Andrew Faulring

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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
Today’s Plan

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

- **s**: sign bit
- **exp**: encodes $E$ ($m$ bits)
  - value unbiased
  - bias = $2^{m-1} - 1$
- **frac**: fractional number ($n$ bits)
  - Normalized: $[1.0, 2.0)$
    - $\exp \neq 0...0$ & $\exp \neq 1...1$
  - 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>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>000</td>
<td>−2</td>
<td>¼</td>
</tr>
<tr>
<td>1</td>
<td>001</td>
<td>−2</td>
<td>¼</td>
</tr>
<tr>
<td>2</td>
<td>010</td>
<td>−1</td>
<td>½</td>
</tr>
<tr>
<td>3</td>
<td>011</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>100</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>101</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>110</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>7</td>
<td>111</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>
Practice Problems

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

  OldSensorData       oldData;
  NewSensorData       newData;

} SensorDataUnion;