The Journey Inside[SM]: Digital Information
Student Handout: ASCII Computer Code

ASCII Computer Code

Computers work in binary code. Information is coded using 0s and 1s. Each 0 or 1 is called a *bit*. In the early years of computer development, different computer companies applied the binary system in their own way. The code for the letters in the word “cat” was often different in different brands of computers.

Eventually, a set of standards was developed. Computer manufacturers agreed to use one code called the ASCII (American Standard Code for Information Interchange). ASCII is an 8-bit code. That is, it uses eight bits to represent a letter or a punctuation mark. Eight bits are called a byte. A binary code with eight digits, such as $1101\ 1011_2$, can be stored in one byte of computer memory. The word "CAT" in a word processor becomes $0100\ 0011_2$, $0100\ 0001_2$, and $0101\ 0100_2$. The word "cat" is $0110\ 0011_2$, $0110\ 0001_2$, and $0111\ 0100_2$.

Each letter, number, and symbol is represented by an 8-bit ASCII code. Part of the ASCII code is given in this handout. Notice that there is even an ASCII code for a blank space.

Character	Decimal Number	Binary Number	Character	Decimal Number	Binary Number
blank space	32	0010 0000	^	94	0101 1110
!	33	0010 0001	-	95	0101 1111
“	34	0010 0010	`	96	0110 0000
#	35	0010 0011	a	97	0110 0001
$	36	0010 0100	b	98	0110 0010
A	65	0100 0001	c	99	0110 0011
B	66	0100 0010	d	100	0110 0100
C	67	0100 0011	e	101	0110 0101
D	68	0100 0100	f	102	0110 0110
E	69	0100 0101	g	103	0110 0111
F	70	0100 0110	h	104	0110 1000
G	71	0100 0111	i	105	0110 1001
H	72	0100 1000	j	106	0110 1010
I	73	0100 1001	k	107	0110 1011
J	74	0100 1010	l	108	0110 1100
K	75	0100 1011	m	109	0110 1101
L	76	0100 1100	n	110	0110 1110
M	77	0100 1101	o	111	0110 1111
N	78	0100 1110	p	112	0111 0000
O	79	0100 1111	q	113	0111 0001
P	80	0101 0000	r	114	0111 0010
Q	81	0101 0001	s	115	0111 0011
R	82	0101 0010	t	116	0111 0100
S	83	0101 0011	u	117	0111 0101
T	84	0101 0100	v	118	0111 0110
U	85	0101 0101	w	119	0111 0111
V	86	0101 0110	x	120	0111 1000
W	87	0101 0111	y	121	0111 1001
X	88	0101 1000	z	122	0111 1010
Y	89	0101 1001	{	123	0111 1011
Z	90	0101 1010	|	124	0111 1100
[	91	0101 1011	}	125	0111 1101
/	92	0101 1100	~	126	0111 1110
]	93	0101 1101			

Activities

1. Use the ASCII code to write your first name or nickname in binary numbers beginning with an uppercase letter and continuing with lowercase letters. Put the letters of your name in the first column.

Letter	Binary representation of the letter							

2. On a separate sheet of paper, write a short message in ASCII. Exchange messages with a partner and decode each other's message.

3. The ASCII code for a blank space is the decimal number 32, or the binary number $0010\ 0000_2$. Why do you think it is important to have a code for a blank space?

4. How many characters of text are there in an average book? To help answer this question, select several different books of varying lengths. For each book, estimate the number of characters of text. Remember to count the punctuation marks and include the blank character between words and sentences. Since ASCII is an 8-bit code and requires 8 binary numbers to represent each letter, blank space, or punctuation mark, how many binary numbers does it take to represent the text of an average book? (Hint: Multiply 8 by the average number of text characters.)