

CS 2420 — Computer Science II

Section 20

Spring 2012

Instructor: **Matthew Flatt**

Reminder

Section 20 is the “systems track.”

Course Content

- **Machine model**

- Machine code
- C

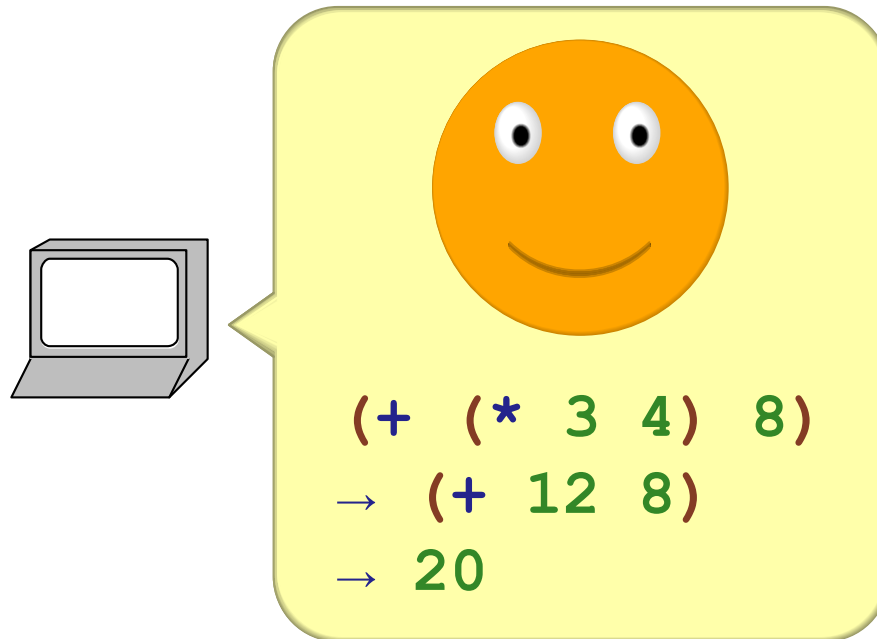
- **Data structures**

- Balanced binary trees, hash tables, ...

- **Algorithms**

- Binary search, dynamic programming, ...

