In [29]:

```
area = [
    [0,0,0,0,0,0,0,0,0,0,0,0],
    [0,1,1,0,0,0,0,0,0,0,0,0],
    [0,1,1,0,0,0,0,0,0,0,0,0],
    [0,1,1,0,0,0,0,0,0,0,0,0],
    [0,1,1,0,0,0,0,0,0,0,0,0],
    [0,1,1,0,0,0,0,0,0,0,0,0],
    [0,1,1,0,0,0,0,0,0,0,0,0],
    [0,1,1,0,0,0,0,0,0,0,0,0],
    [0,1,1,1,1,1,1,1,1,1,1,0],
    [0,1,1,1,1,1,1,1,1,1,1,0],
    [0,0,0,0,0,0,0,0,0,0,0,0]
]
x = 42

section = [[0 for _ in range(x)] for _ in range(x)]
for i in range(1,x-1):
    for j in range(1,x-1):
        if i < x//3 *2 and j < x//3:
            section[i][j] = 1
        elif i>=x//3 *2:
            section[i][j] = 1
for i in section:
    print(i)
```

```
[0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0]
[0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
```

```
 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0]
 [0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0]
 [0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0]
 [0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0]
 [0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0]
 [0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0]
 [0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0]
 [0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0]
 [0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0]
 [0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0]
 [0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0]
 [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
```

In [30]:

```
cnt = 0
for line in area:
    for i in range(len(line)):
        if line[i]:
            line[i] = cnt + 1
            cnt += 1
area

cnt = 0
for line in section:
    for i in range(len(line)):
        if line[i]:
            line[i] = cnt + 1
            cnt += 1
for i in section:
    print(i)
print(cnt)
```

```
[0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 36
7, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383,
384, 385, 386, 387, 388, 389, 390, 391, 0]
[0, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 40
7, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423,
```

```
424, 425, 426, 427, 428, 429, 430, 431, 0]
[0, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 44
7, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463,
464, 465, 466, 467, 468, 469, 470, 471, 0]
[0, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 48
7, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503,
504, 505, 506, 507, 508, 509, 510, 511, 0]
[0, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 52
7, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543,
544, 545, 546, 547, 548, 549, 550, 551, 0]
[0, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 56
7, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583,
584, 585, 586, 587, 588, 589, 590, 591, 0]
[0, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 60
7, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623,
624, 625, 626, 627, 628, 629, 630, 631, 0]
[0, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 64
7, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663,
664, 665, 666, 667, 668, 669, 670, 671, 0]
[0, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 68
7, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703,
704, 705, 706, 707, 708, 709, 710, 711, 0]
[0, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 72
7, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743,
744, 745, 746, 747, 748, 749, 750, 751, 0]
[0, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 76
7, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783,
784, 785, 786, 787, 788, 789, 790, 791, 0]
[0, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 80
7, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823,
824, 825, 826, 827, 828, 829, 830, 831, 0]
[0, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 84
7, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863,
864, 865, 866, 867, 868, 869, 870, 871, 0]
[0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
871
```

In [18]:

```
#초기 빈 행렬식 A
# cnt가 미지수의 개수
A = [[0 for _ in range(cnt+1)] for _ in range(cnt)]
# for i in A:
#     print(i)
```

In [31]:

```
dx = [1, -1, 0, 0]
dy = [0, 0, 1, -1] #이동기
def solve(y, x, linenum):
    for k in range(4):
        next_y = y + dy[k]
        next_x = x + dx[k]
        if 0 <= next_x < len(section) and 0 <= next_y < len(section) and section[next_y][next_x
]:
            nodenum = section[next_y][next_x]-1
            A[linenum][nodenum] = -1
for y in range(len(section)):
    for x in range(len(section)):
        if section[y][x]:
            linenum = section[y][x]-1
            A[linenum][linenum] = 4
            solve(y,x,linenum)
for line in A:
    line[-1] = 0.005
# for line in A:
#     print(line)
```

