Problem-Based Learning
Python 3
Lecture: 04-for-example

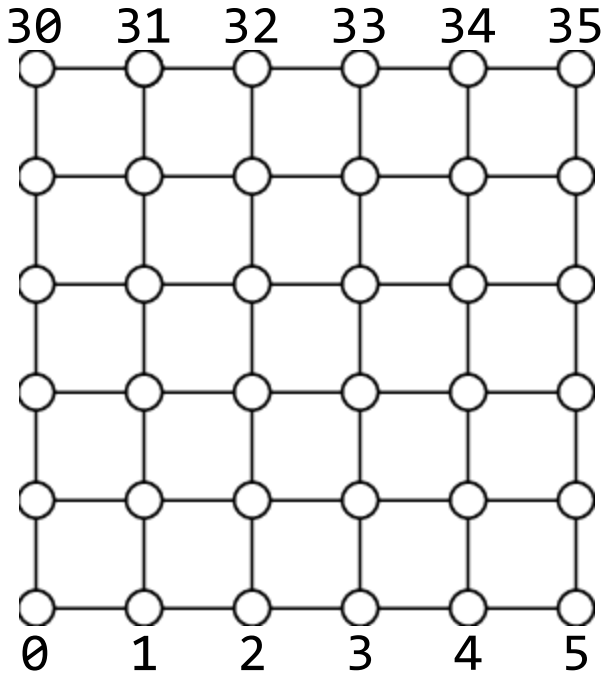
Online Python

- https://www.programiz.com/python-programming/online-compiler/

Lecture Notes

- https://web.phy.ntnu.edu.tw/~hongyi/?url=notes

Problem



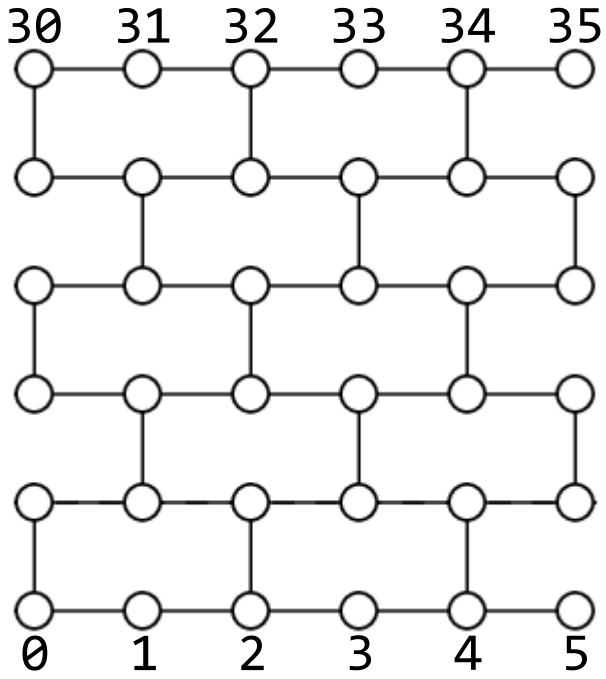

```
0→(0,0)
1→(1,0)
2→(2,0)

33→(3,5)
34→(4,5)
35→(5,5)
```

顯示結果

I	(x,y)	+x	-x	+y	-y
0	(0,0)	1	5	6	30
1	(1,0)	2	0	7	31
2	(2,0)	3	1	8	32
33	(3,5)	34	32	3	27
34	(4,5)	35	33	4	28
35	(5,5)	30	34	5	29

Problem




```
0→(0,0)
1→(1,0)
2→(2,0)

33→(3,5)
34→(4,5)
35→(5,5)
```

顯示結果

I	(x,y)	+x	-x	+y	-y
0	(0,0)	1	5	6	30
1	(1,0)	2	0	-1	-1
2	(2,0)	3	1	8	32
33	(3,5)	34	32	3	27
34	(4,5)	35	33	-1	-1
35	(5,5)	30	34	5	29

Solution (1)

- `import numpy as np`
- `nx = 6`
- `ny = 6`
- `size = nx * ny`
- `site = np.zeros(size, dtype=int)`
- `site_x = np.zeros(size, dtype=int)`
- `site_y = np.zeros(size, dtype=int)`
- `site_px = np.zeros(size, dtype=int)`
- `site_mx = np.zeros(size, dtype=int)`

Solution (1)

```
site_py = np.zeros(size, dtype=int)
site_my = np.zeros(size, dtype=int)
i = 0
for iy in range(ny):
    for ix in range(nx):
        site[i] = i
        site_x[i] = ix
        site_y[i] = iy
```

Solution (1)

```
        ipx = ix + 1
        if ix == nx - 1:
            ipx = 0
        site_px[i] = (iy)*nx + ipx
        imx = ix - 1
        if ix == 0:
            imx = nx - 1
        site_mx[i] = (iy)*nx + imx
```

Solution (1)

```
        ipy = iy + 1
        if iy == ny - 1:
            ipy = 0
        site_py[i] = (ipy)*nx + ix
        imy = iy - 1
        if iy == 0:
            imy = ny - 1
        site_my[i] = (imy)*nx + ix
        i = i + 1
```

Solution (1)

- `print(u' i  (x,y)  +x  -x  +y  -y')`
- `for i in range(size):`
- `    print(f"{i:2d}  ({site_x[i]:1d},{site_y[i]:1d})  {site_px[i]:2d}  {site_mx[i]:2d}  {site_py[i]:2d}  {site_my[i]:2d}")`

Solution (2)

- `import numpy as np`
- `nx = 6`
- `ny = 6`
- `size = nx * ny`
- `site = np.zeros(size, dtype=int)`
- `site_x = np.zeros(size, dtype=int)`
- `site_y = np.zeros(size, dtype=int)`
- `site_px = np.zeros(size, dtype=int)`
- `site_mx = np.zeros(size, dtype=int)`

Solution (2)

```
site_py = np.zeros(size, dtype=int)
site_my = np.zeros(size, dtype=int)
i = 0
for iy in range(ny):
    for ix in range(nx):
        site[i] = i
        site_x[i] = ix
        site_y[i] = iy
```

Solution (2)

```
        ipx = ix + 1
        if ix == nx - 1:
            ipx = 0
        site_px[i] = (iy)*nx + ipx
        imx = ix - 1
        if ix == 0:
            imx = nx - 1
        site_mx[i] = (iy)*nx + imx
```

Solution (2)

```
        ipy = iy + 1
        if iy == ny - 1:
            ipy = 0
        if (ix+iy)%2 == 0:
            site_py[i] = (ipy)*nx + ix
        else:
            site_py[i] = -1
```

Solution (2)

```
        imy = iy - 1
        if iy == 0:
            imy = ny - 1
        if (ix+iy)%2 == 0:
            site_my[i] = (imy)*nx + ix
        else:
            site_my[i] = -1
        i = i + 1
```

Solution (2)

```
print(u' i  (x,y)  +x  -x  +y  -y')
for i_ in range(size):
    print(f"{i_:2d}  ({site_x[i_]:1d},{site_y[i_]:1d})  {site_px[i_]:2d}  {site_mx[i_]:2d}  {site_py[i_]:2d}  {site_my[i_]:2d}")
```