Review

Introduction to Character & String Data Types

Character Data Type `char`

- In Java **`char`** type is a 2 bytes (16 bit) integer
- The following statement declares a **`char`** type and initialize it with the letter 'A'. Any character confined between single quotes is called a character constant:

```
char my_letter = 'A';
```

- Since every data, including characters must be converted to patterns of zeros and ones, for each character there is an equivalent ASCII number (code).
- For example the ASCII value of letter 'A' is 65.

A Small Portion of ASCII Table

- BINARY DECIMAL GLYPH

BINARY	DECIMAL	GLYPH
0100 0001	65	A
0100 0010	66	B
0100 0011	67	C
…		
0011 0000	48	0
0011 0001	49	1
0011 0010	50	2
…		
0011 1010	58	:
0011 1011	59	;
0011 1100	60	<

Binary data is usually presented
In hexadecimal form for shorthand

ASCII Table

Dec	Hx	Oct	Char	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr
0	0	000	NUL (null)	32	20	040		Space	64	40	100	@	@	96	60	140	`	`
1	1	001	SOH (start of heading)	33	21	041	!	!	65	41	101	A	A	97	61	141	a	a
2	2	002	STX (start of text)	34	22	042	"	"	66	42	102	B	B	98	62	142	b	b
3	3	003	ETX (end of text)	35	23	043	#	#	67	43	103	C	C	99	63	143	c	c
4	4	004	EOT (end of transmission)	36	24	044	$	$	68	44	104	D	D	100	64	144	d	d
5	5	005	ENQ (enquiry)	37	25	045	%	%	69	45	105	E	E	101	65	145	e	e
6	6	006	ACK (acknowledge)	38	26	046	&	&	70	46	106	F	F	102	66	146	f	f
7	7	007	BEL (bell)	39	27	047	'	'	71	47	107	G	G	103	67	147	g	g
8	8	010	BS (backspace)	40	28	050	(	(	72	48	110	H	H	104	68	150	h	h
9	9	011	TAB (horizontal tab)	41	29	051	)	)	73	49	111	I	I	105	69	151	i	i
10	A	012	LF (NL line feed, new line)	42	2A	052	*	*	74	4A	112	J	J	106	6A	152	j	j
11	B	013	VT (vertical tab)	43	2B	053	+	+	75	4B	113	K	K	107	6B	153	k	k
12	C	014	FF (NP form feed, new page)	44	2C	054	,	,	76	4C	114	L	L	108	6C	154	l	l
13	D	015	CR (carriage return)	45	2D	055	-	-	77	4D	115	M	M	109	6D	155	m	m
14	E	016	SO (shift out)	46	2E	056	.	.	78	4E	116	N	N	110	6E	156	n	n
15	F	017	SI (shift in)	47	2F	057	/	/	79	4F	117	O	O	111	6F	157	o	o
16	10	020	DLE (data link escape)	48	30	060	0	0	80	50	120	P	P	112	70	160	p	p
17	11	021	DC1 (device control 1)	49	31	061	1	1	81	51	121	Q	Q	113	71	161	q	q
18	12	022	DC2 (device control 2)	50	32	062	2	2	82	52	122	R	R	114	72	162	r	r
19	13	023	DC3 (device control 3)	51	33	063	3	3	83	53	123	S	S	115	73	163	s	s
20	14	024	DC4 (device control 4)	52	34	064	4	4	84	54	124	T	T	116	74	164	t	t
21	15	025	NAK (negative acknowledge)	53	35	065	5	5	85	55	125	U	U	117	75	165	u	u
22	16	026	SYN (synchronous idle)	54	36	066	6	6	86	56	126	V	V	118	76	166	v	v
23	17	027	ETB (end of trans. block)	55	37	067	7	7	87	57	127	W	W	119	77	167	w	w
24	18	030	CAN (cancel)	56	38	070	8	8	88	58	130	X	X	120	78	170	x	x
25	19	031	EM (end of medium)	57	39	071	9	9	89	59	131	Y	Y	121	79	171	y	y
26	1A	032	SUB (substitute)	58	3A	072	:	:	90	5A	132	Z	Z	122	7A	172	z	z
27	1B	033	ESC (escape)	59	3B	073	;	;	91	5B	133	[	[	123	7B	173	{	{
28	1C	034	FS (file separator)	60	3C	074	<	<	92	5C	134	\	\	124	7C	174			|
29	1D	035	GS (group separator)	61	3D	075	=	=	93	5D	135	]	]	125	7D	175	}	}
30	1E	036	RS (record separator)	62	3E	076	>	>	94	5E	136	^	^	126	7E	176	~	~
31	1F	037	US (unit separator)	63	3F	077	?	?	95	5F	137	_	_	127	7F	177	&#127;	DEL

Character Data Type `char`

- The same mathematical operations that work on integers also work on characters.
- **Example:**

  What is the output of the following code?

```
char ltr;
ltr = 'A' + 1;
System.out.println(ltr);
```

