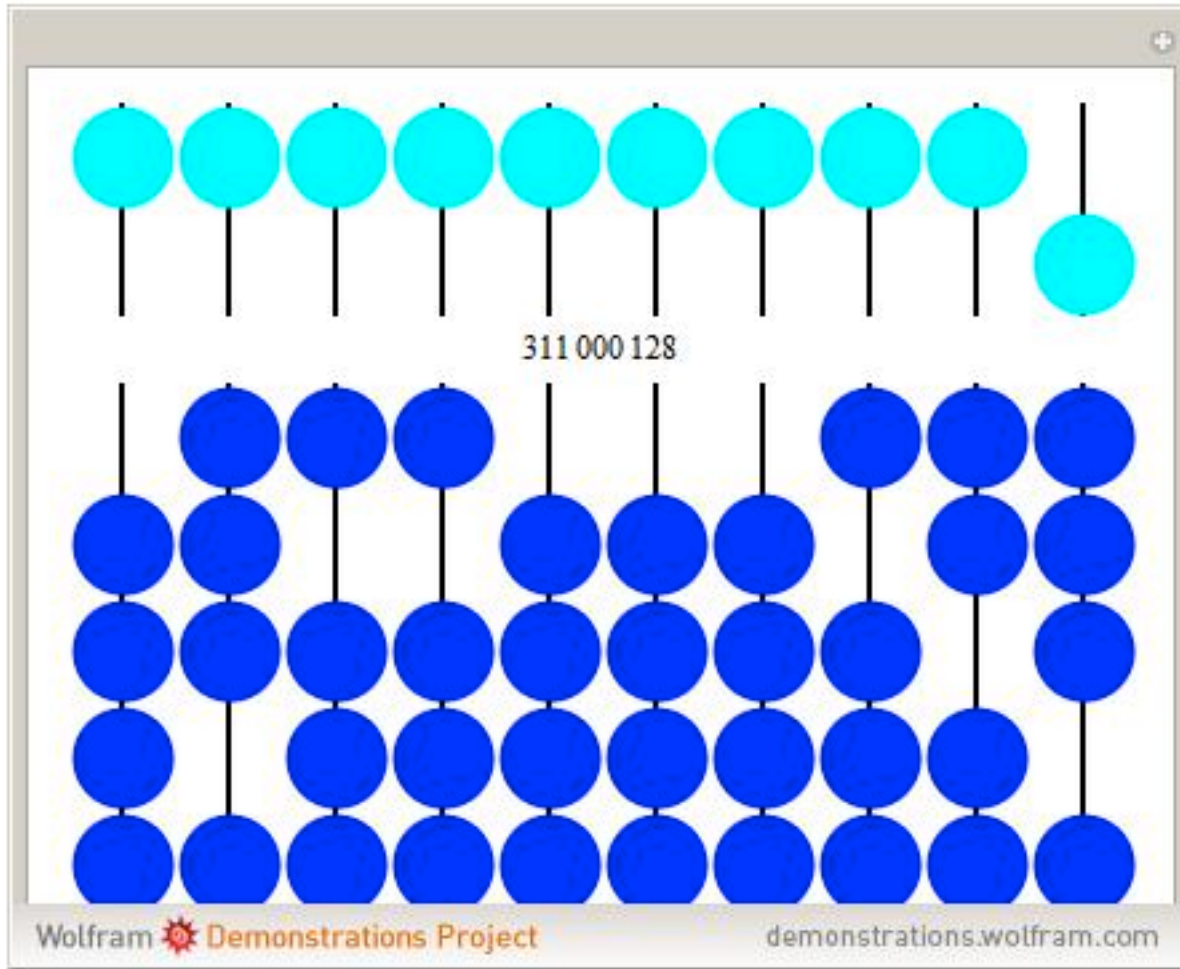
Height of use: 1930s-1950s

(left) used for studying tides

Credit: Andy Dingley, wikipedia



# Early digital computer: abacus



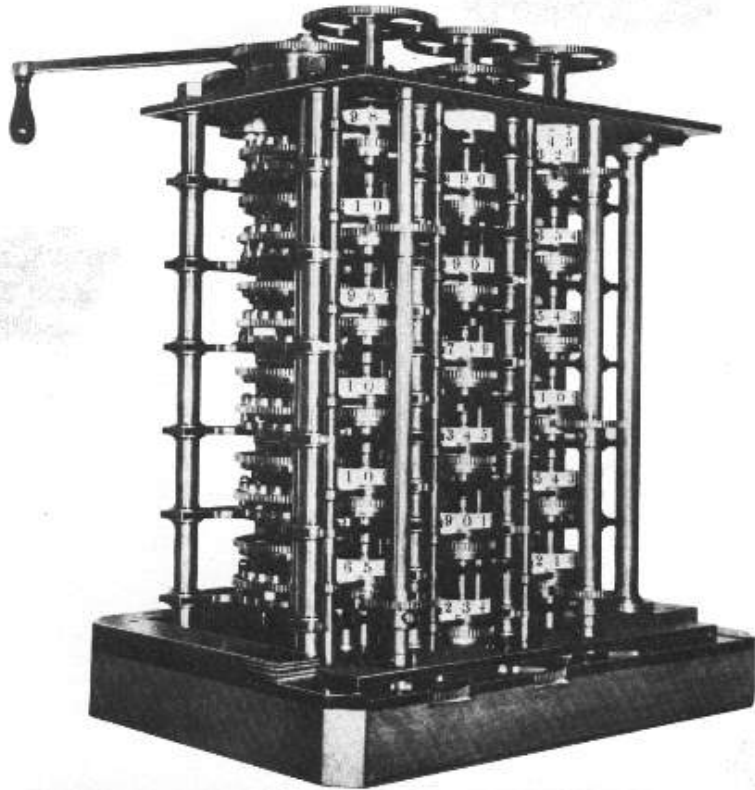
Early as 2500 BC

Appeared in many cultures

Used for addition,  
multiplication

More info: <https://en.wikipedia.org/wiki/Abacus>

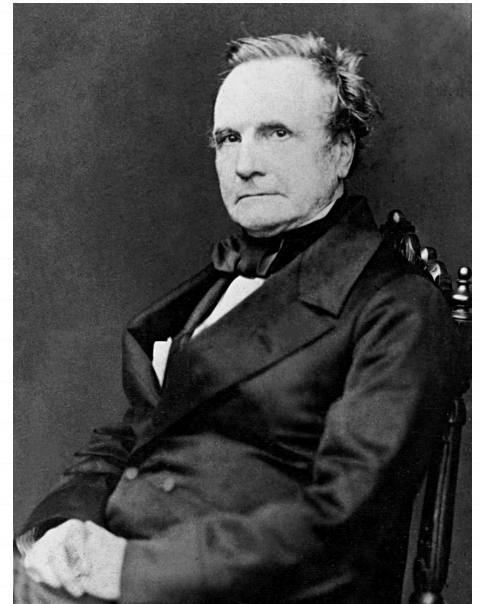
