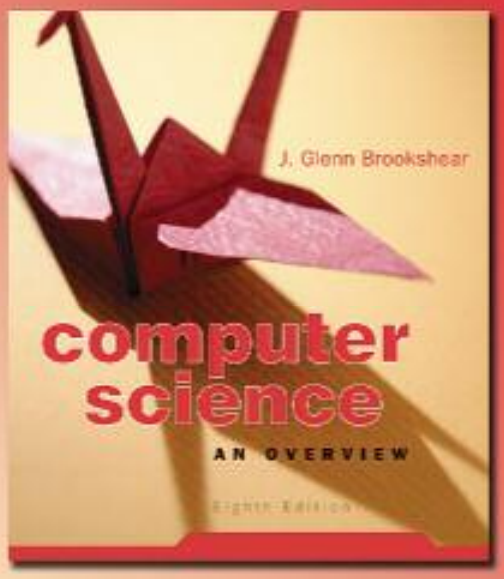
Chapter 1



Chapter 1: Data Storage

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Bits and their meaning

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Bit patterns

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Boolean operations

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Figure 1.1 The Boolean operations AND, OR, and XOR (exclusive or)

The AND operation

0 AND 0 = 0	0 AND 1 = 0	1 AND 0 = 0	1 AND 1 = 1

The OR operation

0 OR 0 = 0	0 OR 1 = 1	1 OR 0 = 1	1 OR 1 = 1

The XOR operation

0 XOR 0 = 0	0 XOR 1 = 1	1 XOR 0 = 1	1 XOR 1 = 0

Gates

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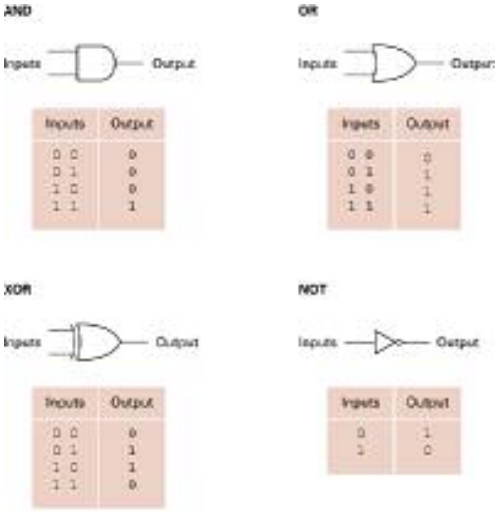
Figure 1.2 A pictorial representation of AND, OR, XOR, and NOT gates as well as their input and output values



storage techniques

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Main memory: cells

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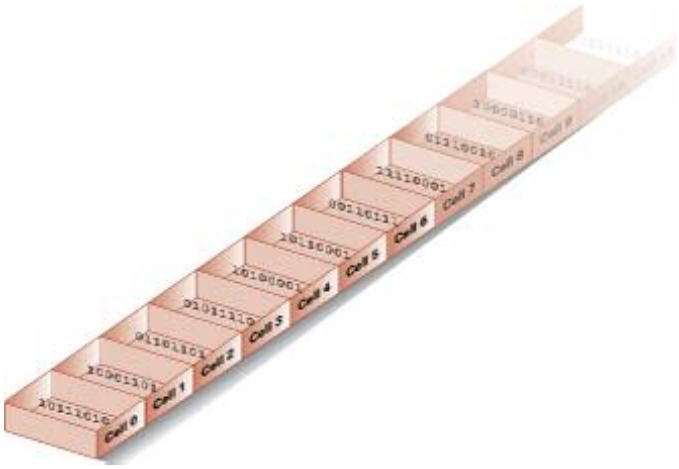
Figure 1.7 The organization of a byte-size memory cell

Main memory addresses

- “ ”
  ’
- “ ” “
  ”

Figure 1.8 Memory cells arranged by address



Measuring memory capacity: Not quite like the metric system

- “ ”
- “ ”
- “ ”

Mass Storage Systems

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Figure 1.9 A disk storage system

