Muxes Practice
Introduction to Computer Systems, Fall 2024

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Head TAs: Adam Gorka   Daniel Gearhardt
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TAs:

Ahmed Abdellah	Ethan Weisberg	Maya Huizar
Angie Cao	Garrett O'Malley Kirsch	Meghana Vasireddy
August Fu	Hassan Rizwan	Perrie Quek
Caroline Begg	Iain Li	Sidharth Roy
Cathy Cao	Jerry Wang	Sydnie-Shea Cohen
Claire Lu	Juan Lopez	Vivi Li
Eric Sungwon Lee	Keith Mathe	Yousef AlRabiah

Poll Everywhere

❖ What have you heard about CMPE? (Computer Engineering)

- Ever considered joining it? (Why or Why not)
- Did you know that it existed?

Upcoming Due Dates

❖ HW03 (RPN):
- Due Last Friday

❖ HW04 will release on Friday, will be due before Fall break.
- **THIS IS A WRITTEN HW, AT MAX 72 HOURS LATE**
- It should be pretty short.
- We want to give you some practice on hardware that we are sure we can get graded and back to you before the midterm.
- Will try to get HW05 back to you before midterm as well, but aren't certain about it.

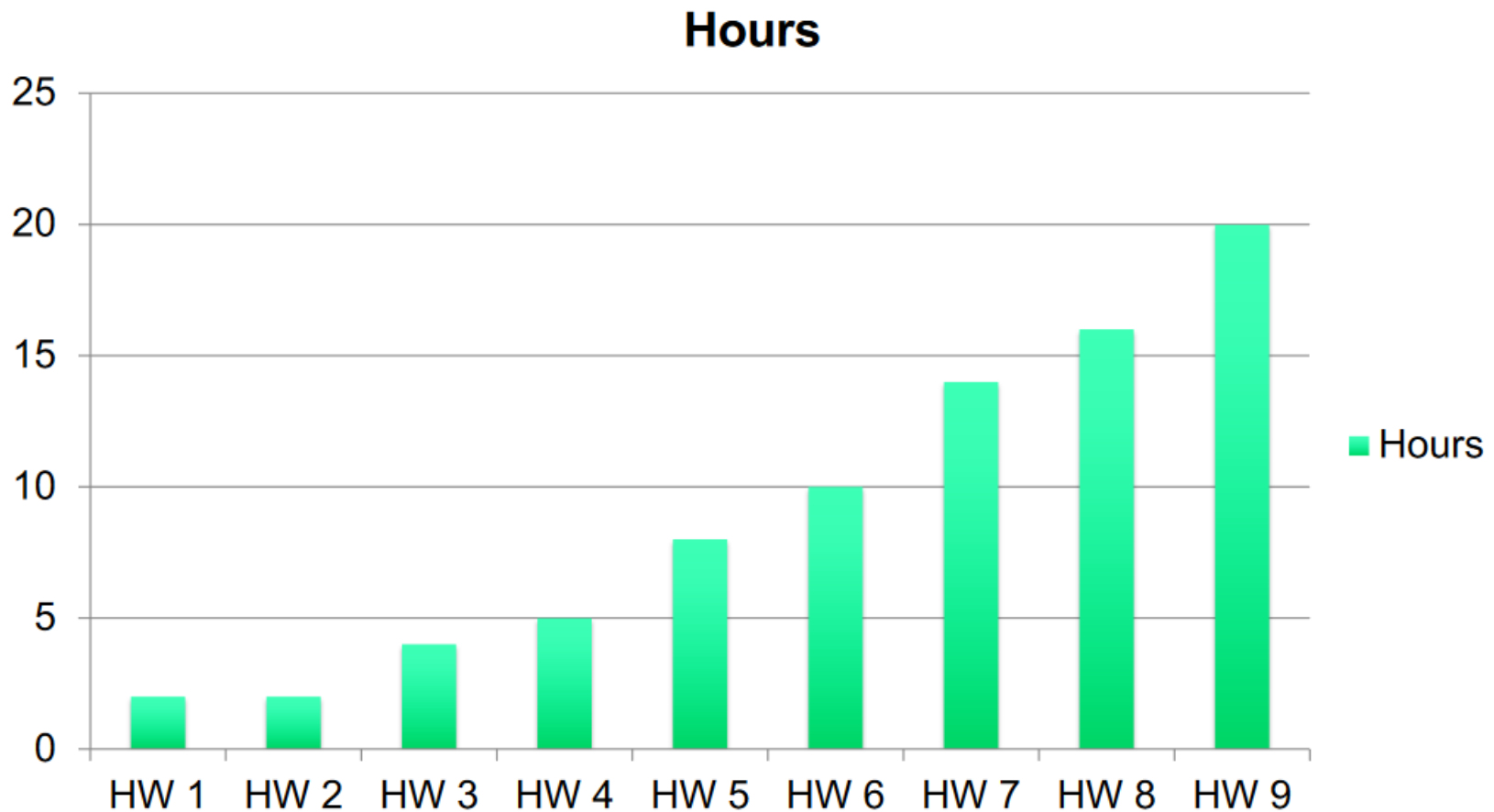❖ No lecture check-in this week

Tentative Final Exam Scheduling

❖ 9am – 11am Monday 12/16/24

❖ Probably chem 102?

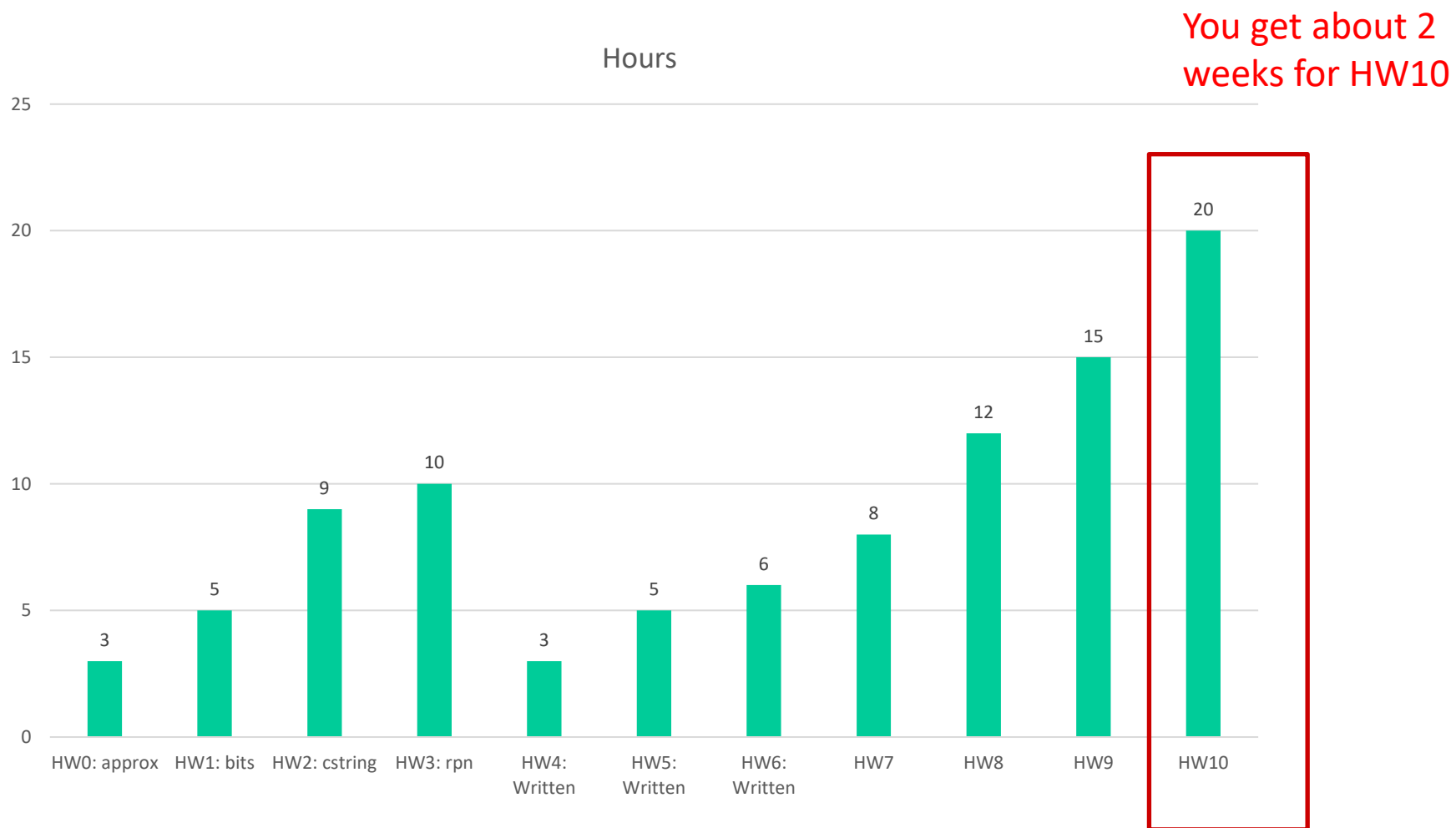❖ This isn't locked in, but >80% probability

