Dijkstra : (i) single src all dest shortest path (wt)
(ii) greedy
(iii) fails on -ve edge wt

Src = 0

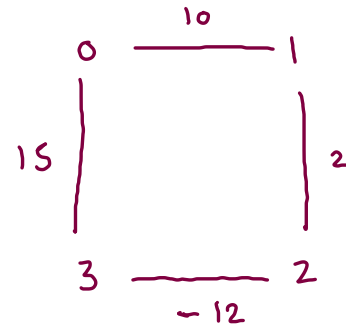$$0 \xrightarrow{10} 1$$

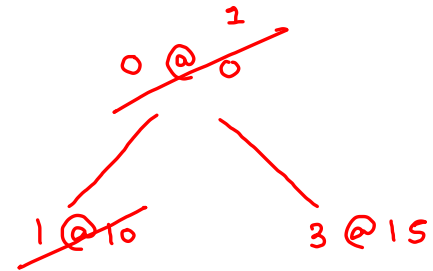15 │   │ 2

$$3 \underset{-12}{\rule{2cm}{0.4pt}} 2$$

dest   cost
0 ⟶ 0
1 ⟶ 5
2 ⟶ 3
3 ⟶ 0

Src = 0

0 @ 0   ~~1~~

~~1 @ 10~~   3 @ 15
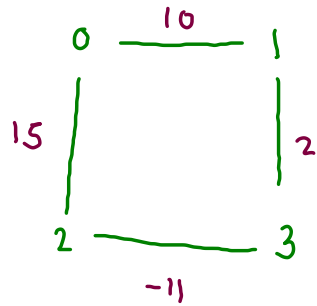
0 ⟶ 0
~~1 ⟶ 10~~ ✗
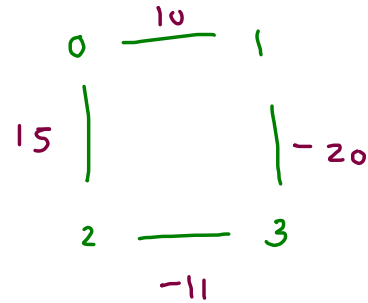
Bellman ford : (i) single src all dest shortest path.
                (ii) DP based
                (iii) works on -ve edge wt
                (iv) detects -ve wt cycle

-ve edge wt, cycle wt +ve   -ve wt cycle

```
    0 ── 10 ── 1                          0 ── 10 ── 1
    │          │                          │          │
   15          │2                        15          │ -20
    │          │                          │          │
    2 ──────── 3                          2 ──────── 3
        -11                                   -11
```

no meaning
of shortest
paths
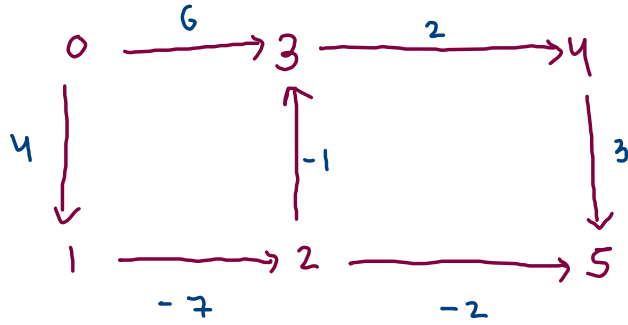
Src = 0

u	v	wt
4	5	3
3	4	2
2	5	-2
2	3	-1
1	2	-7
0	3	6
0	1	4
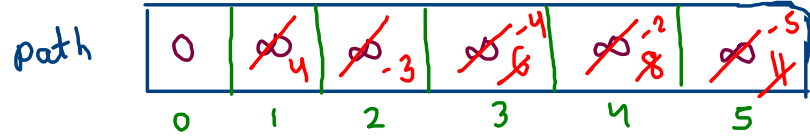
V-1 [edges]

path[u] + wt < path[v]

src to w   u-v   src to v

Graph:
- 0 → 3 (weight 6)
- 3 → 4 (weight 2)
- 0 → 1 (weight 4)
- 2 → 3 (weight -1)
- 4 → 5 (weight 3)
- 1 → 2 (weight -7)
- 2 → 5 (weight -2)

Array:

