Welcome to CPSC 213!

Check in at the front!!

Randy Zhu

Lab Policy

You should come to labs!!

- Attendance mandatory
- Check-in with me at the start of the lab to get access
- Code to put into PL for attendance
  - **put code in = full marks for lab**
- Arrive no more than 15mins late
- Respectful environment/safe space

About Me

- 3rd year, BSc Honours CS
  - Working on thesis now with Dr. Caroline Lemieux @SPL
- Second time TAing for 213, 3 terms of 210
- Enjoy hiking, cycling, working on programming projects

Upcoming Deadlines

- Assignment 1 due Saturday, Jan 17th

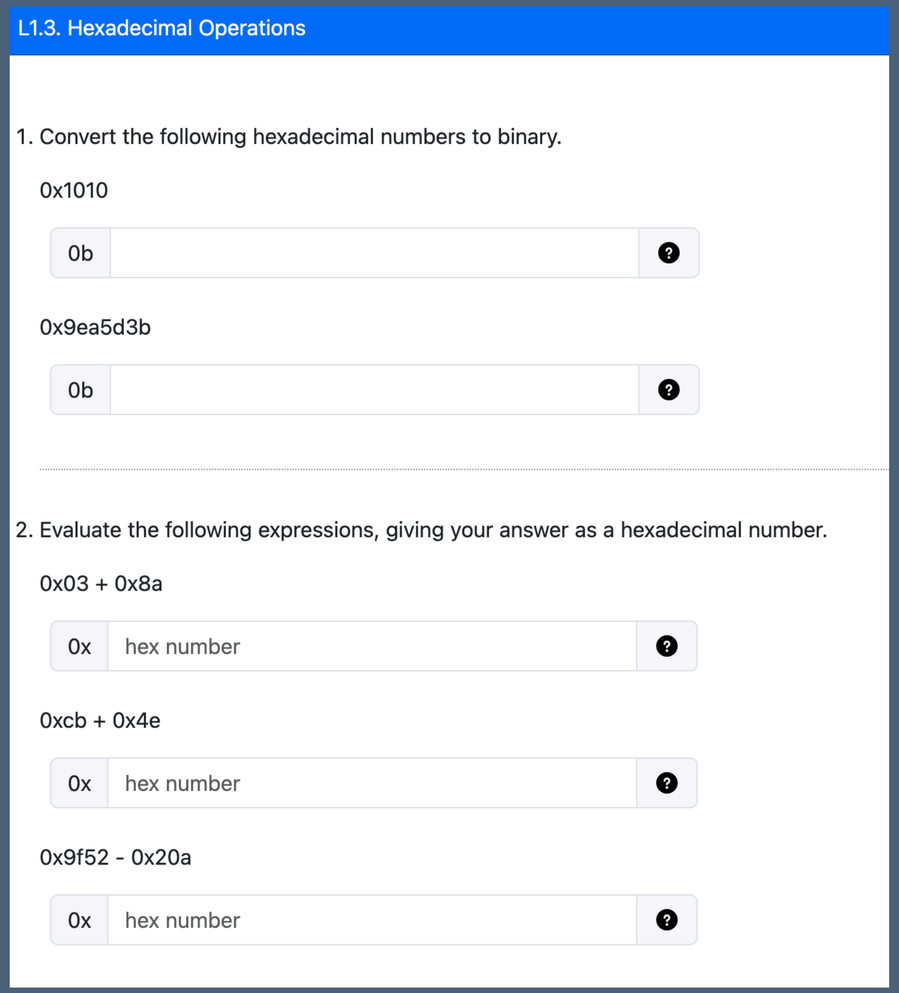
Lab is on PrairieTest

us.prairietest.com

Exercise 1

Hexadecimal Operations

1. Use binary <-> hexit table
2. Subtraction in two's complement (CPSC 121)
    1. Flip
    2. Add 1



0x9f52 - 0x20a

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- 0x9f52 - 0x20a = 0x9f52 + (-0x020a)

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    - 0x020a = 0000_0010_0000_1010

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- 0x9f52 - 0x20a = 0x9f52 + (-0x020a)
    - 0x020a = 0000_0010_0000_1010
        - flip -> 1111_0010_0000_1010

0x9f52 - 0x20a

- 0x9f52 - 0x20a = 0x9f52 + (-0x020a)
    - 0x020a = 0000_0010_0000_1010
        - flip -> 1111_0010_0000_1010
        - add1 -> 1111_0010_0000_1011 = f20b

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    - 0x020a = 0000_0010_0000_1010
        - flip -> 1111_0010_0000_1010
        - add1 -> 1111_0010_0000_1011 = f20b
    - Calculate 0x9f52 + 0xf20b

