CSE115 / CSE503
Introduction to Computer Science I

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Office hours:
Tuesday 10:00 AM – 12:00 PM (11-1 once a month)
Wednesday 4:00 PM – 5:00 PM
Friday 11:00 AM – 12:00 PM
OR request appointment via e-mail
Until we do an interactive exercise or a poll, turn off and put away electronics:

cell phones
pagers
laptops
 tablets
etc.
Class today
  Representations

Coming up
  Gates
  Memory
  Instruction decoding
Text (ASCII, EBCDIC, Unicode, Morse code…)
    http://www.lookuptables.com
Images (GIF, JPG, …)
Music (mp3, …)
Video (MPG, …)
Quantity (decimal, binary,…)
    http://en.wikipedia.org/wiki/Numeral_system
Two distinct color models

Subtractive
painting/printing

Additive
television/monitors/stage lighting

See: www.designersinsights.com/designer-resources/understanding-color-models
or: www.normankoren.com/light_color.html
Encoding quantity

5

five
cinq

V
Decimal (base 10)

1 2 3 4 5 6 7 8 9 10 11 12 13 etc.

Unary (base 1)

1 11 111 1111 11111 111111 1111111 11111111 111111111 1111111111 11111111111 111111111111 etc.
<table>
<thead>
<tr>
<th>Decimal (base 10)</th>
<th>Binary (base 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>101</td>
</tr>
<tr>
<td>6</td>
<td>110</td>
</tr>
<tr>
<td>7</td>
<td>111</td>
</tr>
<tr>
<td>8</td>
<td>1000</td>
</tr>
<tr>
<td>9</td>
<td>1001</td>
</tr>
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<td>10</td>
<td>1010</td>
</tr>
<tr>
<td>11</td>
<td>1011</td>
</tr>
<tr>
<td>12</td>
<td>1100</td>
</tr>
<tr>
<td>13</td>
<td>1101</td>
</tr>
<tr>
<td>etc.</td>
<td>etc.</td>
</tr>
</tbody>
</table>
We use a subscript on a number to indicate in what base it should be interpreted:

11_{10} \text{ is a base } 10 \text{ number representing the quantity eleven}

11_{2} \text{ is a base } 2 \text{ number representing the quantity three}
Number systems

Decimal (base 10)

Each position is weighted by a power of 10.

E.g. 734 =
\[ 7 \times 100 + 3 \times 10 + 4 \times 1 \]
\[ 7 \times 10^2 + 3 \times 10^1 + 4 \times 10^0 \]

E.g. 1101 =
\[ 1 \times 1000 + 1 \times 100 + 0 \times 10 + 1 \times 1 \]
\[ 1 \times 10^3 + 1 \times 10^2 + 0 \times 10^1 + 1 \times 10^0 \]

Binary (base 2)

Each position is weighted by a power of 2.

E.g. 111 =
\[ 1 \times 4 + 1 \times 2 + 1 \times 1 = \text{“seven”} \]
\[ 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 \]

E.g. 1101 =
\[ 1 \times 8 + 1 \times 4 + 0 \times 2 + 1 \times 1 = \text{“thirteen”} \]
\[ 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 \]
QUESTION:
What does 1101 represent?
QUESTION:
What does 1101 represent?

ANSWER:
Whatever we want it to represent!
Physical reality:

WIRE

Carries a HIGH voltage or a LOW voltage

Logical view:

WIRE

Carries a 1 or a 0
Controlling flow (normally open)
Controlling flow (normally open)
Two in a row (in series)?
Two in a row (in series)?
Two in a row (in series)?
Two in a row (in series)?
For which input values is output 1?

For which input values is output 0?
### Truth table for AND

<table>
<thead>
<tr>
<th>Input 1</th>
<th>Input 2</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
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</tr>
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<td>0</td>
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