Type Cast (1A)

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2/17/18

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Type Conversion

Implicit Type Conversion

Promotion

1 / 2.0 ➡ 1.0 / 2.0

Demotion

```
int m;
m = 1.25;
```
➡ `m = 1;` truncation problem

Explicit Type Conversion

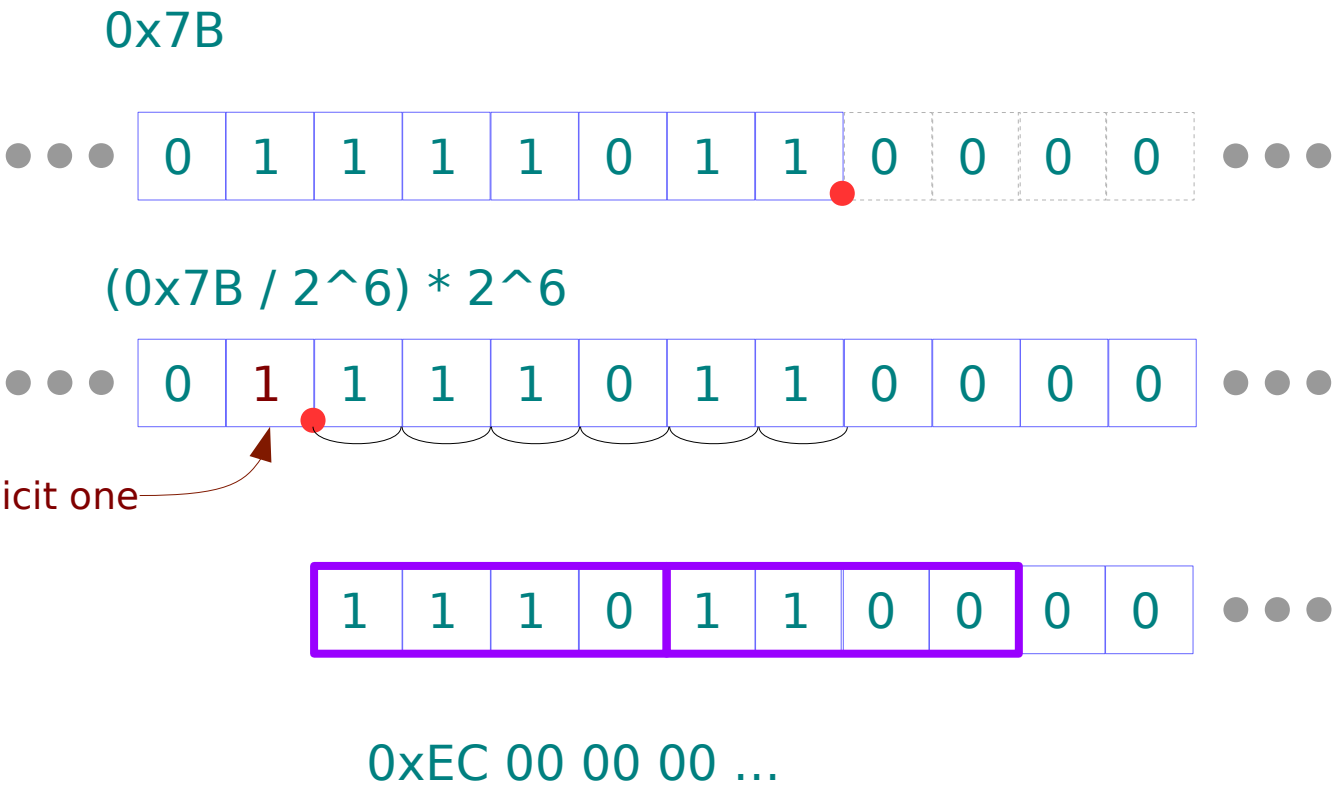
```
m = (int) 1.25;
```
No warning message

Type Conversion (int → double) – implicit one

Implicit Type Conversion **Promotion**

```
int m;
m = 123;
```

```
double x;
x = m;
```