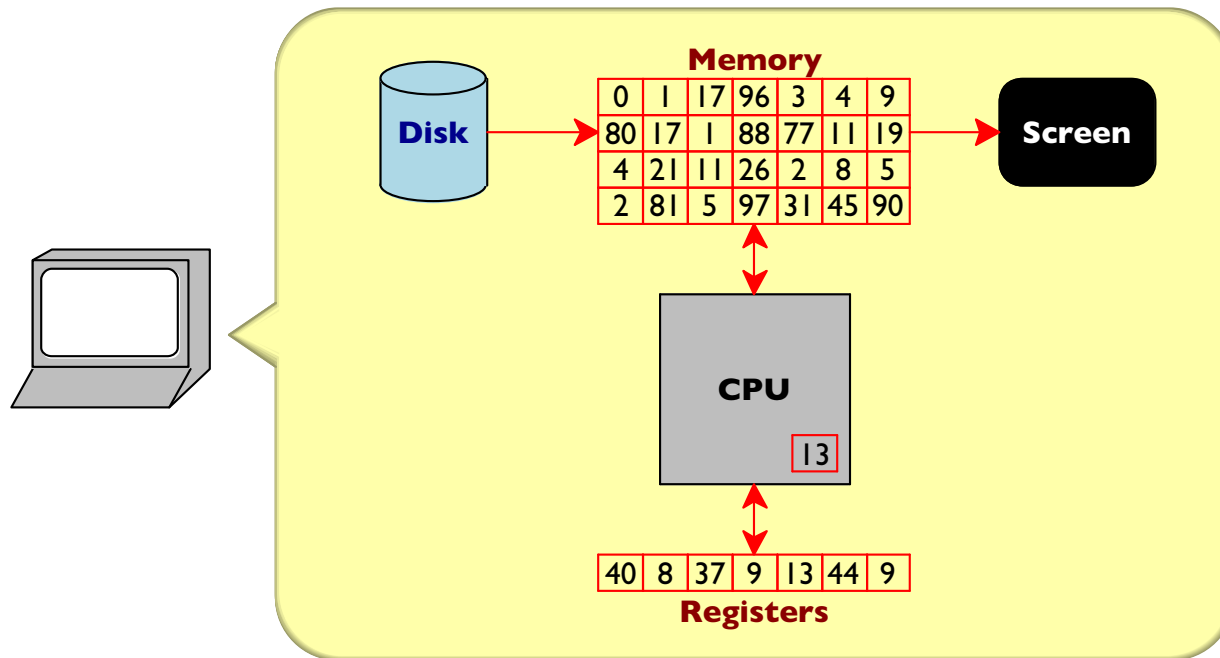
CS 1410-20 Machine



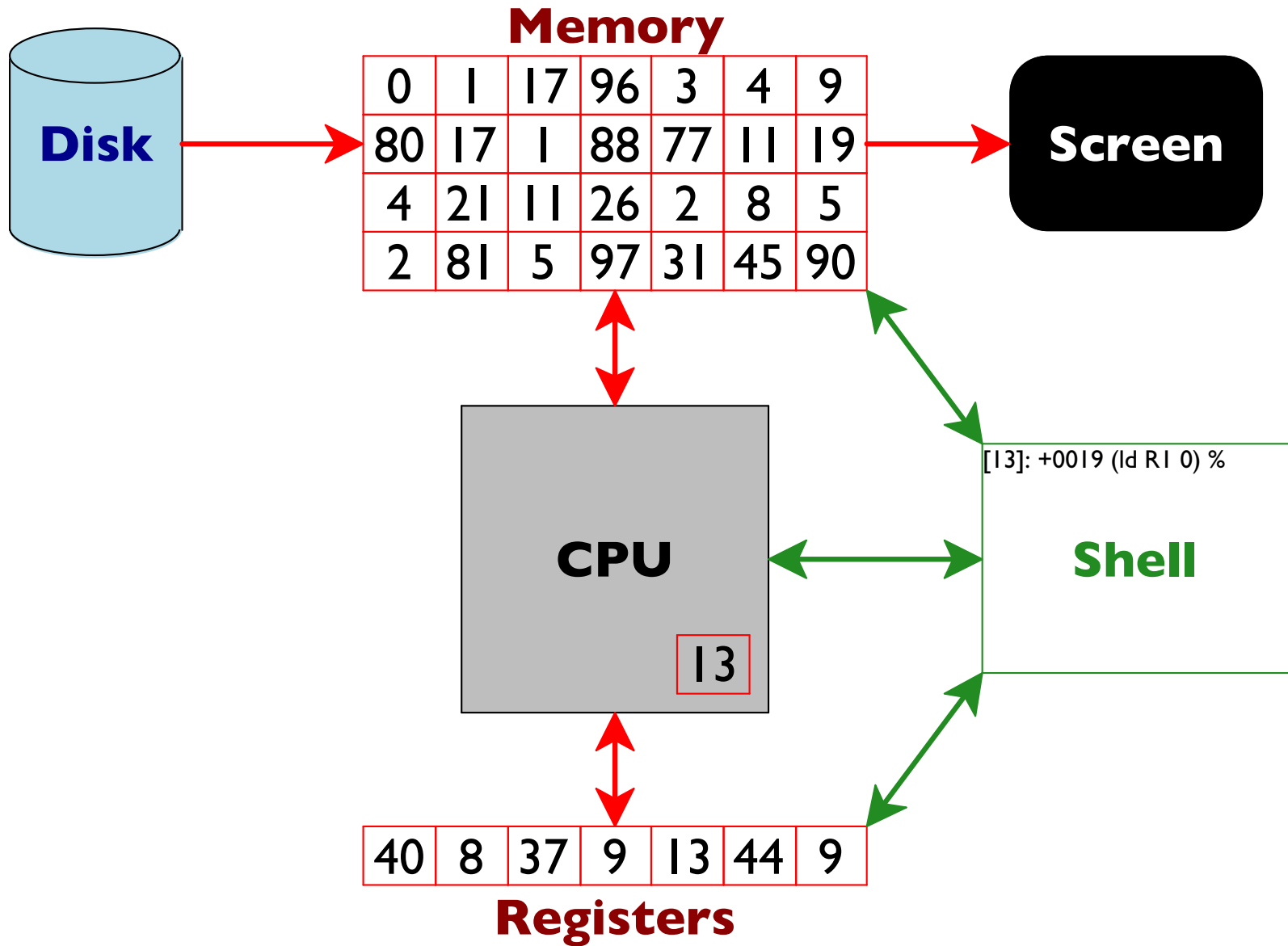
A small grey laptop icon is positioned to the left of a yellow speech bubble. Inside the speech bubble is a large orange smiley face with two white eyes and a curved mouth. Below the smiley face, the following postfix expression is displayed:

$$\begin{aligned} & (+ \ (* \ 3 \ 4) \ 8) \\ \rightarrow & \ (+ \ 12 \ 8) \\ \rightarrow & \ 20 \end{aligned}$$

CS 2420-20 Machine



The Jam2000 Machine



Everything is a Number

The number 1490:	1490
The “copy register 4 to 1” instruction:	1490
The name of the 1491st memory cell:	1490
A greenish-blue pixel:	1490

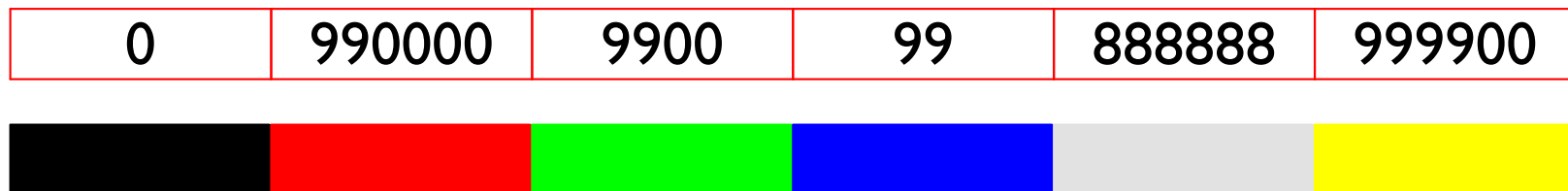
In fact, everything is represented by a number between -999999999 and 999999999

- but memory addresses are 0 to 9999
- only some numbers are sensible instructions
- the screen ignores some digits

Pixels

- Screen memory starts at 8000
- Digits encode red, green, and blue intensities:

? ? d_r d_r d_g d_g d_b d_b



Instructions

Numbers encode actions like “put the number $d_7d_6d_5d_4d_3d_2$ in register x ”:

```
(ldi Rx  $d_7d_6d_5d_4d_3d_2$ )
```

```
 $d_7$   $d_6$   $d_5$   $d_4$   $d_3$   $d_2$   $x$  9
```

“Put the number 77 in register 6”:

```
(ldi R6 77)
```

```
0 0 0 0 7 7 6 9
```