Logistics

Reading: Pattern Chapter 2

HW 1 Due Thursday
▶ Today’s Discussion will cover some aspects of the HW
▶ Any Questions now?

Goals Today
▶ More bit encodings
▶ Boolean Logic

HW 2
▶ Up by Thursday
▶ Due Next Week Thursday
▶ Sign up for Code.org
  ▶ Direct link: http://studio.code.org/join/WFPGRG
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Quick Review

- What are bits?
- How many bits in a byte?
- What kinds of things have we used binary for thus far?
- What’s binary number system?
Scheme 1: Placement of 1

<table>
<thead>
<tr>
<th>Character</th>
<th>Placement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td>10</td>
</tr>
<tr>
<td>C</td>
<td>100</td>
</tr>
<tr>
<td>D</td>
<td>1000</td>
</tr>
<tr>
<td>E</td>
<td>10000</td>
</tr>
<tr>
<td>..</td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>100000000000000000000000000</td>
</tr>
</tbody>
</table>

26 bits for 26 Characters

- Okay, but seems like a lot of 0’s...
English Characters

Scheme 2: Each letter has an associated number

<table>
<thead>
<tr>
<th>Letter</th>
<th>Num</th>
<th>Digit</th>
<th>Binary</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0</td>
<td>0</td>
<td>00000</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
<td>1</td>
<td>00001</td>
</tr>
<tr>
<td>C</td>
<td>2</td>
<td>10</td>
<td>00010</td>
</tr>
<tr>
<td>D</td>
<td>3</td>
<td>11</td>
<td>00011</td>
</tr>
<tr>
<td>E</td>
<td>4</td>
<td>100</td>
<td>00100</td>
</tr>
<tr>
<td>F</td>
<td>5</td>
<td>101</td>
<td>00101</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>26</td>
<td>11001</td>
<td>11001</td>
</tr>
</tbody>
</table>

5 bits for 26 characters
- 5 bits could handle up to 32 characters

In general: X things can be represented by N bits where $X \leq 2^N$

Q: How many bits to represent both UPPER and lowercase English characters?
Character Coding Conventions

- Would be hard for people to share words if they interpreted bits as letters differently
- ASCII is an old standard for which bits mean which characters
- 7 bits per character, includes upper, lower case, punctuation
- **Write your name or initials** in All Caps using ASCII coding

<table>
<thead>
<tr>
<th>Decimal</th>
<th>Hex</th>
<th>Binary</th>
<th>Decimal</th>
<th>Hex</th>
<th>Binary</th>
</tr>
</thead>
<tbody>
<tr>
<td>65</td>
<td>41</td>
<td>01000001</td>
<td>A</td>
<td>78</td>
<td>4E</td>
</tr>
<tr>
<td>66</td>
<td>42</td>
<td>01000010</td>
<td>B</td>
<td>79</td>
<td>4F</td>
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<tr>
<td>67</td>
<td>43</td>
<td>01000011</td>
<td>C</td>
<td>80</td>
<td>50</td>
</tr>
<tr>
<td>68</td>
<td>44</td>
<td>01000100</td>
<td>D</td>
<td>81</td>
<td>51</td>
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<tr>
<td>69</td>
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<td>01000101</td>
<td>E</td>
<td>82</td>
<td>52</td>
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<tr>
<td>73</td>
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<td>01001001</td>
<td>I</td>
<td>86</td>
<td>56</td>
</tr>
<tr>
<td>74</td>
<td>4A</td>
<td>01001010</td>
<td>J</td>
<td>87</td>
<td>57</td>
</tr>
<tr>
<td>75</td>
<td>4B</td>
<td>01001011</td>
<td>K</td>
<td>88</td>
<td>58</td>
</tr>
<tr>
<td>76</td>
<td>4C</td>
<td>01001100</td>
<td>L</td>
<td>89</td>
<td>59</td>
</tr>
<tr>
<td>77</td>
<td>4D</td>
<td>01001101</td>
<td>M</td>
<td>90</td>
<td>5A</td>
</tr>
</tbody>
</table>

Decimal Hex Binary Decimal Hex Binary
65 41 01000001 A 78 4E 01001110 N
66 42 01000010 B 79 4F 01001111 O
67 43 01000011 C 80 50 01010000 P
68 44 01000100 D 81 51 01010001 Q
69 45 01000101 E 82 52 01010010 R
70 46 01000110 F 83 53 01010011 S
71 47 01000111 G 84 54 01010100 T
72 48 01001000 H 85 55 01010101 U
73 49 01001001 I 86 56 01010110 V
74 4A 01001010 J 87 57 01010111 W
75 4B 01001011 K 88 58 01011000 X
76 4C 01001100 L 89 59 01011001 Y
77 4D 01001101 M 90 5A 01011010 Z
Discuss in groups of 2-4 how bits could be used to represent pictures like photos or drawings.

Include on one piece of paper

- Short description of your ideas
- All names from your group
- NetIDs of all members
- Hand in by end of class

Example Work Sheet

Chris Kauffman ckauffm2
Mark Snyder msnyde14
Kinga Dobolyi kdobolyi

We would use bits to represent a photo by using the first few bits to...
Discuss in groups of 2-4 how bits could be used to represent documents like Word docs, PDFs, or web pages.

Add to your piece of paper

- Short description of your ideas
- All names from your group
- NetIDs of all members

Example

Chris Kauffman ckauffm2
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Kinga Dobolyi kdobolyi

We would use bits to represent a document by using the first bits to...
Next Time

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