Type Conversion (int → double) – 16 hexa digits

Fraction : 52bit = 4 * 13 → **13** hexa digits

0xEC 00 00 00 00 00 0

Exponent : 11bit
Sign : 1bit = 4 * 3 → **3** hexa digits

(0x7B / 2^6) * 2^6

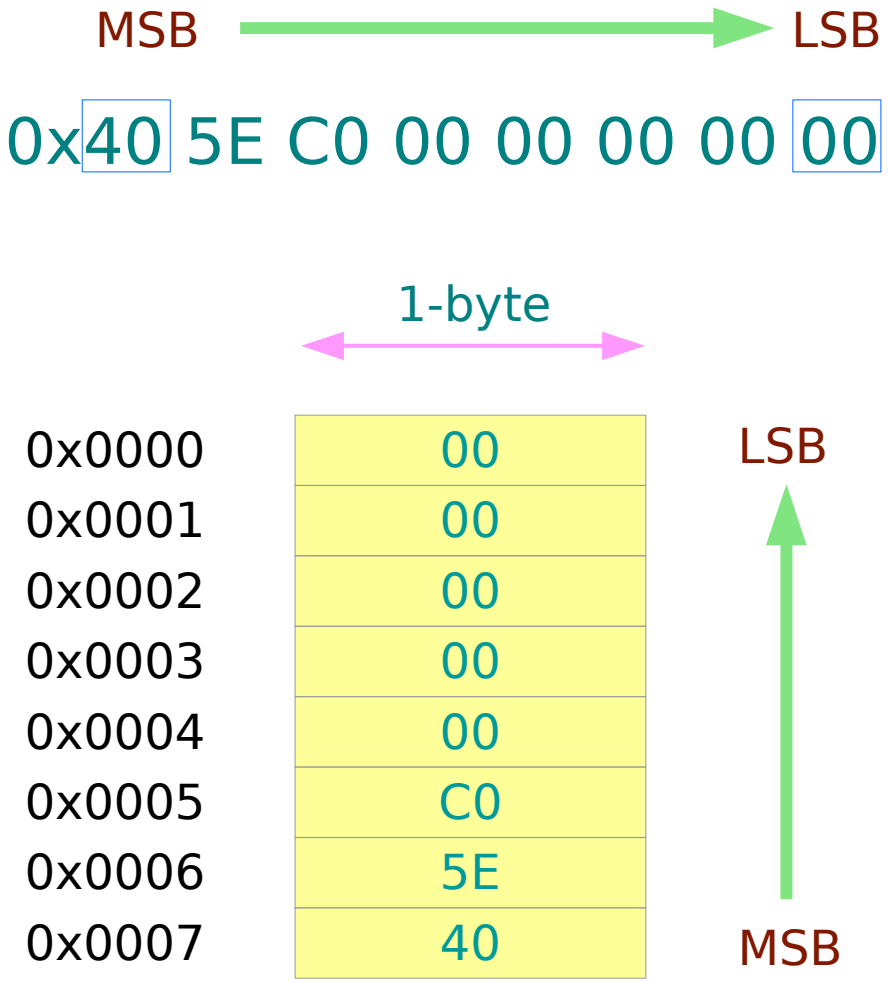
excess 1023 code

6+ 1023 = 1029 → 0x405

0x405 EC 00 00 00 00 00 0

0x40 5E C0 00 00 00 00 00

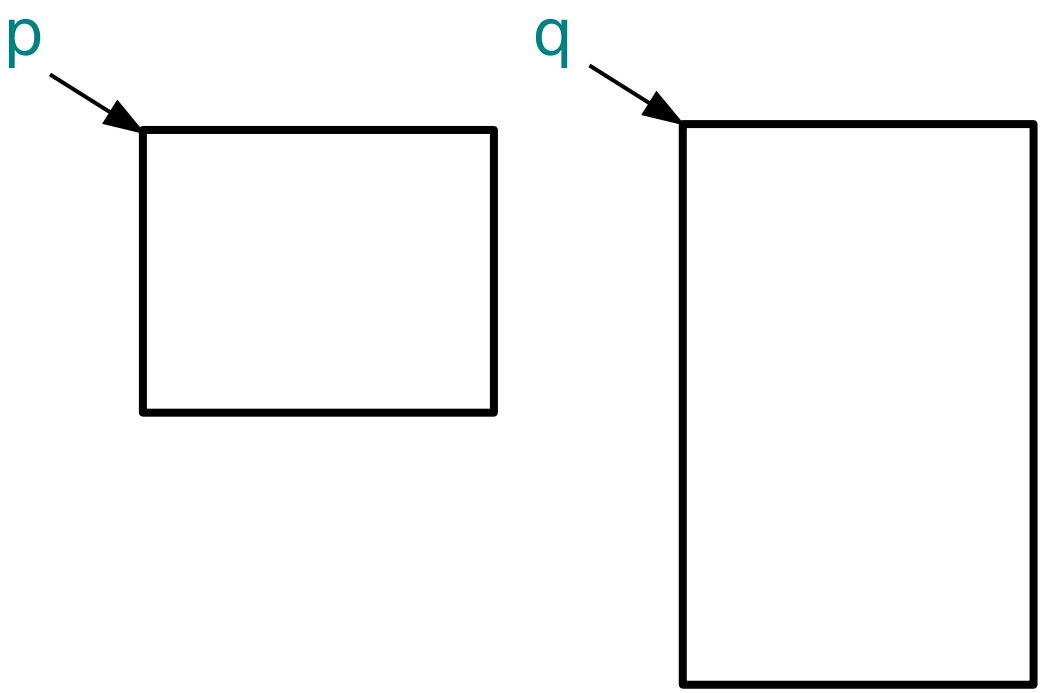
Type Conversion (int → double) – Little Endian