In [ ]:

```
import numpy as np
n=cnt
A = np.array(A, dtype=float)
pivot_target = []
for i in range(0, n-1):
    for j in range(i+1, n):
        temp = A[j,i]/A[i,i]
        A[j,:] = A[j,:] - temp * A[i,:]
#     print(np.matrix(A))

    # 대각행렬에 0이 있는 행은 pivot_target이라는 리스트에 추가.
    for x in range(i,n-1):
        if not A[x,x]:
            pivot_target.append(x)

    #pivot_target이 다 떨어질 때까지 반복하면서 피버팅
    while pivot_target:
#         print("While 안에 들어옴")
#         print(np.matrix(A))
        x = pivot_target.pop()
        for change_target in range(i+1, n-1):
            if A[x,change_target] and A[change_target,x]:
                A[[x,change_target]] = A[[change_target,x]]
x = np.zeros(shape=(n,1), dtype=float)
for i in range(n-1,-1,-1):
    if i==n-1:
        x[i]=A[i,n]/A[i,i]
    else:
        x[i]=A[i,n]/A[i,i]
        for j in range(1, n-i):
            x[i] = x[i]- (A[i,i+j]/A[i,i])*x[i+j]
print(x)
```

In [21]:

```
xx = []
for i in range(len(x)):
    xx.append(float(x[i]))
xx
```

Out[21]:

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In [23]:

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potential_section = [[0 for _ in range(len(section))] for _ in range(len(section))]
cnt = 0
for i in range(len(section)):
    for j in range(len(section)):
        if section[i][j]:
            potential_section[i][j] = xx[cnt]
            cnt += 1
potential_section
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Out[23]:

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```

In [24]:

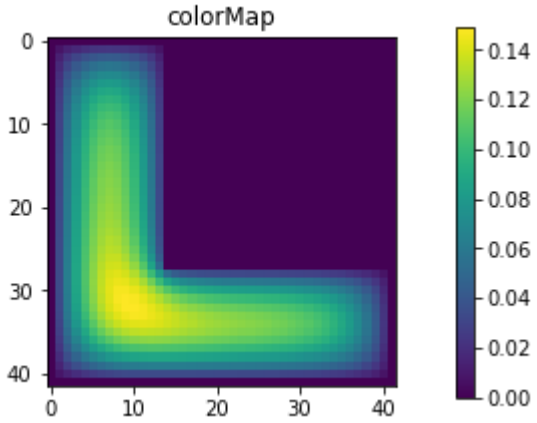
```
import numpy as np
import matplotlib.pyplot as plt

H = np.array(potential_section)

fig = plt.figure(figsize=(6, 3.2))

ax = fig.add_subplot(111)
ax.set_title('colorMap')
plt.imshow(H)
ax.set_aspect('equal')

cax = fig.add_axes([0.12, 0.1, 0.78, 0.8])
cax.get_xaxis().set_visible(False)
cax.get_yaxis().set_visible(False)
cax.patch.set_alpha(0)
cax.set_frame_on(False)
plt.colorbar(orientation='vertical')
plt.show()
```



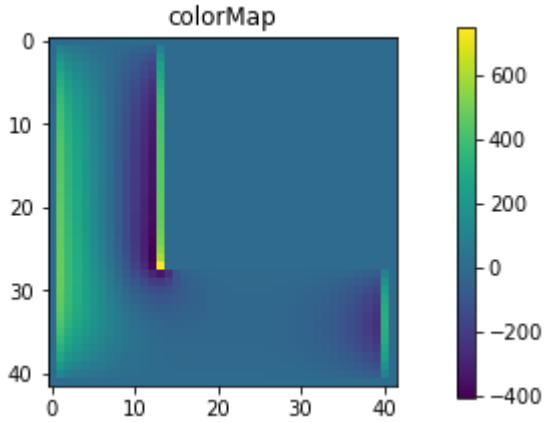
In [26]:

```
h = 0.003/42
tauzy =  [[0 for _ in range(len(section))] for _ in range(len(section))]
tauzx =  [[0 for _ in range(len(section))] for _ in range(len(section))]
for y in range(len(potential_section)):
    for x in range(1,len(potential_section)-1):
        prev_x = x-1
        next_x = x+1
        if not potential_section[y][prev_x]:
            tauzy[y][x] = (potential_section[y][x]-potential_section[y][prev_x])/h
        elif not potential_section[y][next_x]:
            tauzy[y][x] = (potential_section[y][x]-potential_section[y][next_x])/h
        else:
            tauzy[y][x] = (potential_section[y][next_x]-potential_section[y][prev_x])/(2*h)
H = np.array(tauzy)

fig = plt.figure(figsize=(6, 3.2))

ax = fig.add_subplot(111)
ax.set_title('colorMap')
plt.imshow(H)
ax.set_aspect('equal')

cax = fig.add_axes([0.12, 0.1, 0.78, 0.8])
cax.get_xaxis().set_visible(False)
cax.get_yaxis().set_visible(False)
cax.patch.set_alpha(0)
cax.set_frame_on(False)
plt.colorbar(orientation='vertical')
plt.show()
```



