

Today:

- Pointer recap
- Arrays of pointers

Computer Programming 143 – Lecture 21

Pointers V

Faculty of Engineering



Variables, pointers, bytes and malloc

```
int x = 9014;
char y = 'a';
printf("%d", x);
```



```
int *foo;
foo = &x;
printf("%d", *foo);
```

`foo`
(int)

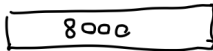


```
double *foo2;
foo2 = malloc(sizeof(double));
*foo2 = 16.5;
```

`foo2`
(double)



`foo3`
(int)



```
int *foo3;
foo3 = malloc(2 * sizeof(int));
*foo3 = 7; // foo3[0] = 7;
*(foo3 + 1) = 9; // foo3[1] = 9;
```

```
free(foo2);
```

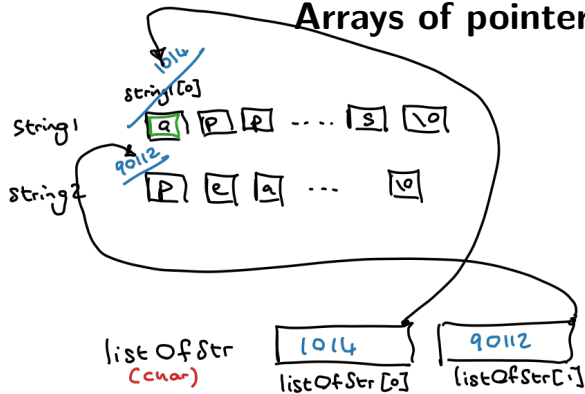
1 byte = 8 bits

Sizes

char	1 byte
int	4 bytes
float	4 bytes
double	8 bytes
address	8 bytes

On 64-bit machine

Arrays of pointers

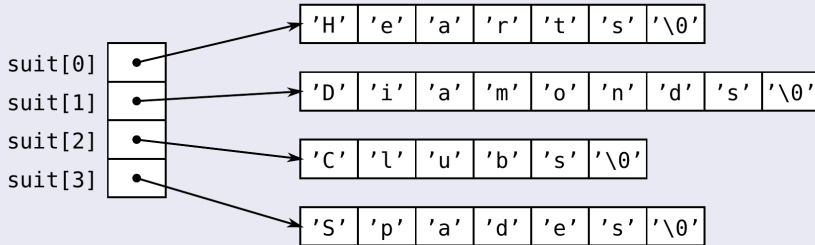


7.10 Arrays of Pointers

Array of strings

```
const char *suit[ 4 ] = { "Hearts", "Diamonds", "Clubs", "Spades" };
```

- Declares an array of 4 pointers to type char
- Initialises 4 strings and assigns the addresses of the first characters to the 4 pointers

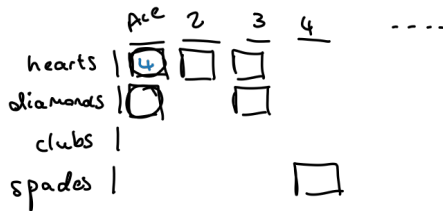


7.11 Card Shuffling and Dealing I

Problem statement

Design and implement an algorithm that shuffles and deals a 52-card deck

```
int deck[4][12];
```



7.11 Card Shuffling and Dealing II

Deck representation

```
int deck[ 4 ][ 13 ];
```

		Ace	Two	Three	Four	Five	Six	Seven	Eight	Nine	Ten	Jack	Queen	King
		0	1	2	3	4	5	6	7	8	9	10	11	12
Hearts	0													
Diamonds	1													
Clubs	2													
Spades	3													

deck[2][12] represents the King of Clubs

The value stored in deck[2][12], represents the card's unique position in the deck

7.11 Card Shuffling and Dealing III

Empty Deck representation

		Ace	Two	Three	Four	Five	Six	Seven	Eight	Nine	Ten	Jack	Queen	King
		0	1	2	3	4	5	6	7	8	9	10	11	12
Hearts	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diamonds	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Clubs	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Spades	3	0	0	0	0	0	0	0	0	0	0	0	0	0

7.11 Card Shuffling and Dealing IV

Ordered Deck representation

		Ace	Two	Three	Four	Five	Six	Seven	Eight	Nine	Ten	Jack	Queen	King
		0	1	2	3	4	5	6	7	8	9	10	11	12
Hearts	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Diamonds	1	14	15	16	17	18	19	20	21	22	23	24	25	26
Clubs	2	27	28	29	30	31	32	33	34	35	36	37	38	39
Spades	3	40	41	42	43	44	45	46	47	48	49	50	51	52

7.11 Card Shuffling and Dealing V

Shuffled Deck representation

		Ace	Two	Three	Four	Five	Six	Seven	Eight	Nine	Ten	Jack	Queen	King
		0	1	2	3	4	5	6	7	8	9	10	11	12
Hearts	0	26	51	16	44	36	15	50	46	3	38	52	40	10
Diamonds	1	11	19	34	27	1	20	47	21	25	4	32	18	31
Clubs	2	6	35	8	9	37	2	49	29	22	13	5	42	33
Spades	3	12	7	23	45	24	41	28	14	39	30	48	43	17