Little Endian:
LSByte First

Type Casting

```
double  x = 123;
int        *p;
double   *q;
```

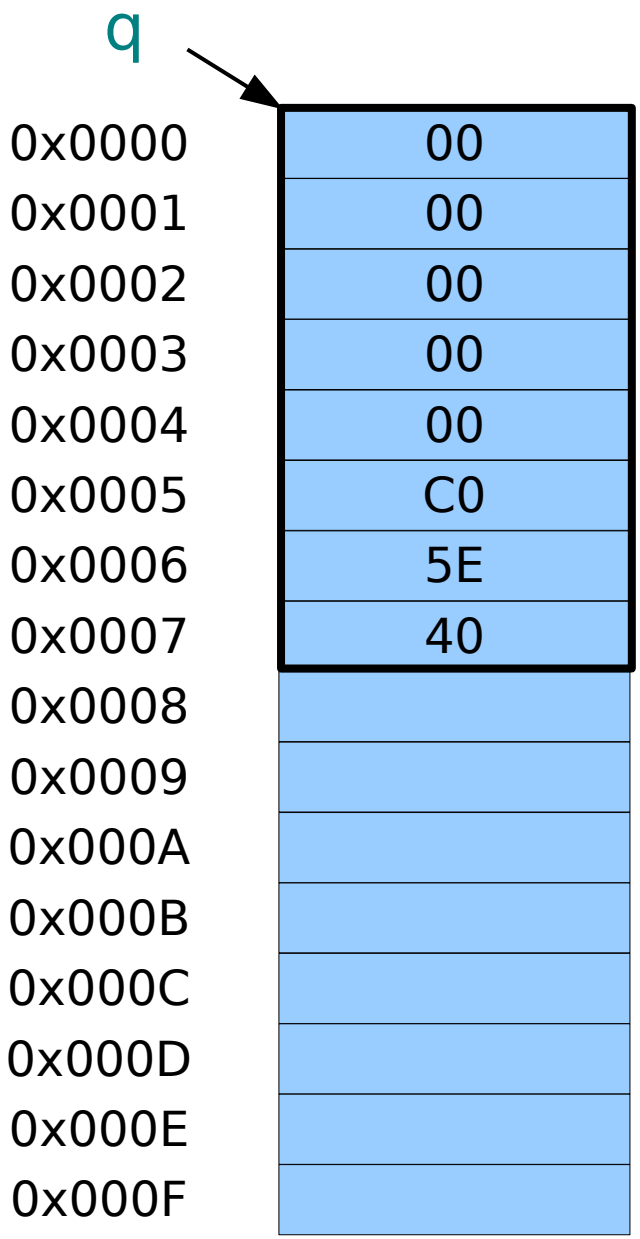


0x0000	00
0x0001	00
0x0002	00
0x0003	00
0x0004	00
0x0005	C0
0x0006	5E
0x0007	40
0x0008	
0x0009	
0x000A	
0x000B	
0x000C	
0x000D	
0x000E	
0x000F	

Type Casting

```
double  x = 123;
int        *p;
double   *q;

q = &x;
```

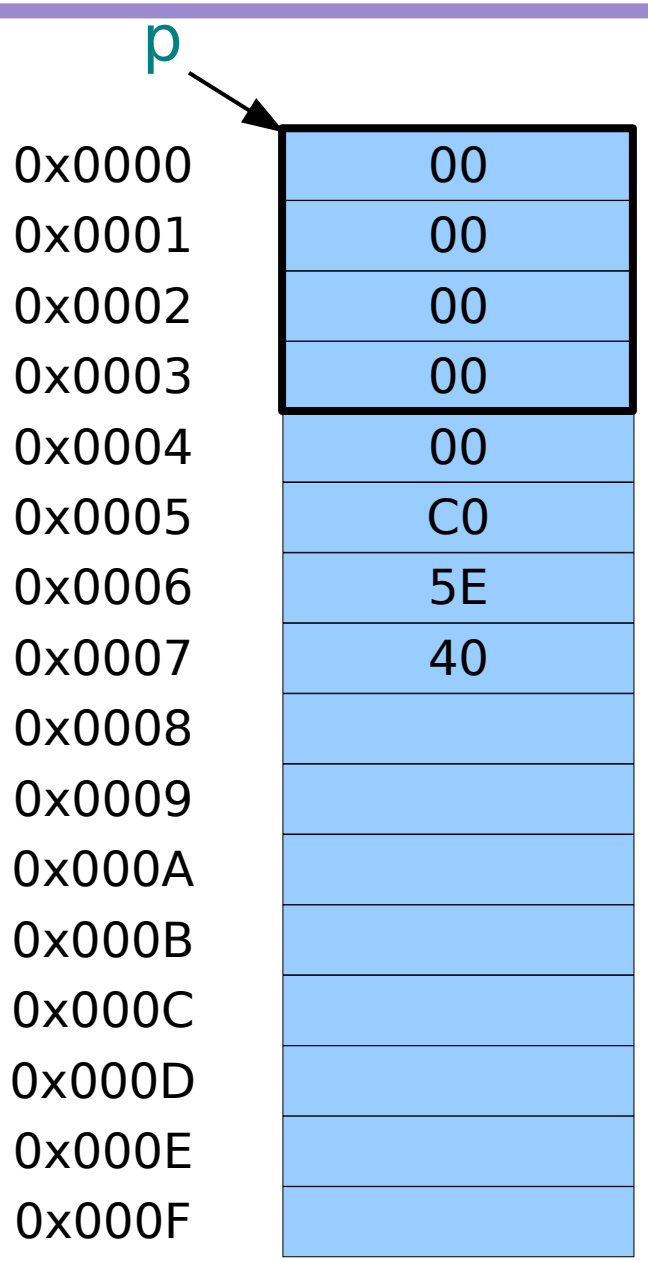
*q → 123.0



Type Casting

```
double  x = 123;
int        *p;
double   *q;

p = (int *) &x;
```