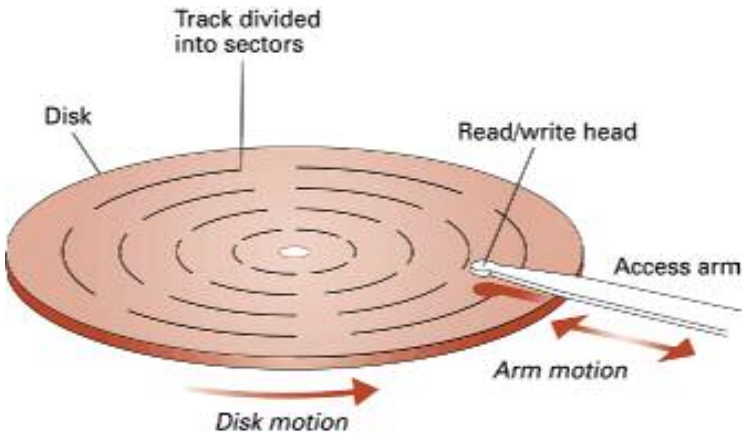


Figure 1.10 CD storage format

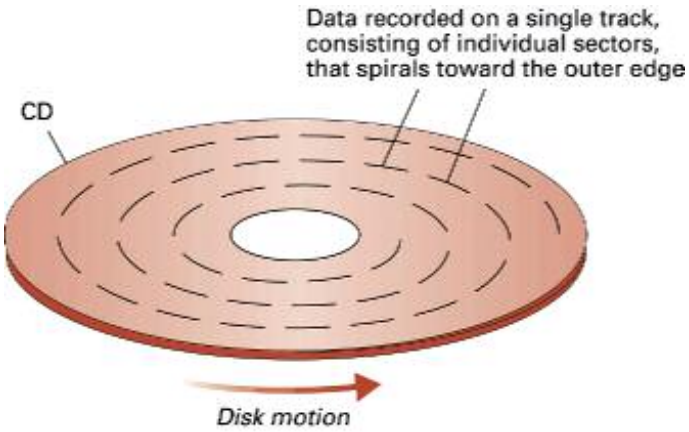
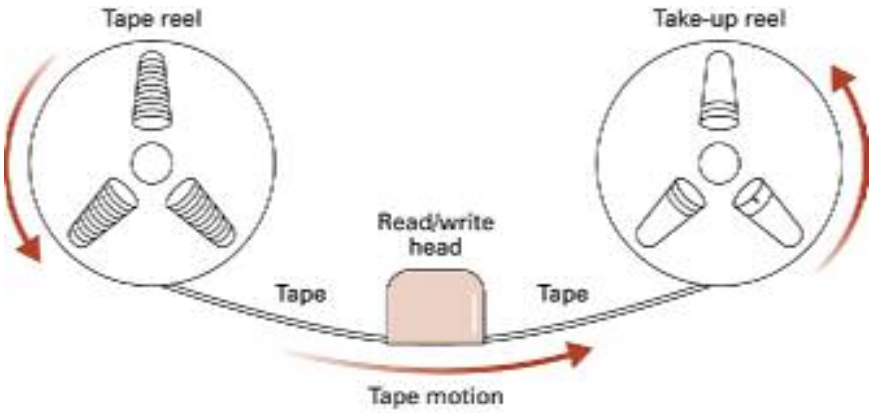


Figure 1.11 A magnetic tape storage mechanism



Files

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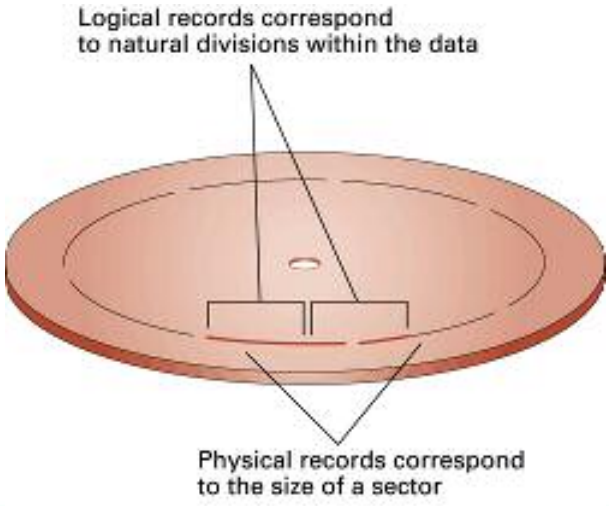
Figure 1.12 Logical records versus physical records on a disk



Representing text

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ASCII Values

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Figure 1.13 The message “Hello.” in ASCII

01001000	01100101	01101100	01101100	01101111	00101110
H	e	l	l	o	.

