Digital Content

The Basics

- Data
  - Representation of entities using discrete symbols
  - Singular: datum
  - In computer terms, is not synonymous with information
    - Representation of data in “human-friendly” formats
- Data representation
  - The form imposed on data for use in the input-processing-output (IPO) cycle/s
  - Digital
    - Sequences and patterns of discrete digits
    - Binary
      - Sequences that contain patterns of only two possible states

- Most widely used type of digital representation
  - Examples:
    - Binary digits
      - representation using 0s and 1s
      - bit
        - The unit in the binary system that can be either 0 or 1
        - Derivative of BInary digiT
      - Storage medium used by the American Standard Code for Information Interchange (ASCII)
    - DC Electronics
      - Signals of 5 volts or 0(-0.2) volts
    - Optical
      - Signals of light pulses
    - Magnetic

        - Particles with varying positive and negative charges
- Analog
    - Sequences that may contain patterns of an infinite set of values
        - Examples
            - Vinyl records
                - Infinite variability in groove depth and contour
            - Physical art mediums and film
                - Infinite color combinations and exposures
            - Dial readouts
                - Infinite degree readings
- Digitization
- Recording or storage of data in a digital format
- Can be used of both
    - retroactive conversion of stored analog information

        - Capture of real-time information
- Digital File (File)
    - A uniquely-named reproducible collection of data
    - Stored on one of the above mentioned digital storage mediums
        - Magnetic, optical, binary
    - Format
        - Indicates the type of data and the method of encoding
        - Denoted by the file name extension
            - a sequence preceded by a period (.) which may be appended to the file name

Data Representation

- Numbers
    - Numeric data: the set of values used in arithmetic operations
        - The real numbers (integers, floating-point numbers)

- Stored in the computer using the binary number system
  - A position may contain only two possible values (0,1)
    - Compare with the decimal number system, which has 10 possible values (0-9) for a given position in the number
  - Expansion of orders of units occurs more rapidly than a decimal equivalent

Decimal (Base 10)	Binary (Base 2)	10^n	2^n
000	0000	009	1001
001	0001	010	1010
002	0010	011	1011
003	0011	012	1011
004	0100	013	1100
005	0101	014	1101
006	0110	015	1111
007	0111	016	0001 0000
008	1000	1,000	0011 1110 1000

- Text
  - Character data
    - All symbols that are not used in arithmetic calculations
    - Numerals are included in textual information, but they are for viewing purposes only, no computations will be performed
  - Represented by two major coding standards
    - ASCII /ˈæski/
      - Stored symbol information in 7 bits chunks
      - Provides codes for 128 symbols (2^7)
      - Stored in a "*.txt" file
        - *: "wildcard character, meaning any file with the .txt extension
      - Extended ASCII
        - Superset of ASCII

        - Uses eight bits for each character
        - Allows for the coding of 256 characters (2^8)
    - Unicode /ˈjunɪˌkoʊd/
        - Uses 16 bits to store symbols
        - 2^{16} = 65,536 characters
        - UTF-8
            - variable-length coding scheme
            - Uses ASCII as a baseline approach for common characters
            - Will use Unicode characters as needed
- Simple ASCII text files are not formatted for efficient human viewing
    - Codes must be embedded in the file, which programs will interpret appropriately and display the information properly.
        - Resulting modified text files take on different file extensions.
            - MS Word text editor: .docx files

- Adobe Acrobat reader: .pdf
- HTML markup language for web page production: .html
- Ebook: .epub

- May be added directly to the document directly within the text stream.
  - Using a delimiter
    - special character that signifies the difference between the formatting characters and plain text.
    - Commonly-used delimiters include slashes (//) and angle brackets (< >)

- Digitizing analog textual "hard-copy" information
  - Manual data entry
  - Optical scan
    - Will result in one of two results
      - Graphics format file
        - Can only be edited by an image editor only, not a text editor

- OCR format
  - Optical character recognition
    - Interprets the textual information, and determines the correct ASCII code to apply to the characters
    - Outputs a file that can be edited by a word processor.