*p → 0



Pointer Type Cast

Changing the associated data type of an address

long a;

address of a long value

int * p;

address of an int value

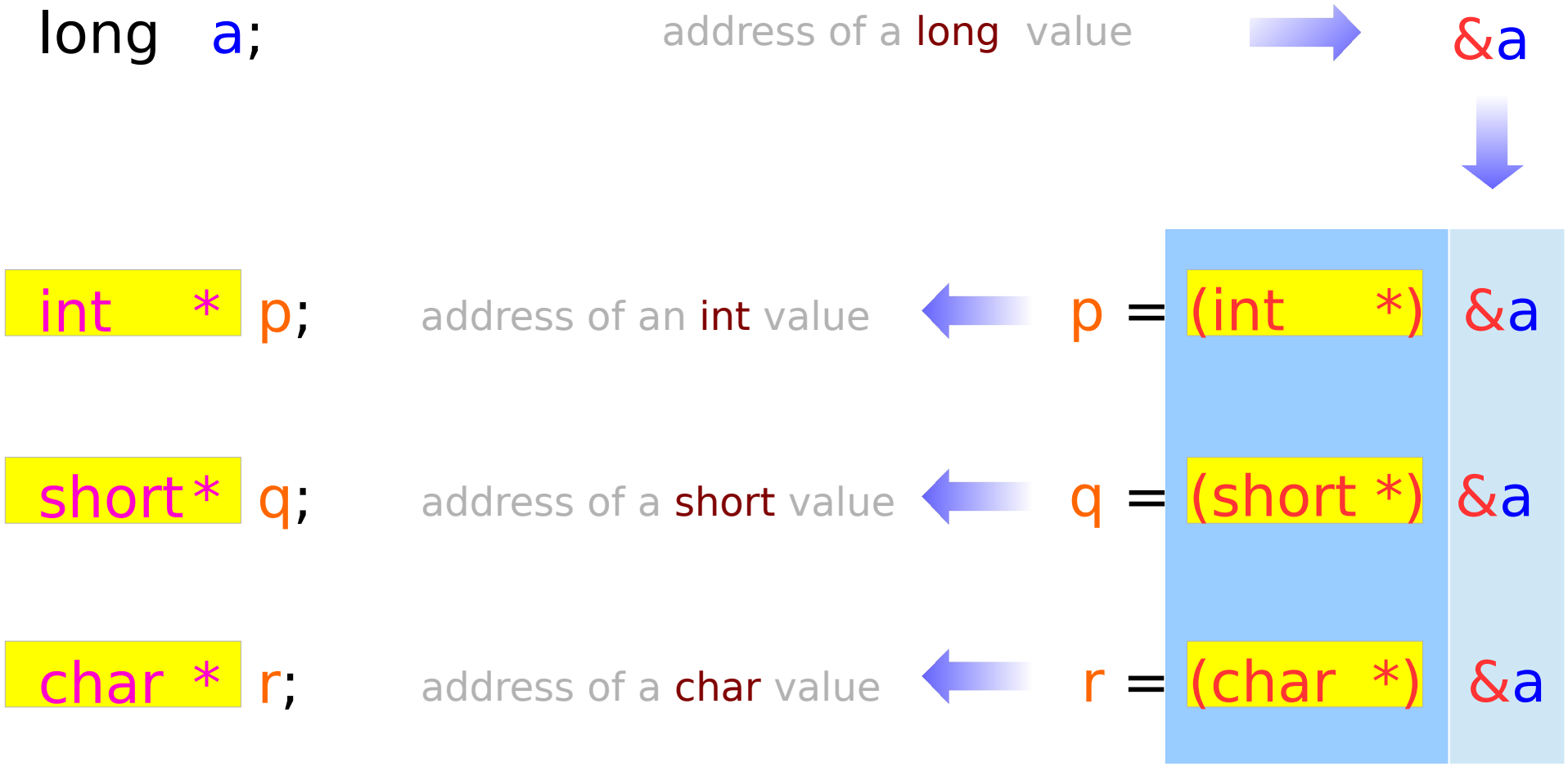
short* q;