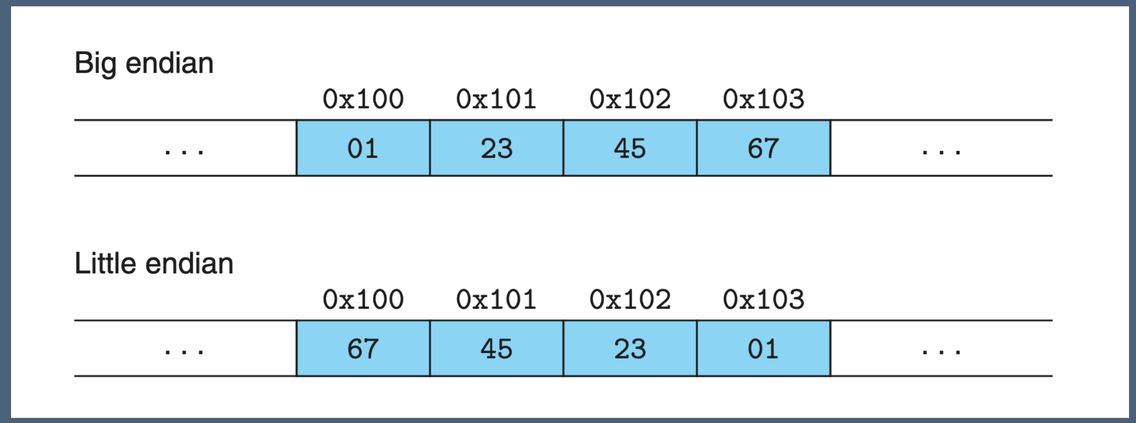
0x9f52 - 0x20a

- 0x9f52 - 0x20a = 0x9f52 + (-0x020a)
    - 0x020a = 0000_0010_0000_1010
        - flip -> 1111_0010_0000_1010
        - add1 -> 1111_0010_0000_1011 = f20b
    - Calculate 0x9f52 + 0xf20b
    - Ignore overflows

Exercise 2

Endianness

- Strategy
  1. Determine sign extension first if RHS type is bigger
  2. Break up into bytes
     - 1 byte = 2 hexits = 8 binary digits
  3. Place by endianness



Memory layout for 0x01234567

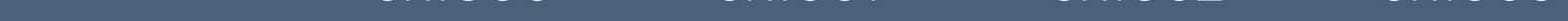
2.3 Layout of short a = 0x1234;

- short in Java: 16 bits, 2 bytes
- Starts at 0x1000

0x12_34

- 34: least significant bit

Big Endian



Little Endian

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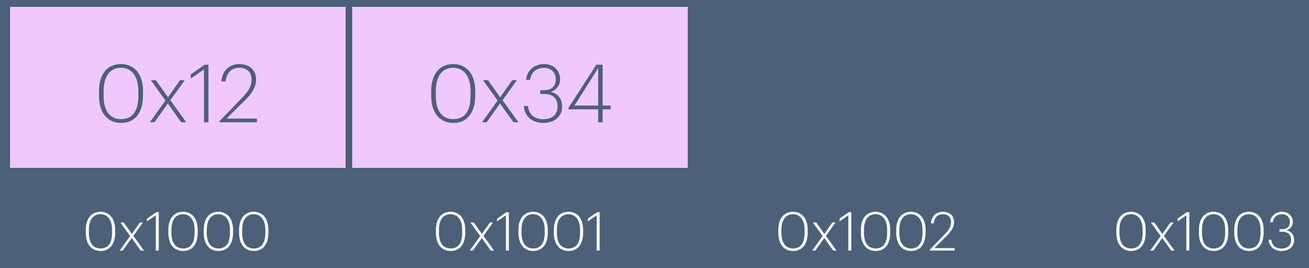

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Big Endian

Little Endian

Lab Code

WZKM

Exercise 3

- All expressions below **are 32 bit (int)**
  - 0x7b
  - 0b0110
  - 42
- Widening conversion (e.g., short -> int, byte -> short) sign extends

```
int a = ((byte) 0xae) << 16;
```

int a = ((byte) 0xae) << 16;

- 0xae is an **int**

int a = ((byte) 0xae) << 16;

- 0xae is an **int**
  - 0xae = 0x00_00_00_ae

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  - (byte) 0xae = 0xae

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  - Promote to int, sign extend

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  - ((byte) 0xae) = 0xff_ff_ff_ae

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- 0xae is an **int**
  - 0xae = 0x00_00_00_ae
  - (byte) 0xae = 0xae
  - Promote to int, sign extend
  - ((byte) 0xae) = 0xff_ff_ff_ae
- Shift right 16 bits

int a = ((byte) 0xae) << 16;

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  - Promote to int, sign extend
  - ((byte) 0xae) = 0xff_ff_ff_ae
- Shift right 16 bits
- 1 hexit = 4 bits

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- So shift 4 hexits

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  - Promote to int, sign extend
  - ((byte) 0xae) = 0xff_ff_ff_ae
- Shift right 16 bits
- 1 hexit = 4 bits
- So shift 4 hexits
- **int a = 0xff_ae_00_00**