Consider the 64-bit case. The goal is to encode 1 (leading) digit $d_0$ together with a biased exponent $E$.

$$0 \leq d_0 \leq 9, \quad 0 \leq E \leq 3 \times 2^8 - 1$$
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\[
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\]

Break \( E \) into \( e_{hi} \) and \( e_{lo} \), and

\[
E = 2^8 \times e_{hi} + e_{lo}, \quad e_{hi} \leq 2, e_{lo} \leq 2^8 - 1.
\]
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Current Combination Field

| 5 bit encode \((e_{hi}, d_0)\) | 8 bit encode \(e_{lo}\) |

- Allow easy NaN initialization
- Exponent field and digit field non-contiguous
- Unordered
An Alternative Combination Field

Case of $0 \leq d_0 \leq 7$
An Alternative Combination Field

Case of $0 \leq d_0 \leq 7$

Binary code: $8E + d_0$

<table>
<thead>
<tr>
<th>$E$</th>
<th>$d_0$</th>
</tr>
</thead>
</table>

Note: Two msb never 11.
### An Alternative Combination Field

**Case of** $0 \leq d_0 \leq 7$  
**binary code** $8E + d_0$

<table>
<thead>
<tr>
<th></th>
<th>E</th>
<th>$d_0$</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note** two msb never 11

**Case of** $8 \leq d_0 \leq 9$  
**binary code** $3 \times 2^{11} + 2E + d_0 \mod 8$

<table>
<thead>
<tr>
<th></th>
<th>E</th>
<th>$d_0$ mod 8</th>
</tr>
</thead>
</table>
An Alternative Combination Field

Case of $0 \leq d_0 \leq 7$, binary code $8E + d_0$
Case of $8 \leq d_0 \leq 9$, binary code $3 \times 2^{11} + 2E + d_0 \mod 8$
An Alternative Combination Field

Case of \(0 \leq d_0 \leq 7\), binary code \(8E + d_0\)

Case of \(8 \leq d_0 \leq 9\), binary code \(3 \times 2^{11} + 2E + d_0 \mod 8\)

- Easy initialization of NaN
- Contiguous exponent and digit fields
- Some ordering
- Allow exploitation of binary FP hardware