Question 1

Consider the following declarations and assignments:

```c
int a, *b, *c, d[4];
for (a = 0; a < 4; a++) {
    d[a] = 1 + a;
}
b = d;
c = &a;
a = b[3];
```

Describe the TYPE and VALUE of each of the expressions below. The TYPE should be one of: int, int * (int pointer), or int [] (int array). For the VALUE, if the expression is an address, describe what it is the address of. If an expression is invalid, write “Illegal Expression”.

<table>
<thead>
<tr>
<th></th>
<th>TYPE</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>a</td>
<td>---------------</td>
</tr>
<tr>
<td>2.</td>
<td>b</td>
<td>---------------</td>
</tr>
<tr>
<td>3.</td>
<td>*b</td>
<td>---------------</td>
</tr>
<tr>
<td>4.</td>
<td>c</td>
<td>---------------</td>
</tr>
<tr>
<td>5.</td>
<td>d</td>
<td>---------------</td>
</tr>
<tr>
<td>6.</td>
<td>&amp;d[1]</td>
<td>---------------</td>
</tr>
</tbody>
</table>
Question 2

Trace through the following C code, draw memory contents (heap and stack) at the execution point indicated in `func`, and show the output produced by a complete run of the program. (Assume `stdio.h` and `stdlib.h` have been included, and that `malloc` succeeds.)

```
int *func(int *a, int *b, int s);

int main (void) {
    int *arr = NULL, x = 4, y = 3, i;

    arr = func(&x, &y, 5);
    printf("x = %d y = %d\n", x, y);
    if (arr != NULL) {
        for (i = 0; i < 5; i++) {
            printf("arr[%d] = %d\n", i, arr[i]);
        }
    }
    free(arr);
    return 0;
}

int *func(int *a, int *b, int s) {
    int *tmp, i;

    tmp = malloc(sizeof(int) * s);
    if (tmp != NULL) {
        for (i = 0; i < s; i++) {
            tmp[i] = i + *b;
        }
        *a = tmp[2];
        *b = 8;
    }
    // DRAW MEMORY WHEN YOU GET HERE
    return tmp;
}
```

Output

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