

Digital Data (4)

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I) Representations of number.

Natural numbers (+0)

Integers

Rational numbers \rightarrow $\frac{\text{integer}}{\text{integer}}$

Real numbers

Scientific notation:

$\text{sign} \cdot \text{before the decimal point} \cdot \text{fractional value} \cdot 10^{\text{sign exponent}}$

example:

$+ 3 \cdot 1 \cdot 10^{+0}$

Simplification:

$\text{sign} \cdot \text{fractional value} \cdot 10^{\text{sign exponent}}$

example:

$+ 0.31 \cdot 10^{+1}$

Limit the representation of real numbers ②
 on 32 bits:

sign 1 bit

8 bits exponent

fractional value.

23 bits

Improving precision: representing real numbers on 64 bits:

sign 1 bit

11 bits exponent

fractional value.

52 bits.

Attention:



II) Representing text

We want to represent the 26 letters of the English alphabet on a computer.

a	Dec	5 bit representation (3)
b	1	□ □ □ □ □
.	2	
.	.	
.	.	
.	.	
.	.	
.	.	
.	.	
.	.	
Z	26	□ □ □ □ □

26 characters is not enough for actually representing correctly the English language.

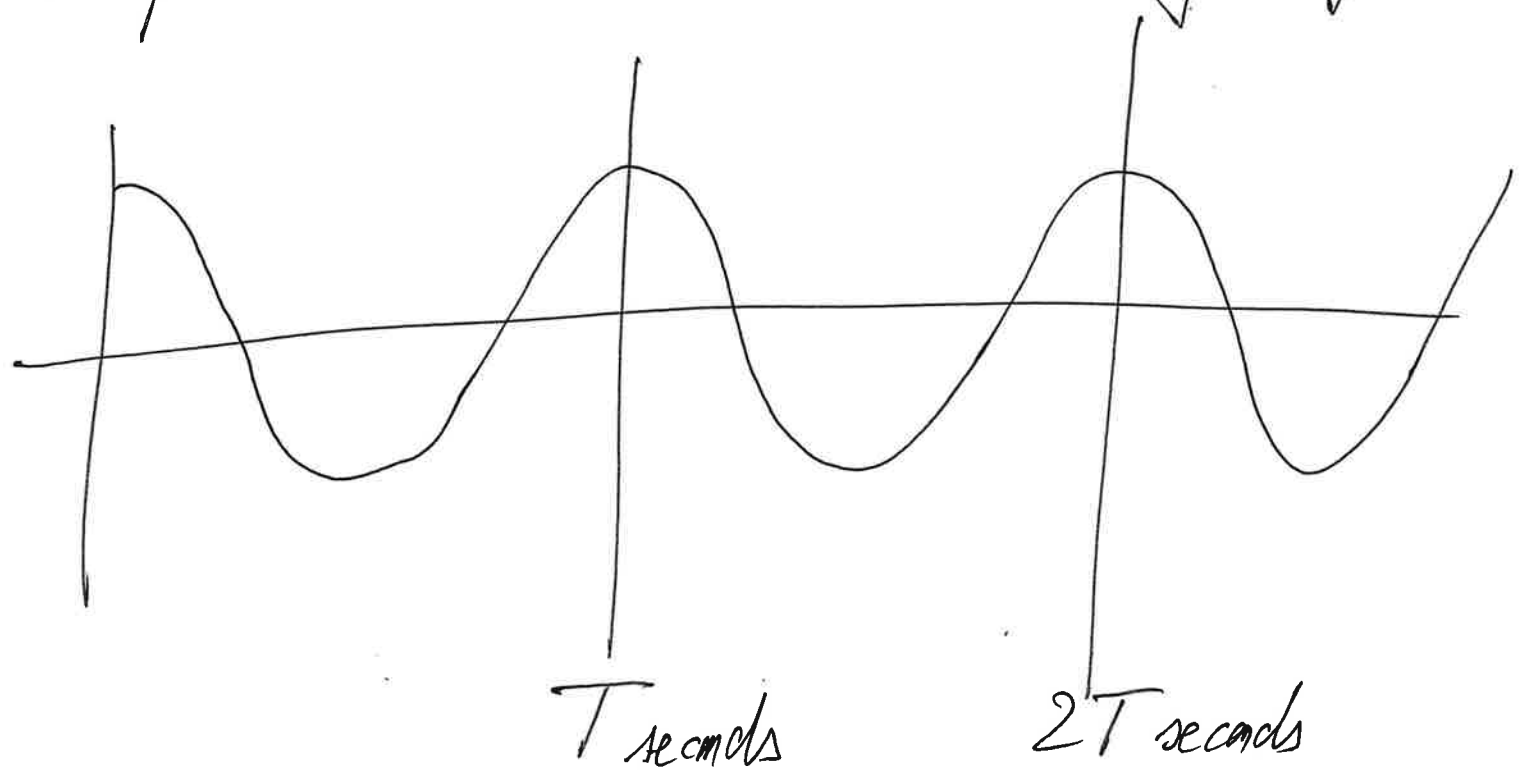
→ 128 characters

Defining the ASCII system:
only 128 characters.

Today most computers use an extended ASCII code, called UNICODE, with currently approximately 150,000 characters.

Sound and music

A pure sound is an oscillating signal:



In signal processing, T is given in the form $\frac{1}{f}$: frequency.

Unit of frequency: Hertz \Rightarrow Hz

Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
0	00	Null	32	20	Space	64	40	@	96	60	`
1	01	Start of heading	33	21	!	65	41	A	97	61	a
2	02	Start of text	34	22	"	66	42	B	98	62	b
3	03	End of text	35	23	#	67	43	C	99	63	c
4	04	End of transmit	36	24	\$	68	44	D	100	64	d
5	05	Enquiry	37	25	%	69	45	E	101	65	e
6	06	Acknowledge	38	26	&	70	46	F	102	66	f
7	07	Audible bell	39	27	'	71	47	G	103	67	g
8	08	Backspace	40	28	(	72	48	H	104	68	h
9	09	Horizontal tab	41	29	)	73	49	I	105	69	i
10	0A	Line feed	42	2A	*	74	4A	J	106	6A	j
11	0B	Vertical tab	43	2B	+	75	4B	K	107	6B	k
12	0C	Form feed	44	2C	,	76	4C	L	108	6C	l
13	0D	Carriage return	45	2D	-	77	4D	M	109	6D	m
14	0E	Shift out	46	2E	.	78	4E	N	110	6E	n
15	0F	Shift in	47	2F	/	79	4F	O	111	6F	o
16	10	Data link escape	48	30	0	80	50	P	112	70	p
17	11	Device control 1	49	31	1	81	51	Q	113	71	q
18	12	Device control 2	50	32	2	82	52	R	114	72	r
19	13	Device control 3	51	33	3	83	53	S	115	73	s
20	14	Device control 4	52	34	4	84	54	T	116	74	t
21	15	Neg. acknowledge	53	35	5	85	55	U	117	75	u
22	16	Synchronous idle	54	36	6	86	56	V	118	76	v
23	17	End trans. block	55	37	7	87	57	W	119	77	w
24	18	Cancel	56	38	8	88	58	X	120	78	x
25	19	End of medium	57	39	9	89	59	Y	121	79	y
26	1A	Substitution	58	3A	:	90	5A	Z	122	7A	z
27	1B	Escape	59	3B	;	91	5B	[	123	7B	{
28	1C	File separator	60	3C	<	92	5C	\	124	7C	|
29	1D	Group separator	61	3D	=	93	5D	]	125	7D	}
30	1E	Record separator	62	3E	>	94	5E	^	126	7E	~
31	1F	Unit separator	63	3F	?	95	5F	_	127	7F	□