address of a short value

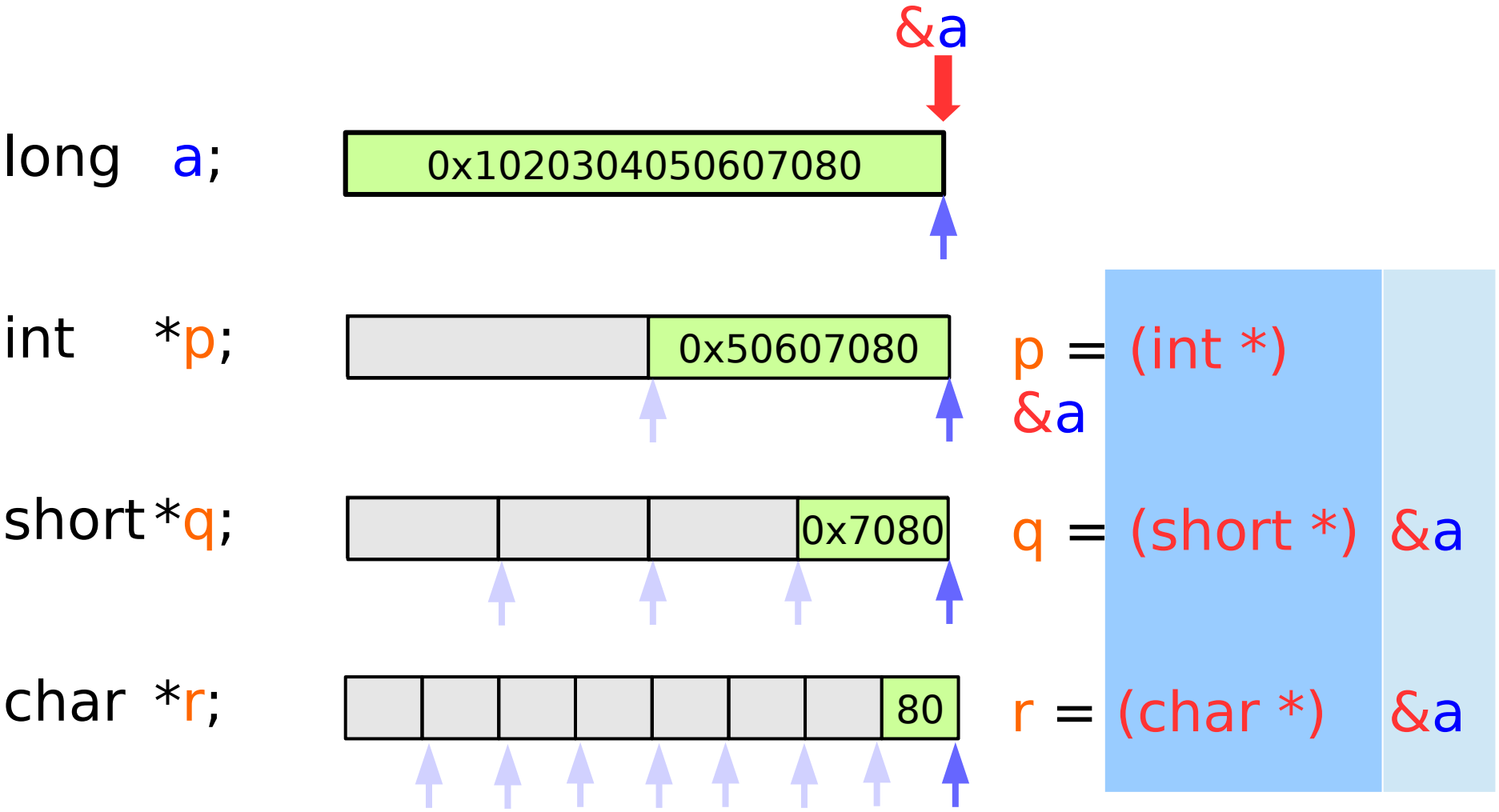
char * r;