Dec	Oct	Hex	Binary	Value	Description	Dec	Oct	Hex	Binary	Value	Description
000	000	00	0000 0000	NUL	"null" character	019	023	13	0001 0011	DC3	device control 3 (XOFF)
001	001	01	0000 0001	SOH	start of header	020	024	14	0001 0100	DC4	device control 4
002	002	02	0000 0010	STX	start of text	021	025	15	0001 0101	NAK	negative acknowledgment
003	003	03	0000 0011	ETX	end of text	022	026	16	0001 0110	SYN	synchronous idle
004	004	04	0000 0100	EOT	end of transmission	023	027	17	0001 0111	ETB	end of transmission block
005	005	05	0000 0101	ENQ	enquiry	024	030	18	0001 1000	CAN	cancel
006	006	06	0000 0110	ACK	acknowledgment	025	031	19	0001 1001	EM	end of medium
007	007	07	0000 0111	BEL	bell	026	032	1A	0001 1010	SUB	substitute
008	010	08	0000 1000	BS	backspace	027	033	1B	0001 1011	ESC	escape
009	011	09	0000 1001	HT	horizontal tab	028	034	1C	0001 1100	FS	file separator
010	012	0A	0000 1010	LF	line feed	029	035	1D	0001 1101	GS	group separator
011	013	0B	0000 1011	VT	vertical tab	030	036	1E	0001 1110	RS	request to send/record separator
012	014	0C	0000 1100	FF	form feed	031	037	1F	0001 1111	US	unit separator
013	015	0D	0000 1101	CR	carriage return	032	040	20	0010 0000	SP	space
014	016	0E	0000 1110	SO	shift out	033	041	21	0010 0001	!	exclamation mark
015	017	0F	0000 1111	SI	shift in	034	042	22	0010 0010	"	double quote
016	020	10	0001 0000	DLE	data link escape	035	043	23	0010 0011	#	number sign
017	021	11	0001 0001	DC1	device control 1 (XON)	036	044	24	0010 0100	$	dollar sign
018	022	12	0001 0010	DC2	device control 2	037	045	25	0010 0101	%	percent

038	046	26	0010 0110	&	ampersand	058	072	3A	0011 1010	:	colon
039	047	27	0010 0111	'	single quote	059	073	3B	0011 1011	;	semi-colon
040	050	28	0010 1000	(	left/opening parenthesis	060	074	3C	0011 1100	<	less than
041	051	29	0010 1001	)	right/closing parenthesis	061	075	3D	0011 1101	=	equal sign
042	052	2A	0010 1010	*	asterisk	062	076	3E	0011 1110	>	greater than
043	053	2B	0010 1011	+	plus	063	077	3F	0011 1111	?	question mark
044	054	2C	0010 1100	,	comma	064	100	40	0100 0000	@	"at" symbol
045	055	2D	0010 1101	-	minus or dash	065	101	41	0100 0001	A	
046	056	2E	0010 1110	.	dot	066	102	42	0100 0010	B	
047	057	2F	0010 1111	/	forward slash	067	103	43	0100 0011	C	
048	060	30	0011 0000	0		068	104	44	0100 0100	D	
049	061	31	0011 0001	1		069	105	45	0100 0101	E	
050	062	32	0011 0010	2		070	106	46	0100 0110	F	
051	063	33	0011 0011	3		071	107	47	0100 0111	G	
052	064	34	0011 0100	4		072	110	48	0100 1000	H	
053	065	35	0011 0101	5		073	111	49	0100 1001	I	
054	066	36	0011 0110	6		074	112	4A	0100 1010	J	
055	067	37	0011 0111	7		075	113	4B	0100 1011	K	
056	070	38	0011 1000	8		076	114	4C	0100 1100	L	
057	071	39	0011 1001	9		077	115	4D	0100 1101	M	

078	116	4E	0100 1110	N		098	142	62	0110 0010	b
079	117	4F	0100 1111	O		099	143	63	0110 0011	c
080	120	50	0101 0000	P		100	144	64	0110 0100	d
081	121	51	0101 0001	Q		101	145	65	0110 0101	e
082	122	52	0101 0010	R		102	146	66	0110 0110	f
083	123	53	0101 0011	S		103	147	67	0110 0111	g
084	124	54	0101 0100	T		104	150	68	0110 1000	h
085	125	55	0101 0101	U		105	151	69	0110 1001	i
086	126	56	0101 0110	V		106	152	6A	0110 1010	j
087	127	57	0101 0111	W		107	153	6B	0110 1011	k
088	130	58	0101 1000	X		108	154	6C	0110 1100	l
089	131	59	0101 1001	Y		109	155	6D	0110 1101	m
090	132	5A	0101 1010	Z		110	156	6E	0110 1110	n
091	133	5B	0101 1011	[	left/opening bracket	111	157	6F	0110 1111	o
092	134	5C	0101 1100	\	back slash	112	160	70	0111 0000	p
093	135	5D	0101 1101	]	right/closing bracket	113	161	71	0111 0001	q
094	136	5E	0101 1110	^	caret/circumflex	114	162	72	0111 0010	r
095	137	5F	0101 1111	_	underscore	115	163	73	0111 0011	s
096	140	60	0110 0000	`		116	164	74	0111 0100	t
097	141	61	0110 0001	a		117	165	75	0111 0101	u

