

3. Memory - Examples

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1 Introduction

- Memory Example 1
- Memory Example 2

Ex1 - (a)

```
#include <stdio.h>

int main(void)
{
    int a = 100;
    int *p = &a;

    printf("address(a) = %p \n", &a);
    printf("content(a) = %d \n", a);

    printf("address(p) = %p \n", &p);
    printf("content(p) = %p \n", p);

    printf("content(*p)= %d \n", *p);
    printf("address(*p)= %p \n", &(*p));
}
```

Ex1 - (b)

```
$ gcc -Wall mem1.c
$ ./a.out
address(a) = 0x7fff0fdd8fdc
content(a) = 100
address(p) = 0x7fff0fdd8fe0
content(p) = 0x7fff0fdd8fdc
content(*p)= 100
address(*p)= 0x7fff0fdd8fdc
```

```
$ gcc -m32 -Wall mem1.c
$ ./a.out
address(a) = 0xff966ca4
content(a) = 100
address(p) = 0xff966ca8
content(p) = 0xff966ca4
content(*p)= 100
address(*p)= 0xff966ca4
```

Ex2 - (a)

```
#include <stdio.h>

int main(void) {

    int  a;
    int  b;
    int  *p;
    int  *q;

    printf(".....\n");
    printf("addr(a) : &a= 0x%016lx \n", (unsigned long) &a);
    printf("addr(b) : &b= 0x%016lx \n", (unsigned long) &b);
    printf("addr(p) : &p= 0x%016lx \n", (unsigned long) &p);
    printf("addr(q) : &q= 0x%016lx \n", (unsigned long) &q);

    a = 111;
    b = 333;
    p = &a;
    q = &b;
```

Ex2 - (b)

```
printf(".....\n");
printf("data(a) : a=  %16d  \n", a);
printf("data(b) : b=  %16d  \n", b);
printf("data(p) : p= 0x%016lx \n", (unsigned long) p);
printf("data(q) : q= 0x%016lx \n", (unsigned long) q);

printf(".....\n");
printf("addr(*p): p= 0x%016lx = &(*p) \n", (unsigned long) &*p);
printf("addr(*q): q= 0x%016lx = &(*q) \n", (unsigned long) &*q);
printf(".....\n");
printf("data(a) : a=  %16d  \n", *p);
printf("data(b) : b=  %16d  \n", *q);
printf(".....\n");
printf("a = b; \n");
printf("*p = 555; \n");
```

```
a = b;
*q = 555;
```

Ex2 - (c)

```
printf(".....\n");
printf("data(a) : a=  %16d  \n", a);
printf("data(b) : b=  %16d  \n", b);
printf("data(p) : p= 0x%016lx \n", (unsigned long) p);
printf("data(q) : q= 0x%016lx \n", (unsigned long) q);

printf(".....\n");
printf("addr(*p): p= 0x%016lx = &(*p) \n", (unsigned long) &*p);
printf("addr(*q): q= 0x%016lx = &(*q) \n", (unsigned long) &*q);
printf(".....\n");
printf("data(a) : a=  %16d  \n", *p);
printf("data(b) : b=  %16d  \n", *q);
printf(".....\n");

}
```

Ex2 - (d)

```
$ gcc -Wall mem2.c
$ ./a.out
.....
addr(a) : &a= 0x00007fff12255f40
addr(b) : &b= 0x00007fff12255f44
addr(p) : &p= 0x00007fff12255f48
addr(q) : &q= 0x00007fff12255f50
.....
data(a) : a=          111
data(b) : b=          333
data(p) : p= 0x00007fff12255f40
data(q) : q= 0x00007fff12255f44
.....
addr(*p): p= 0x00007fff12255f40 = &(*p)
addr(*q): q= 0x00007fff12255f44 = &(*q)
.....
data(a) : a=          111
data(b) : b=          333
.....
```


Ex2 - (e)

```
a = b;
*p = 555;
.....
data(a) : a=          333
data(b) : b=          555
data(p) : p= 0x00007fff12255f40
data(q) : q= 0x00007fff12255f44
.....
addr(*p): p= 0x00007fff12255f40 = &(*p)
addr(*q): q= 0x00007fff12255f44 = &(*q)
.....
data(a) : a=          333
data(b) : b=          555
.....
```

Ex2 - (f)

```
$ gcc -m32 -Wall mem2.c
$ ./a.out
.....
addr(a) : &a= 0x00000000ffd2f62c
addr(b) : &b= 0x00000000ffd2f630
addr(p) : &p= 0x00000000ffd2f634
addr(q) : &q= 0x00000000ffd2f638
.....
data(a) : a=          111
data(b) : b=          333
data(p) : p= 0x00000000ffd2f62c
data(q) : q= 0x00000000ffd2f630
.....
addr(*p): p= 0x00000000ffd2f62c = &(*p)
addr(*q): q= 0x00000000ffd2f630 = &(*q)
.....
data(a) : a=          111
data(b) : b=          333
.....
a = b;
*p = 555;
```

Ex2 - (g)

```
.....  
data(a) : a=                333  
data(b) : b=                555  
data(p) : p= 0x00000000ffd2f62c  
data(q) : q= 0x00000000ffd2f630  
.....  
addr(*p): p= 0x00000000ffd2f62c = &(*p)  
addr(*q): q= 0x00000000ffd2f630 = &(*q)  
.....  
data(a) : a=                333  
data(b) : b=                555  
.....
```