0	∞ 4	∞ -3	∞ -4 / ∞	∞ -2	∞ -5
0	1	2	3	4	5

Edges list:
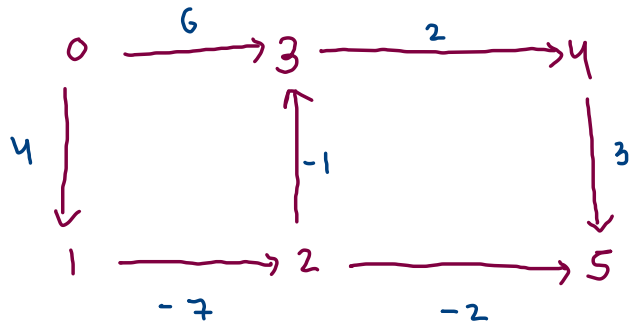
0	1	4
0	3	6
1	2	-7
2	3	-1
2	5	-2
3	4	2
4	5	3

itr = 1

→ A shortest path having length i, will be solved till ith iteration.

detect -ve wt cycle
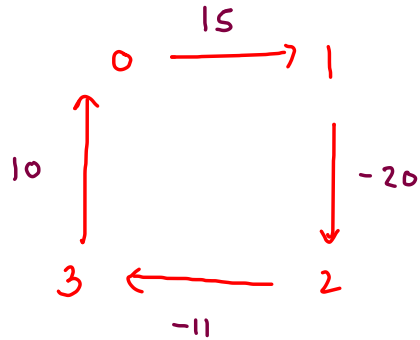
0 → 1 (15)
0 → 3 (10)
1 → 2 (-20)
2 → 3 (-11)

0	1	15
2	3	-11
1	2	-20
3	0	10

src = 0

V-1 iterations

V^{th} iteration
    └→ updation
       (-ve wt cycle
        is present)

-6	9	-11	-22
0	1	2	3

itr : 4

Floyd - warshall : (i) all pairs shortest path.
(ii) works on -ve edge wt.
(iii) DP based
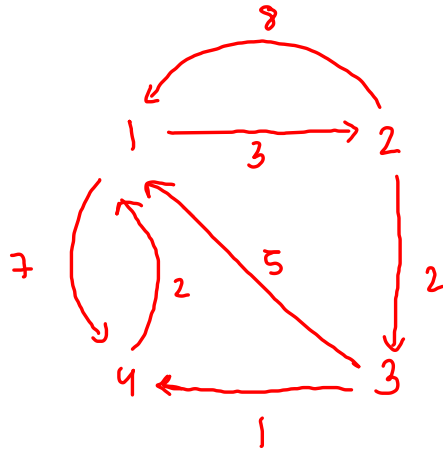
	1	2	3	4
1	∞	3	∞	7
2	8	∞	2	∞
3	5	∞	∞	1
4	2	∞	∞	∞

no intermediate

intermediate

	1	2	3	4
1	∞	3	∞	7
2	8	∞	2	∞
3	5	∞	∞	1
4	∞	∞	∞	∞

uv

no intermediate

	1	2	3	4
1	∞	3	∞	7
2	8	∞	2	15
3	5	8	∞	1
4	2	5	∞	∞

1 as intermediate

$uv \longrightarrow 2,3$
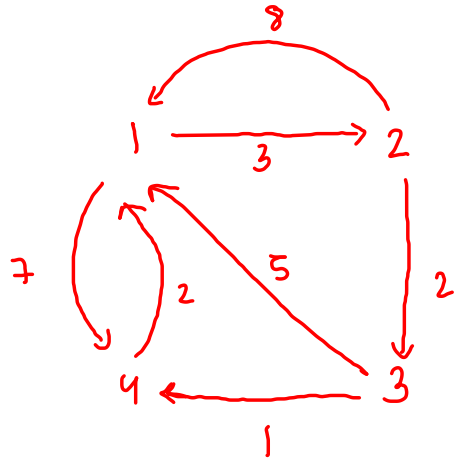
$u_{i_1}v \longrightarrow 3,2$

	1	2	3	4
1	∞	3	5	7
2	8	∞	2	15
3	5	8	∞	1
4	2	5	7	∞

2 as intermediate

$uv \longrightarrow 2,3$

$u_{i_1}v \longrightarrow 3,2$

$u_{i_2}v \longrightarrow 1,3$

$u_{i_1 i_2}v \longrightarrow 4,3$