address of a char value

Pointer Type Casting

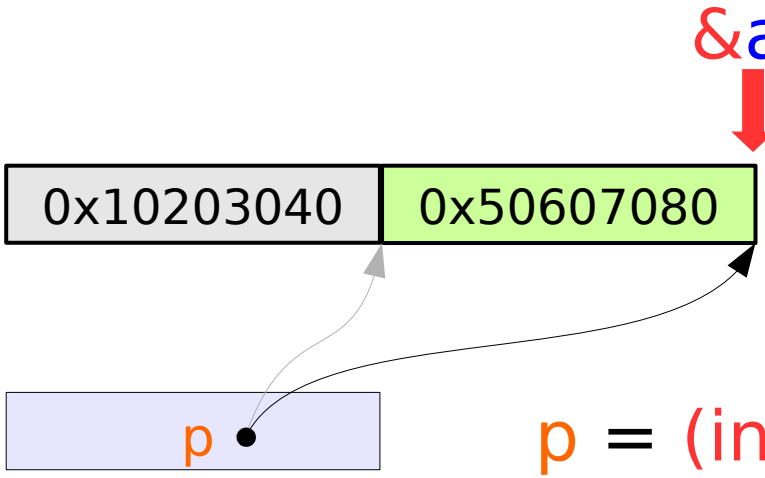


Re-interpretation of memory data – case I



Pointer Type Cast

```
long   a;

int    *p;

short *q;

char  *r;
```

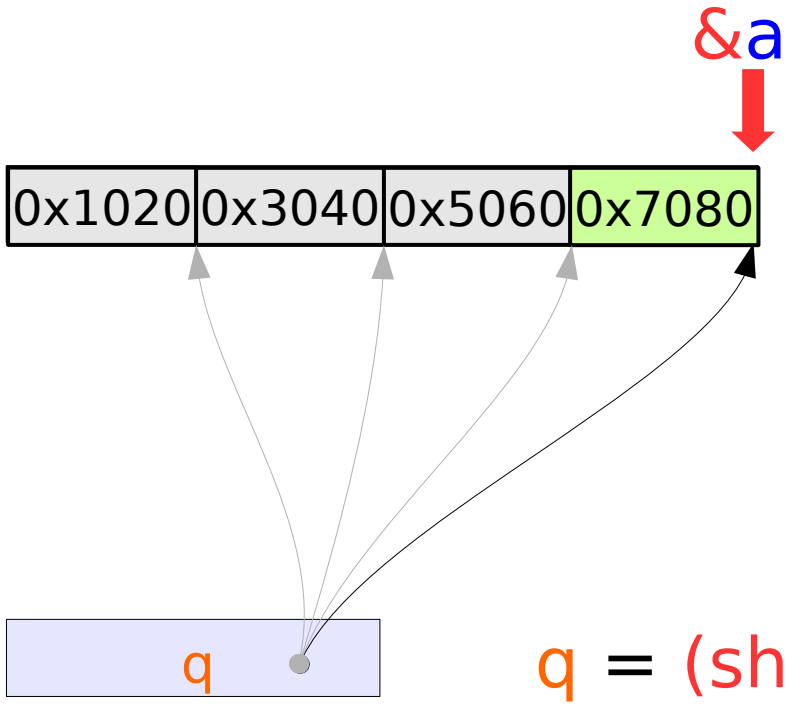


p = (int *) &a

*p ➡ 0x50607080

Integer Pointer Types

```
long   a;