# Difference Engine



Credit:  
Dominique  
Thiebaut



Charles Babbage  
“Father of the  
computer”



Credit: wikipedia

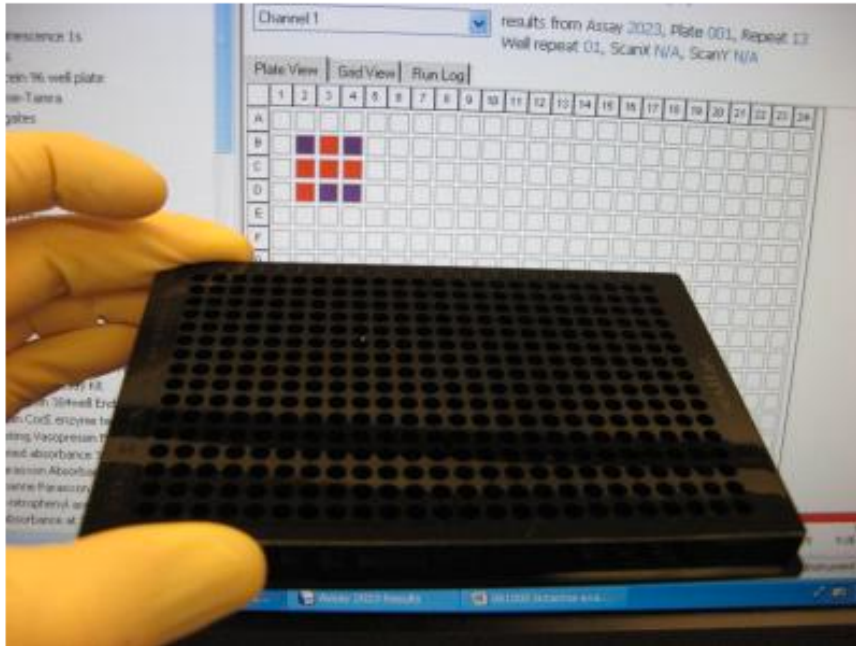
“world’s first computer”

Used for tabulating polynomial functions

Inspiration: frustration with errors made by  
human mathematicians

# DNA computers

## Prototype DNA computer -- MAYA-II



Credit: Dominique Thiebaut

