

CSC 209 Review 4 Solution

August 19, 2020

1. The answer is a) `*p` and g) `*&i`.

Notes

- **Address and Indirection Pointers**

- If `x` is a variable, `&x` points to its memory address
- `*` in `*p` is called **Indirection operator**
 - * Allows variable to gain access to the object pointed by `p`

- **Aliases**

- Is the situation where the value in same memory location can be accessed using different variable names.

Example 1:

```
int i, p*;
p = & i;
printf("%d\n", *p); /* *p is an alias of i */
```

Example 2:

```
int i, p*;
p = *&i /* *p is an alias of i */
```

2. The answers are b) `*p = &i;`, f) `p = q;`, and i) `*p = *q;`

Correct Solution

The answers are e) `p = *&q;`, f) `p = q;`, and i) `*p = *q;`

`p = *&q;` is the same as `p = q`

Notes

- The `*` operator turns a *value* of type **pointer** to **T** into a *variable* of type **T**.
- The `&` operator turns a *variable* of type **T** into a *value* of type pointer to **T**.

- **Pointer Assignment**

- The following is an example of correct pointer assignment

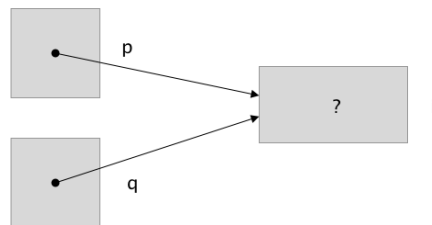
```
int i, j, *p, *q;  
p = &i;
```

* Means the memory address of **p** is pointing to memory address of **i**

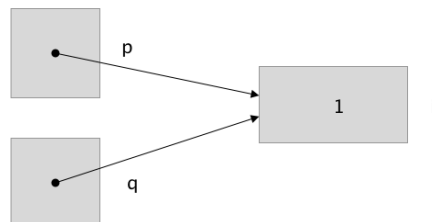
- The following is another valid example of pointer assignment

```
int i, j, *p, *q;  
p = &i;  
q = p;
```

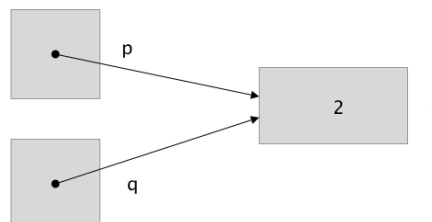
* Means memory address of **q** is the memory address of **p** (which is the memory address of **i**)



```
*p = 1;
```



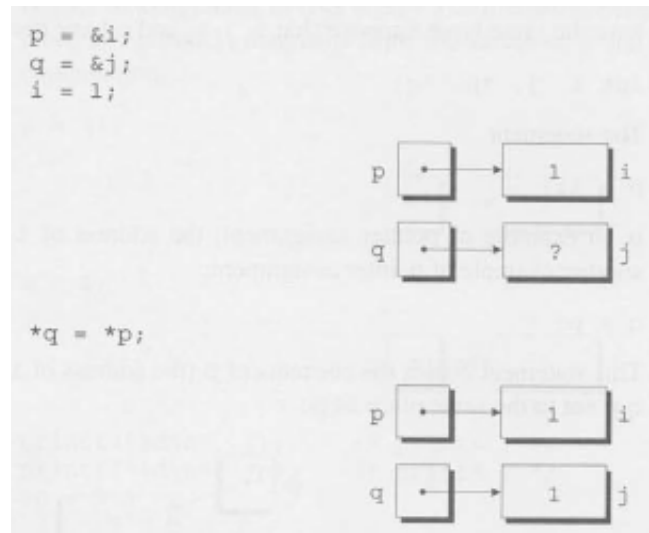
```
*p = 2;
```



- The following is not a pointer assignment

`*q = *p`

- * It copies the value that p points to



```

31 void avg_sum(double a[], int n, double *avg, double *sum)
2   {
3     int i;
4
5     *sum = 0.0;
6     for (i = 0; i < n; i++)
7         *sum += a[i];
8     *avg = *sum / n;
9   }

```

Notes:

- **Pointer as Arguments:**

- Construct prototype using pointer variable as parameter so it can be passed by reference

Example

```

void decompose(double x, long *int_part, double *frac_part);
or
void decompose(double, long *, double *);

void decompose(double x, long *int_part, double *frac_part)
{
    *int_part = (long) x;
    *frac_part = x - *int_part;
}

```

- When using the prototype, pass variable to prototype by reference using & operator (points to variable's memory location)

```
decompose(3.14159, &i, &d);
```

```
41 void swap(int *p, int *q) {
2     int temp;
3
4     temp = *p;
5     *p = *q;
6     *q = temp;
7 }
```

```
51 void split_time(long total_sec, int *hr, int *min, int *sec) {
2     int hours, mins, seconds, min_sec;
3
4     hours = total_sec % 60;
5     min_sec = total_sec - hours;
6     mins = min_sec % 60;
7     seconds = min_sec - mins;
8
9     *hr = hours;
10    *min = mins;
11    *sec = seconds;
12 }
```

Correct Solution:

```
1 void split_time(long total_sec, int *hr, int *min, int *sec) {
2     int hours, mins, seconds, min_sec;
3
4     hours = total_sec % 3600;
5     min_sec = total_sec - (hours * 3600);
6     mins = min_sec % 60;
7     seconds = min_sec - (mins * 60);
8
9     *hr = hours;
10    *min = mins;
11    *sec = seconds;
12 }
```

```
61 #include <stdbool.h> // bool
2   #include <limits.h> // INT_MIN
3
4   bool is_largest(int current_max, int val);
5
6   void find_two_largest (int a[], int n, int *largest, int*
second_largest) {
```

```
7     int current_max = INT_MIN;
8     int current_second_max = INT_MIN;
9
10    for (int i = 0; i < n; i++) {
11        if (is_largest(current_max, a[i])) {
12            current_second_max = current_max;
13            current_max = a[i];
14        }
15    }
16
17    *largest = current_max;
18    *second_largest = current_second_max;
19 }
20
21 bool is_largest(int current_max, int val) {
22     if (val > current_max) {
23         return true;
24     }
25
26     return false;
27 }
```