int    *p;

short *q;

char  *r;
```

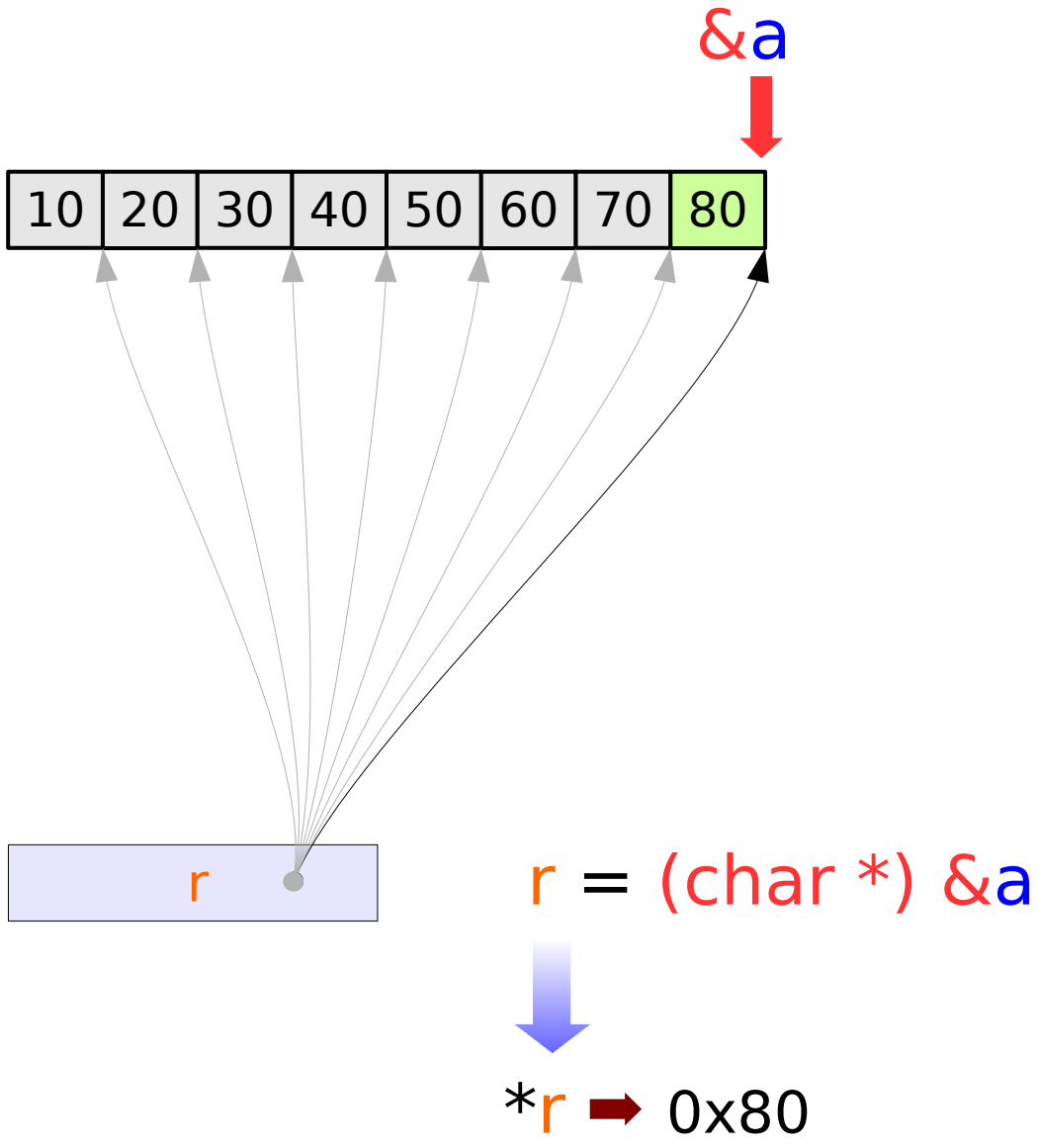


q = (short *) &a

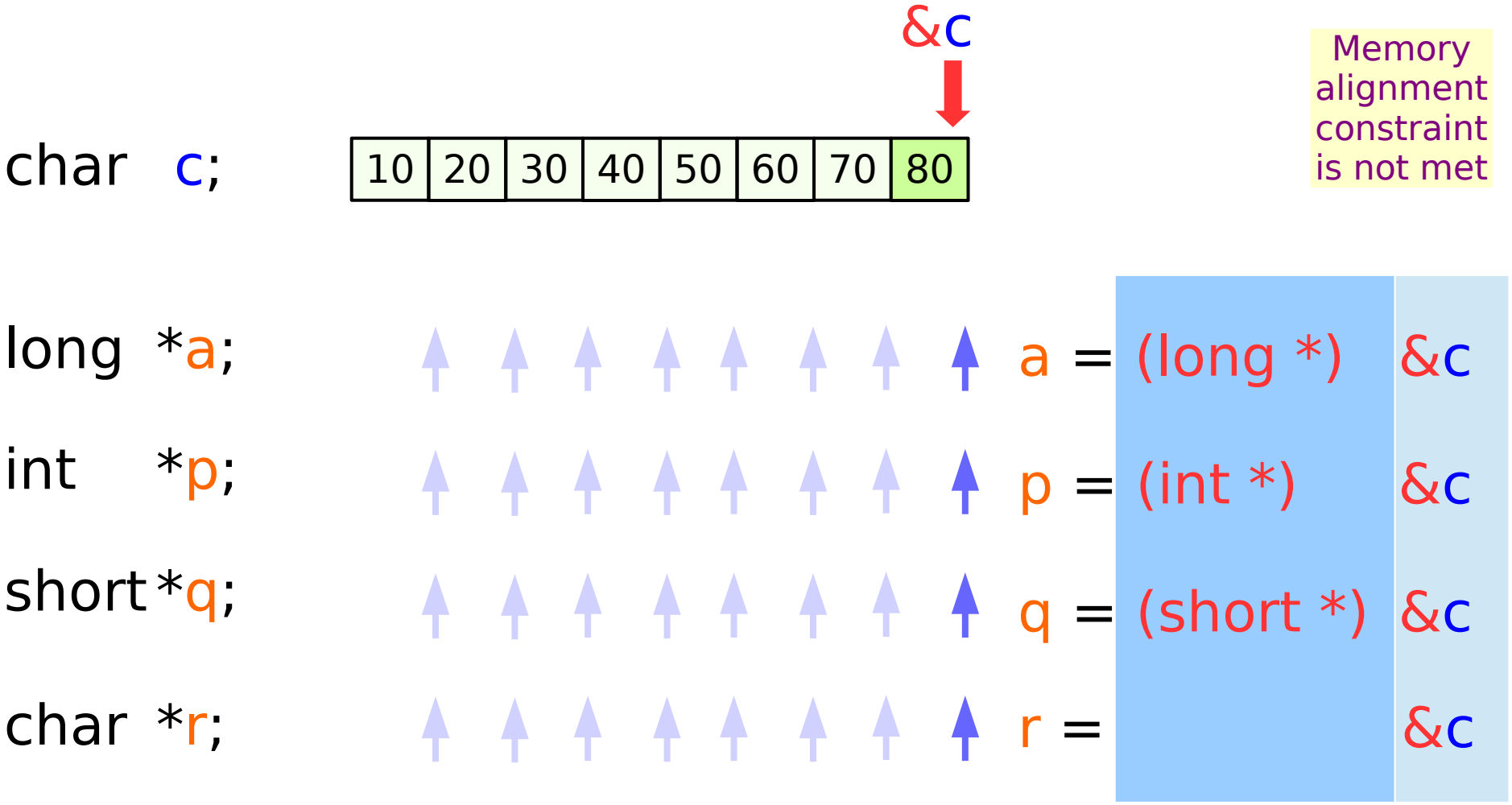
*q ➡ 0x7080

Integer Pointer Types

```
long   a;

int    *p;

short *q;

char  *r;
```



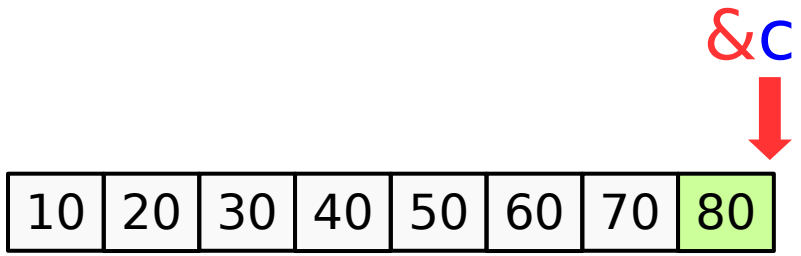
Re-interpretation of memory data – case II