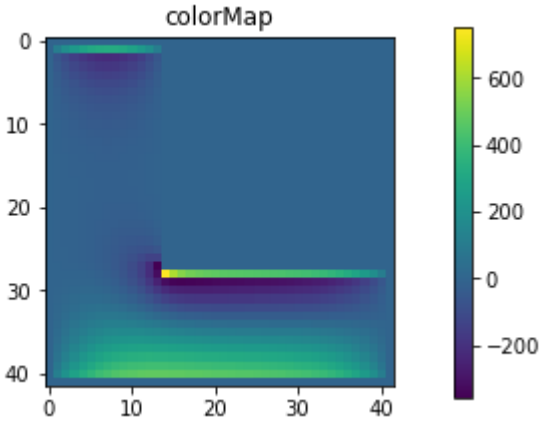
In [27]:

```
for y in range(1,len(potential_section)-1):
    for x in range(1,len(potential_section)-1):
        prev_y = y-1
        next_y = y+1
        if not potential_section[prev_y][x]:
            tauzx[y][x] = (potential_section[y][x]-potential_section[prev_y][x])/h
        elif not potential_section[y][next_x]:
            tauzx[y][x] = (potential_section[y][x]-potential_section[next_y][x])/h
        else:
            tauzx[y][x] = (potential_section[next_y][x]-potential_section[prev_y][x])/(2*h)
H = np.array(tauzx)

fig = plt.figure(figsize=(6, 3.2))

ax = fig.add_subplot(111)
ax.set_title('colorMap')
plt.imshow(H)
ax.set_aspect('equal')

cax = fig.add_axes([0.12, 0.1, 0.78, 0.8])
cax.get_xaxis().set_visible(False)
cax.get_yaxis().set_visible(False)
cax.patch.set_alpha(0)
cax.set_frame_on(False)
plt.colorbar(orientation='vertical')
plt.show()
```



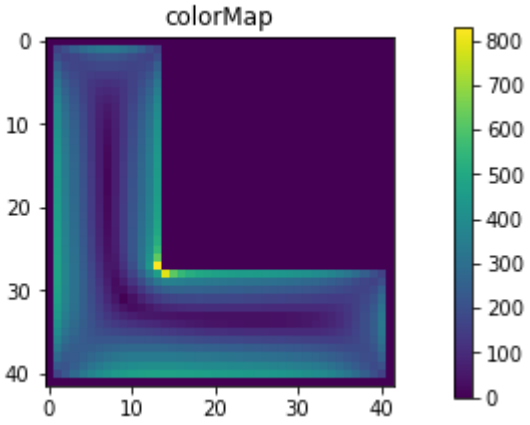
In [28]:

```
shear_stress = [[0 for _ in range(len(section))] for _ in range(len(section))]
for y in range(1,len(potential_section)-1):
    for x in range(1,len(potential_section)-1):
        if tauzy[y][x] or tauzx[y][x]:
            shear_stress[y][x] = pow(tauzy[y][x]**2 + tauzx[y][x]**2, 0.5)
H = np.array(shear_stress)

fig = plt.figure(figsize=(6, 3.2))

ax = fig.add_subplot(111)
ax.set_title('colorMap')
plt.imshow(H)
ax.set_aspect('equal')

cax = fig.add_axes([0.12, 0.1, 0.78, 0.8])
cax.get_xaxis().set_visible(False)
cax.get_yaxis().set_visible(False)
cax.patch.set_alpha(0)
cax.set_frame_on(False)
plt.colorbar(orientation='vertical')
plt.show()
```



In [ ]:

```

```