118	166	76	0111 0110	v		138	212	8A	1000 1010	è	letter e with grave
119	167	77	0111 0111	w		139	213	8B	1000 1011	ï	letter i with diaeresis
120	170	78	0111 1000	x		140	214	8C	1000 1100	î	letter i with circumflex
121	171	79	0111 1001	y		141	215	8D	1000 1101	ì	letter i with grave
122	172	7A	0111 1010	z		142	216	8E	1000 1110	Ä	capital letter a with diaeresis
123	173	7B	0111 1011	{	left/opening brace	143	217	8F	1000 1111	Å	capital letter a with ring above
124	174	7C	0111 1100	|	vertical bar	144	220	90	1001 0000	É	capital letter e with acute
125	175	7D	0111 1101	}	right/closing brace	145	221	91	1001 0001	æ	letter ae
126	176	7E	0111 1110	~	tilde	146	222	92	1001 0010	Æ	capital letter ae
127	177	7F	0111 1111	DEL	delete	147	223	93	1001 0011	ô	letter o with circumflex
128	200	80	1000 0000	Ç	capital letter c with cedilla	148	224	94	1001 0100	ö	letter o with diaeresis
129	201	81	1000 0001	ü	letter u with diaeresis	149	225	95	1001 0101	ò	letter o with grave
130	202	82	1000 0010	é	letter e with acute	150	226	96	1001 0110	û	letter u with circumflex
131	203	83	1000 0011	â	letter a with circumflex	151	227	97	1001 0111	ù	letter u with grave
132	204	84	1000 0100	ä	letter a with diaeresis	152	230	98	1001 1000	ÿ	letter y with diaeresis
133	205	85	1000 0101	à	letter a with grave	153	231	99	1001 1001	Ö	capital letter o with diaeresis
134	206	86	1000 0110	å	letter a with ring above	154	232	9A	1001 1010	Ü	capital letter u with diaeresis
135	207	87	1000 0111	ç	letter c with cedilla	155	233	9B	1001 1011	¢	letter o with stroke
136	210	88	1000 1000	ê	letter e with circumflex	156	234	9C	1001 1100	£	pound sign
137	211	89	1000 1001	ë	letter e with diaeresis	157	235	9D	1001 1101	¥	yen sign

158	236	9E	1001 1110	₧	peseta sign	178	262	B2	1011 0010	▓	dark shade
159	237	9F	1001 1111	ƒ	letter f with hook	179	263	B3	1011 0011	│	single vertical
160	240	A0	1010 0000	á	letter a with acute	180	264	B4	1011 0100	┤	single vertical and left
161	241	A1	1010 0001	í	letter i with acute	181	265	B5	1011 0101	╡	single vertical and double left
162	242	A2	1010 0010	ó	letter o with acute	182	266	B6	1011 0110	╢	double vertical and single left
163	243	A3	1010 0011	ú	letter u with acute	183	267	B7	1011 0111	╖	double down and single left
164	244	A4	1010 0100	ñ	letter n with tilde	184	270	B8	1011 1000	╕	single down and double left
165	245	A5	1010 0101	Ñ	capital letter n with tilde	185	271	B9	1011 1001	╣	double vertical and left
166	246	A6	1010 0110	ª	feminine ordinal indicator	186	272	BA	1011 1010	║	double vertical
167	247	A7	1010 0111	º	masculine ordinal indicator	187	273	BB	1011 1011	╗	double down and left
168	250	A8	1010 1000	¿	inverted question mark	188	274	BC	1011 1100	╝	double up and left
169	251	A9	1010 1001	⌐	reversed not sign	189	275	BD	1011 1101	╜	double up and single left
170	252	AA	1010 1010	¬	not sign	190	276	BE	1011 1110	╛	single up and double left
171	253	AB	1010 1011	½	one half	191	277	BF	1011 1111	┐	single down and left
172	254	AC	1010 1100	¼	one quarter	192	300	C0	1100 0000	└	single up and right
173	255	AD	1010 1101	¡	inverted exclamation mark	193	301	C1	1100 0001	┴	single up and horizontal
174	256	AE	1010 1110	«	left double angle quotation mark	194	302	C2	1100 0010	┬	single down and horizontal
175	257	AF	1010 1111	»	right double angle quotation mark	195	303	C3	1100 0011	├	single vertical and right
176	260	B0	1011 0000	░	light shade	196	304	C4	1100 0100	─	single horizontal
177	261	B1	1011 0001	▒	medium shade	197	305	C5	1100 0101	┼	single vertical and horizontal