B

String Data Type

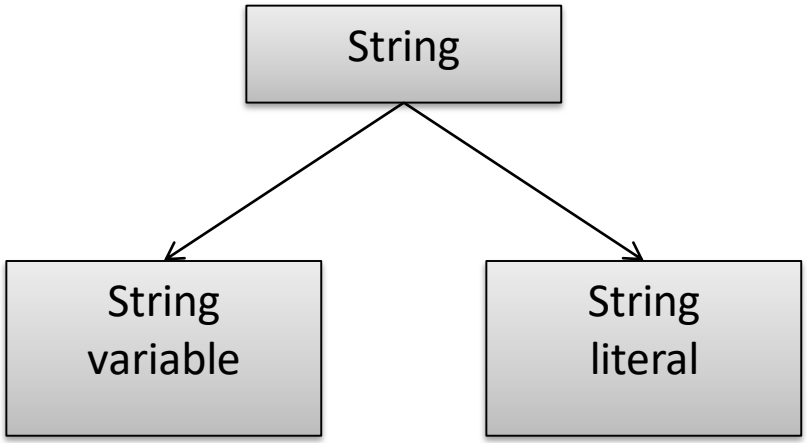
Definition of Strings

- A string is
  - A sequence of letters (characters)
  - A variable containing a sequence of letters
- **Example 1:**

```
"AB34"
"James Bond"
"12.T3"
```

- **Example 2:**

```
string  fname;
```

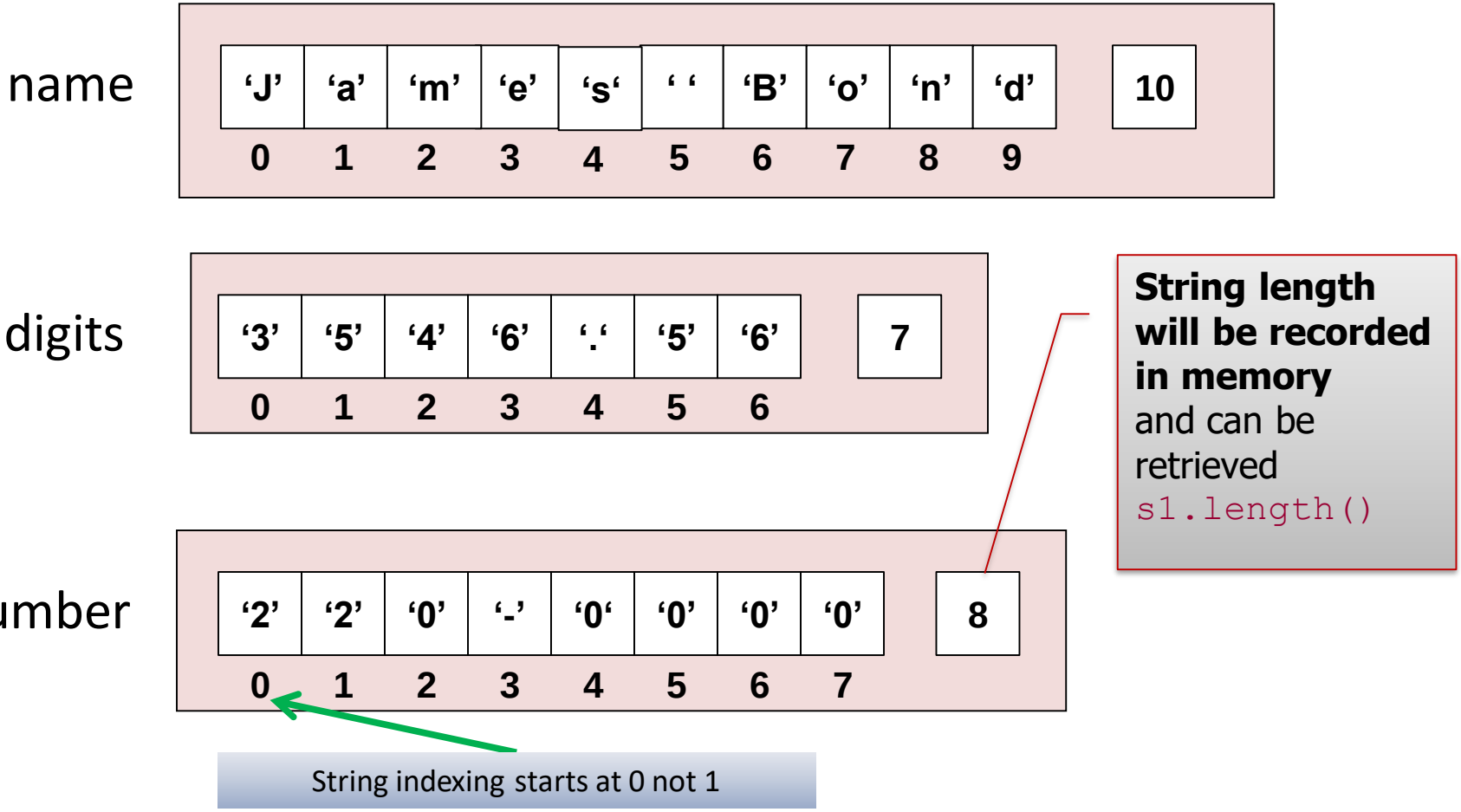


String in Java

- String declaration:

```
String name = "James Bond";
String digits = "3546.56";
String phoneNumber = "220-0000";
```

Strings in Computer Memory



String Methods

- length()
- charAt()
- indexOf()
- equals()
- substring()
- toLowerCase()
- toUpperCase()

length()

```
String s = "ENGG 233";

int size = s.length();

System.out.println(s.length());
```

charAt()

```
String s = "ENGG 233";

char ch = s.charAt(1);

System.out.println(s.charAt(1));
```

`String` Concatenation

- To concatenate two strings s1 and s2:

```
String s1 = "(403)-";
String s2 = "220";
String s3;
s3 = s1 + s2;
System.out.println(s3);
```

- The above code segment prints:

```
(403)-220
```

- You can also use += operator to concatenate string:

```
s3 +="-0000";
System.out.println(s3);
```

- Now, prints: (403)-220-0000