Recitation 5: Exam 1 Review

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15213 Section A
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Today’s Plan

- Exam 1 review
  - Problems from last fall’s exam 1
    - Floating Point
    - Unions

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- Office hours:
  - NSH 2504 (lab) / 2507 (conference room)
  - Tuesday 4–5

- Lab 3: due Monday (7 Oct), 11:59pm
- Lab 4: later this week (probably by Thursday)
- Exam 1: Tuesday (8 Oct), 6:00–7:30pm
  Doherty Hall 2315

Floating Point

<table>
<thead>
<tr>
<th>s</th>
<th>exp</th>
<th>frac</th>
</tr>
</thead>
</table>

- s: sign bit
- exp: encodes E (m bits)
  - value unbiased
  - bias = $2^{m-1} - 1$
- frac: fractional number (n bits)
  - Normalized: [1.0, 2.0)
    - exp ≠ 0...0 & exp ≠ 1...1
  - Denormalized: [0.0, 1.0)
    - exp = 0...0
### Example: exp with 3 bits

<table>
<thead>
<tr>
<th>exp</th>
<th>exp</th>
<th>E</th>
<th>(2^E)</th>
<th>(denoms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>000</td>
<td>-2</td>
<td>¼</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>001</td>
<td>-2</td>
<td>¼</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>010</td>
<td>-1</td>
<td>½</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>011</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>100</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>101</td>
<td>2</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>110</td>
<td>3</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>111</td>
<td>n/a</td>
<td>n/a</td>
<td>(inf, n/a)</td>
</tr>
</tbody>
</table>

### Practice Problems

- #2 floating point
- #1 two’s–complement
- #5 array index
- #7 struct layout (with unions)

### #7 changes

```c
typedef union {
    OldSensorData   oldData;
    NewSensorData   newData;
} SensorDataUnion;
```