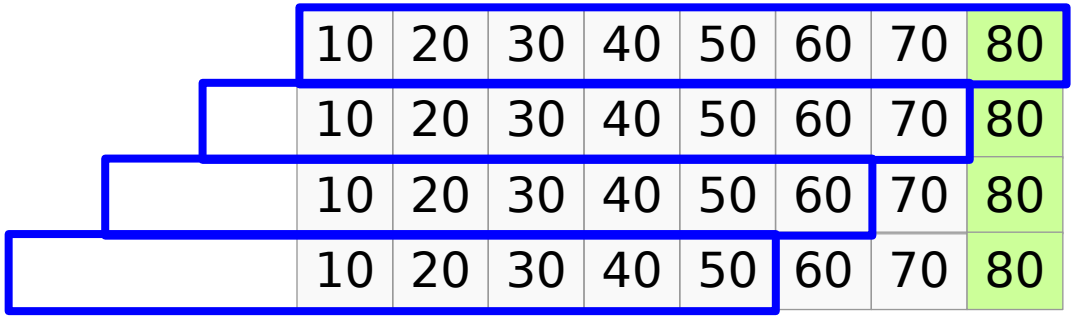
In this case, the memory alignment constraint can be broken

Pointer Type Cast

```
char   c;
```

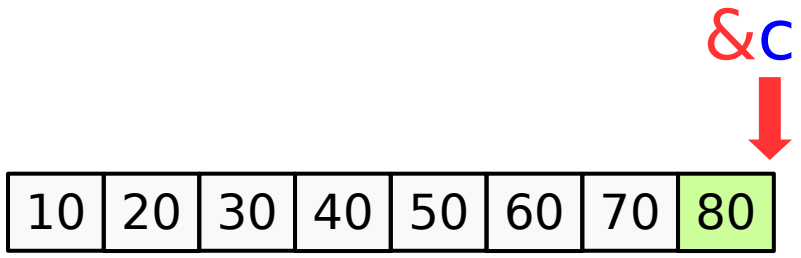



```
long  *a;
```

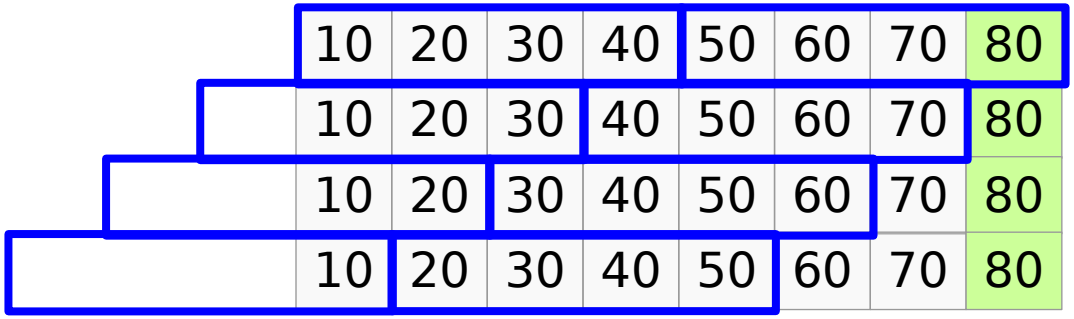


Pointer Type Cast

```
char    c;
```

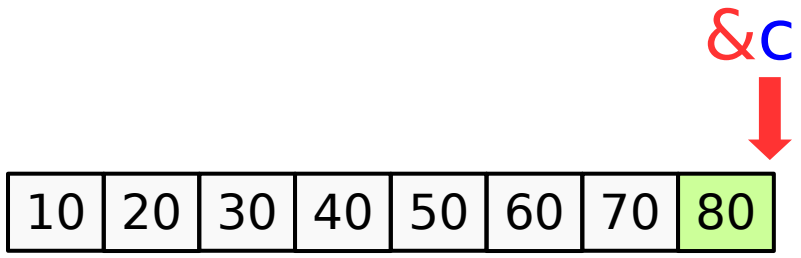



```
int *p;
```

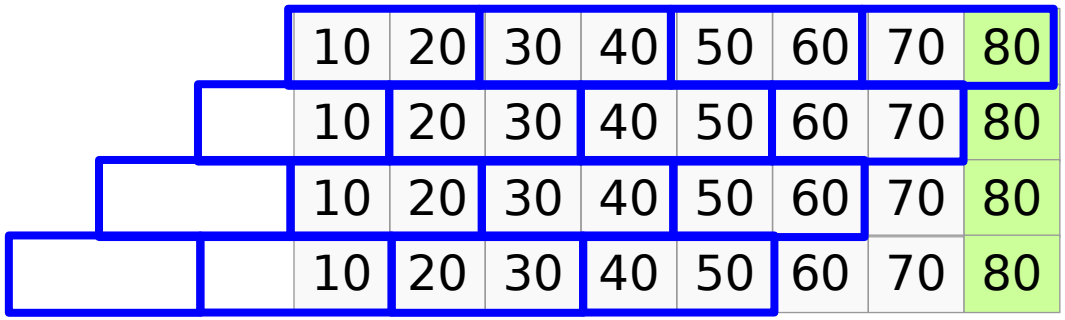


Pointer Type Cast

char c;



short *q;



References

[1] Essential C, Nick Parlante
[2] Efficient C Programming, Mark A. Weiss
[3] C A Reference Manual, Samuel P. Harbison & Guy L. Steele Jr.
[4] C Language Express, I. K. Chun
[5] http://www.stackoverflow.com