198	306	C6	1100 0110	╞	single vertical and double right	218	332	DA	1101 1010	┌	single down and right
199	307	C7	1100 0111	╟	double vertical and single right	219	333	DB	1101 1011		full block
200	310	C8	1100 1000	╚	double up and right	220	334	DC	1101 1100		bottom half block
201	311	C9	1100 1001	╔	double down and right	221	335	DD	1101 1101		left half block
202	312	CA	1100 1010	╩	double up and horizontal	222	336	DE	1101 1110		right half block
203	313	CB	1100 1011	╦	double down and horizontal	223	337	DF	1101 1111		top half block
204	314	CC	1100 1100	╠	double vertical and right	224	340	E0	1110 0000	α	greek letter alpha
205	315	CD	1100 1101	═	double horizontal	225	341	E1	1110 0001	ß	letter sharp s
206	316	CE	1100 1110	╬	double vertical and horizontal	226	342	E2	1110 0010	Γ	greek capital letter gamma
207	317	CF	1100 1111	╧	single up and double horizontal	227	343	E3	1110 0011	π	greek letter pi
208	320	D0	1101 0000	╨	double up and single horizontal	228	344	E4	1110 0100	Σ	greek capital letter sigma
209	321	D1	1101 0001	╤	single down and double horizontal	229	345	E5	1110 0101	σ	greek letter sigma
210	322	D2	1101 0010	╥	double down and single horizontal	230	346	E6	1110 0110	µ	micro sign
211	323	D3	1101 0011	╙	double up and single right	231	347	E7	1110 0111	τ	greek letter tau
212	324	D4	1101 0100	╘	single up and double right	232	350	E8	1110 1000	Φ	greek capital letter phi
213	325	D5	1101 0101	╒	single down and double right	233	351	E9	1110 1001	Θ	greek capital letter theta
214	326	D6	1101 0110	╓	double down and single right	234	352	EA	1110 1010	Ω	greek capital letter omega
215	327	D7	1101 0111	╫	double vertical and single horizontal	235	353	EB	1110 1011	δ	greek letter delta
216	330	D8	1101 1000	╪	single vertical and double horizontal	236	354	EC	1110 1100	∞	infinity
217	331	D9	1101 1001	┘	single up and left	237	355	ED	1110 1101	φ	greek letter phi

238	356	EE	1110 1110	ε	greek letter epsilon
239	357	EF	1110 1111	∩	intersection
240	360	F0	1111 0000	≡	identical to
241	361	F1	1111 0001	±	plus-minus sign
242	362	F2	1111 0010	≥	greater than or equal to
243	363	F3	1111 0011	≤	less than or equal to
244	364	F4	1111 0100	⌠	top half integral
245	365	F5	1111 0101	⌡	bottom half integral
246	366	F6	1111 0110	÷	division sign
247	367	F7	1111 0111	≈	almost equal to
248	370	F8	1111 1000	°	degree sign
249	371	F9	1111 1001	∙	bullet operator
250	372	FA	1111 1010	·	middle dot
251	373	FB	1111 1011	√	square root
252	374	FC	1111 1100	ⁿ	superscript n
253	375	FD	1111 1101	²	superscript 2
254	376	FE	1111 1110	■	black square
255	377	FF	1111 1111		no-break space

Resources

Parsons, June. Computer Concepts 2016: https://www.cengage.com/c/new-perspectives-computer-concepts-2016-enhanced-introductory-19e-parsons/9781305656291/

Discrete Math playlist

Online ASCII Chart