

[illegible]

# Due this week

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- **Homework 3**

- Write solutions in VSCode and paste in Autograder, **Homework 3 CodeRunner**.
- Zip your .cpp files and submit on canvas **Homework 3**. Check the due date! **No late submissions!!**

# The ENIGMA and Bombe - Story of Alan Turing

- This was a cipher device used by the German military during WW2.
- Used by the German military to send secret messages to troops/control room
- Understanding and decoding these messages was the work of a brilliant mathematician Alan Turing!



# Well... what's ASCII all about?

- Essentially what Alan Turing accomplished was understanding the German secret encoding scheme!
- ASCII is an encoding scheme (much simpler and trivial). In simpler words, every character like alphabets, digits, other symbols are assigned a unique number. Why??
- Much of computers developed earlier, faced a unique challenge.
  - How to universally accept what each character means.
  - Lack of a standard resulted in much confusion amongst manufacturers

Dec	Hex	Name	Char	Ctrl-char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
0	0	Null	NUL	CTRL-@	32	20	Space	64	40	@	96	60	`
1	1	Start of heading	SOH	CTRL-A	33	21	!	65	41	A	97	61	a
2	2	Start of text	STX	CTRL-B	34	22	"	66	42	B	98	62	b
3	3	End of text	ETX	CTRL-C	35	23	#	67	43	C	99	63	c
4	4	End of xmit	EOT	CTRL-D	36	24	\$	68	44	D	100	64	d
5	5	Enquiry	ENQ	CTRL-E	37	25	%	69	45	E	101	65	e
6	6	Acknowledge	ACK	CTRL-F	38	26	&	70	46	F	102	66	f
7	7	Bell	BEL	CTRL-G	39	27	'	71	47	G	103	67	g
8	8	Backspace	BS	CTRL-H	40	28	(	72	48	H	104	68	h
9	9	Horizontal tab	HT	CTRL-I	41	29	)	73	49	I	105	69	i
10	0A	Line feed	LF	CTRL-J	42	2A	*	74	4A	J	106	6A	j
11	0B	Vertical tab	VT	CTRL-K	43	2B	+	75	4B	K	107	6B	k
12	0C	Form feed	FF	CTRL-L	44	2C	,	76	4C	L	108	6C	l
13	0D	Carriage feed	CR	CTRL-M	45	2D	-	77	4D	M	109	6D	m
14	0E	Shift out	SO	CTRL-N	46	2E	.	78	4E	N	110	6E	n
15	0F	Shift in	SI	CTRL-O	47	2F	/	79	4F	O	111	6F	o
16	10	Data line escape	DLE	CTRL-P	48	30	0	80	50	P	112	70	p
17	11	Device control 1	DC1	CTRL-Q	49	31	1	81	51	Q	113	71	q
18	12	Device control 2	DC2	CTRL-R	50	32	2	82	52	R	114	72	r
19	13	Device control 3	DC3	CTRL-S	51	33	3	83	53	S	115	73	s
20	14	Device control 4	DC4	CTRL-T	52	34	4	84	54	T	116	74	t
21	15	Neg acknowledge	NAK	CTRL-U	53	35	5	85	55	U	117	75	u
22	16	Synchronous idle	SYN	CTRL-V	54	36	6	86	56	V	118	76	v
23	17	End of xmit block	ETB	CTRL-W	55	37	7	87	57	W	119	77	w
24	18	Cancel	CAN	CTRL-X	56	38	8	88	58	X	120	78	x
25	19	End of medium	EM	CTRL-Y	57	39	9	89	59	Y	121	79	y
26	1A	Substitute	SUB	CTRL-Z	58	3A	:	90	5A	Z	122	7A	z
27	1B	Escape	ESC	CTRL-[	59	3B	;	91	5B	[	123	7B	{
28	1C	File separator	FS	CTRL-\	60	3C	<	92	5C	\	124	7C	
29	1D	Group separator	GS	CTRL-]	61	3D	=	93	5D	]	125	7D	}
30	1E	Record separator	RS	CTRL-^	62	3E	>	94	5E	^	126	7E	~
31	1F	Unit separator	US	CTRL-~	63	3F	?	95	5F	_	127	7F	DEL



Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
128	80	Ç	160	A0	á	192	C0	Ł	224	E0	α
129	81	ü	161	A1	í	193	C1	ł	225	E1	β
130	82	ê	162	A2	ó	194	C2	ṭ	226	E2	Γ
131	83	â	163	A3	ú	195	C3	ṭ	227	E3	π
132	84	ä	164	A4	ñ	196	C4	—	228	E4	Σ
133	85	à	165	A5	Ñ	197	C5	†	229	E5	σ
134	86	â	166	A6	•	198	C6	†	230	E6	μ
135	87	ç	167	A7	•	199	C7	†	231	E7	ι
136	88	ê	168	A8	ł	200	C8	†	232	E8	φ
137	89	ë	169	A9	ı	201	C9	†	233	E9	Θ
138	8A	è	170	AA	ı	202	CA	†	234	EA	Ω
139	8B	ı	171	AB	½	203	CB	†	235	EB	δ
140	8C	î	172	AC	¼	204	CC	†	236	EC	∞
141	8D	ı	173	AD	ı	205	CD	=	237	ED	φ
142	8E	Ä	174	AE	ı	206	CE	†	238	EE	ε
143	8F	Å	175	AF	>	207	CF	†	239	EF	Ω
144	90	E	176	B0	⌘	208	D0	†	240	FO	≡
145	91	æ	177	B1	⌘	209	D1	†	241	F1	±
146	92	Æ	178	B2	⌘	210	D2	†	242	F2	≥
147	93	δ	179	B3	—	211	D3	†	243	F3	≤
148	94	ö	180	B4	†	212	D4	Ö	244	F4	ı
149	95	ò	181	B5	†	213	D5	†	245	F5	ı
150	96	û	182	B6	†	214	D6	†	246	F6	ı
151	97	ù	183	B7	†	215	D7	†	247	F7	ı
152	98	γ	184	B8	†	216	D8	†	248	F8	ı
153	99	Ô	185	B9	†	217	D9	†	249	F9	ı
154	9A	Û	186	BA	†	218	DA	†	250	FA	ı
155	9B	φ	187	BB	†	219	DB	■	251	FB	√
156	9C	£	188	BC	†	220	DC	■	252	FC	ı
157	9D	¥	189	BD	†	221	DD	■	253	FD	ı
158	9E	Ps	190	BE	†	222	DE	■	254	FE	■
159	9F	f	191	BF	ı	223	DF	■	255	FF	

# Just an example - Enigma

- What did Enigma do to a text like “Hello World”

H	e	l	l	o		W	o	r	l	d
K	j	c	c	f		E	f	i	c	q

# What ASCII would do...

H	e	l	l	o		W	o	r	l	d
72	101	108	108	111		87	111	114	108	100



# Hmm... Where could this stuff be used?

## Create a password

Enter the password you would like to use with your account.

Passwords must have at least 8 characters and contain at least two of the following: uppercase letters, lowercase letters, numbers, and symbols.

abc

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☒ Show password

Next

- We've seen this before, when we try to use a weak password!
- The website is complaining about the password not being strong enough!

# A larger encoding scheme: The Unicode (*unique-code*)

- Was 256 numbers sufficient? Absolutely not!
- A much larger encoding scheme termed as Unicode came about in 1991.
- What did it do?
  - Gave about 100,000 characters, a unique number.
  - Characters from all known languages are also assigned a number.
  - Even your emoji's like 🤪 have a unique number assigned to them
- Well, encoding schemes like ASCII and Unicode exist (in your computers) so that you can send/receive data to other devices and have the other device understand it the same way you do!