Representing numeric values

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Figure 1.15 The base ten and binary systems

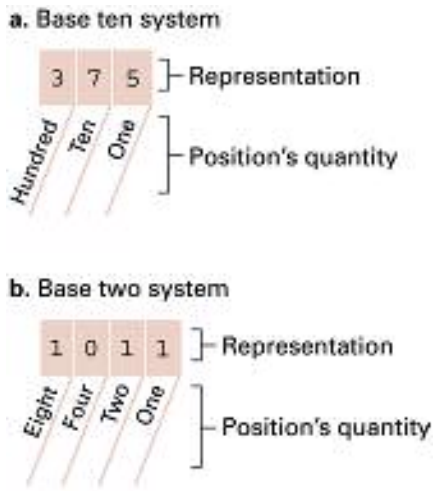


Figure 1.16 Decoding the binary representation 100101

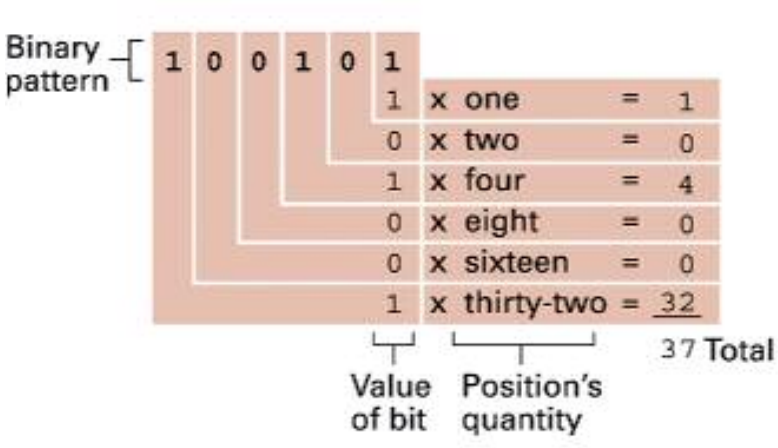
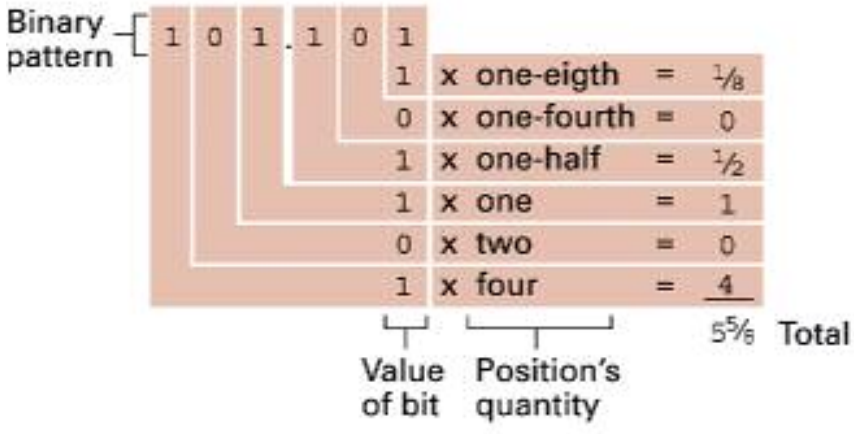


Figure 1.19 The binary addition facts

```
  0      1      0      1
+ 0    + 0    + 1    + 1
---    ---    ---    ---
  0      1      1     10
```


Figure 1.20 Decoding the binary representation 101.101



Representing Integers

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Figure 1.21 Two’s complement notation systems

a. Using patterns of length three

Bit pattern	Value represented
011	3
010	2
001	1
000	0
111	-1
110	-2
101	-3
100	-4

b. Using patterns of length four

Bit pattern	Value represented
0111	7
0110	6
0101	5
0100	4
0011	3
0010	2
0001	1
0000	0
1111	-1
1110	-2
1101	-3
1100	-4
1011	-5
1010	-6
1001	-7
1000	-8

Figure 1.22 Coding the value -6 in two's complement notation using four bits