Workload Concerns

❖ **THIS IS AN OLD GRAPH FROM FALL 2021 / FALL 2022**

What you are getting yourself into

Hours

HW	Hours
HW 1	2
HW 2	2
HW 3	4
HW 4	5
HW 5	8
HW 6	10
HW 7	14
HW 8	16
HW 9	20

Workload Concerns

❖ **<u>If I had to GUESS what it looks like this semester</u>**

You get about 2 weeks for HW10

Hours

HW	Hours
HW0: approx	3
HW1: bits	5
HW2: cstring	9
HW3: rpn	10
HW4: Written	3
HW5: Written	5
HW6: Written	6
HW7	8
HW8	12
HW9	15
HW10	20

Poll: Interest in Recitation at another time?

Poll: Interest in Saturday Review Session?

❖ Some TA's have interest in hosting a session on Saturday's to review the content of the course, go more in depth or talk about advanced applications of the material.

- This would NOT be for homework questions / Debugging
- Any interest in this?

Lecture Outline

❖ Mux, Saturated Adders, Practice

❖ Open-Ended Questions on Anything

Poll Everywhere

pollev.com/tqm

❖ How are you? Any Questions from last lecture?

Saturated Adder

❖ Saturated Arithmetic is when arithmetic is bound to a fixed range and overflow would result in the maximum value
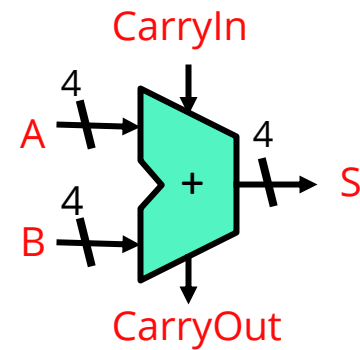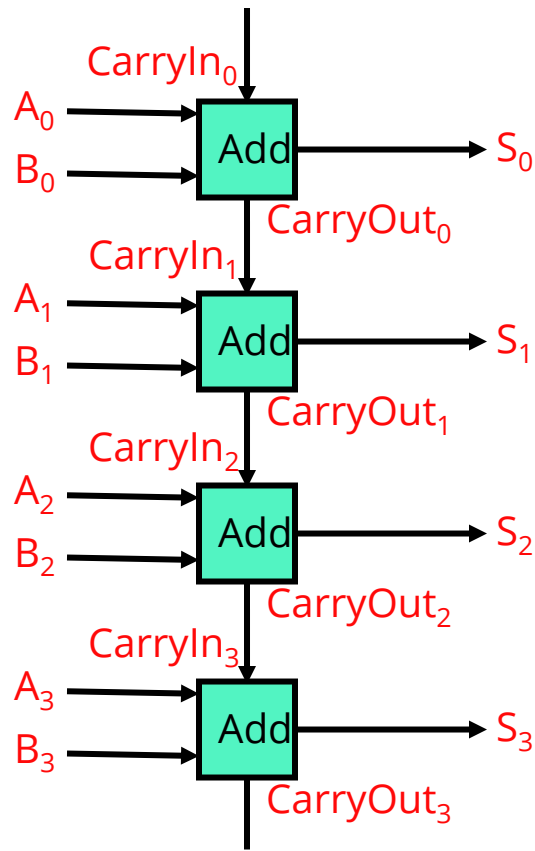
❖ Consider 4 bit addition:

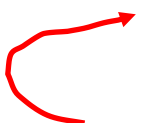|	Unsigned values	2C values
1010	(10)	(−6)
+ 0011	(3)	(3)
1101	(13)	(−3)

11

Practice!

❖ Design a saturated Adder. You can use:

▪ the 4-bit adder we made in last lecture

▪ Muxes

▪ Logic Gates

Overflow for 2C

❖ Overflow for 2C isn't always "problematic", it doesn't always result in a value that is incorrect.

❖ Detection for problematic overflow is different than unsigned

❖ Discuss: do you see a pattern for detecting 2C overflow?


```
       2C
  1111  (−1)
+ 0001  (1)
  ─────
 10000  (0)
```

Problematic with unsigned ☹ but works for 2C!

```
                2C values
  1000   (−8)
+ 1111   (−1)
  ─────
 10111   (7)
```

```
                2C values
  0111   (7)
+ 0001   (1)
  ─────
 01000   (−8)
```
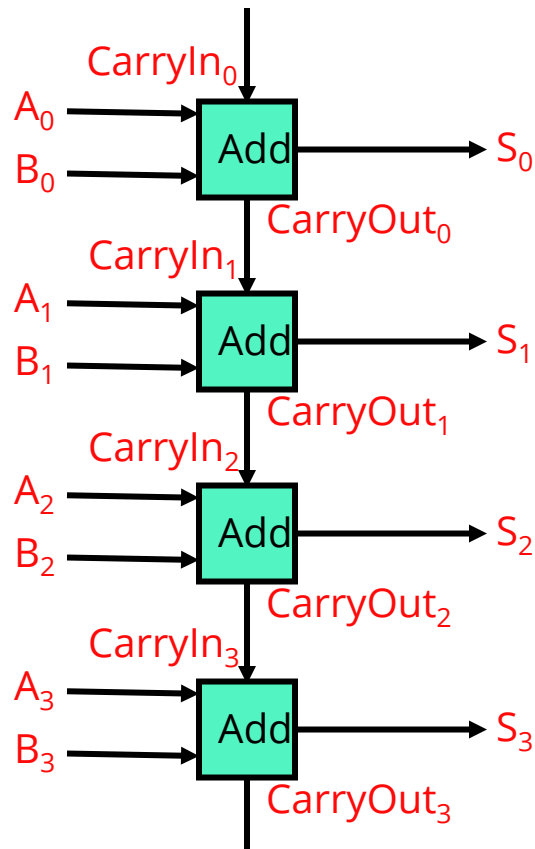
Practice!

❖ Design a saturated Adder for 2C. You can use:

  ▪ the 4-bit adder we made in last lecture

  ▪ Muxes

  ▪ Logic Gates

Reminder:
Problematic overflow for 2c when
A3 == B3 and A3 != S3

Different saturated value for
negative and positive overflow
1000 and 01111

Poll Everywhere

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❖ **Anonymous Poll:**
Have you had an internship yet?

- More than one

- One

- Never

- Prefer not to answer

Poll Everywhere

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❖ Anonymous Poll:
What motivates your career in Computing?

- I love CS for CS, I'll be happy as long as I am working on interesting problems

- I love CS but need to find a fulfilling way to apply it (e.g. trying to better the world)

- I Like CS, but I like other things more. If salary differences were not a concern, I may do another STEM related career

- CS is fine, but my true passions lay elsewhere. If money weren't a concern I would not be here

- Prefer not to answer

📊 Poll Everywhere

❖ **Any questions on anything?**

- Can't answer anything too specific on HW

- I have OH right after class for HW questions

- Happy to talk about

    - more advanced material

    - Career stuff

    - Misc programming stuff

    - things not related at all