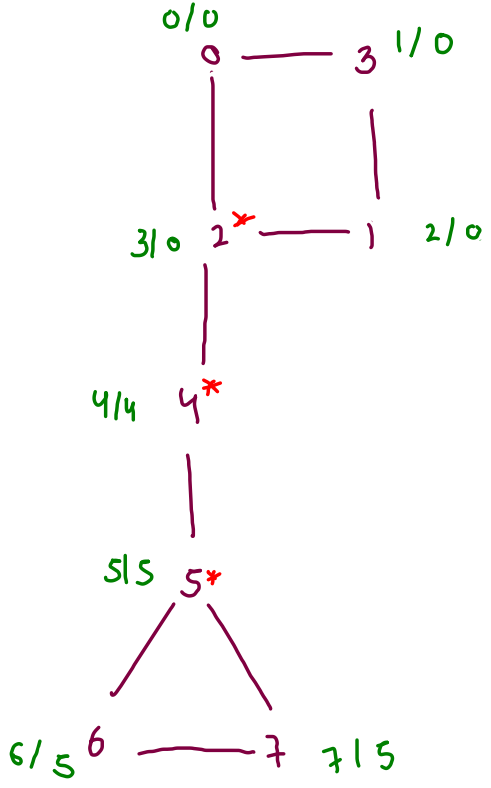
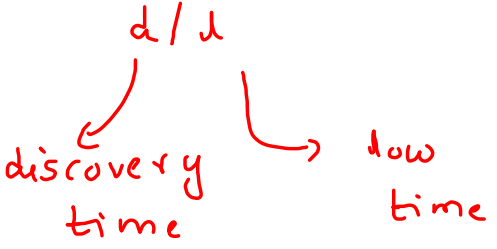
Articulation points & bridges

articulation point

discovery time (pre): time when a vertex is discovered while travelling dfs.

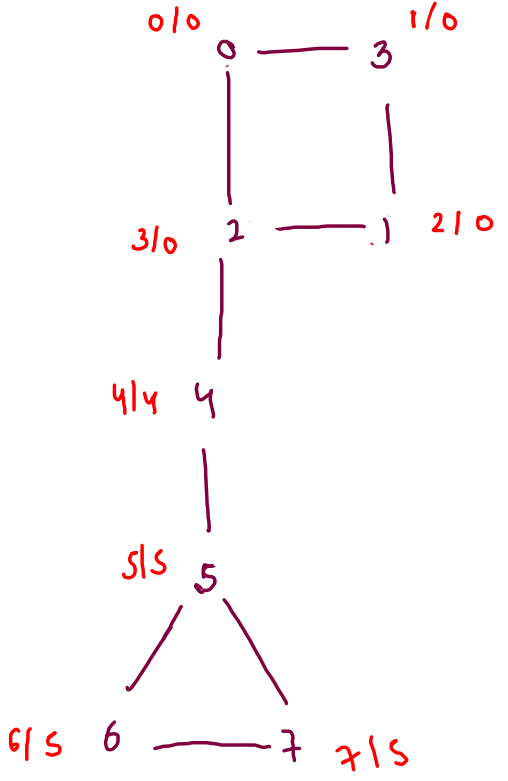
low time (post): ignoring parent path, the lowest vertex (time-wise) which is connected with you.





// articulation point

```
if (disc[u] ≤ low[v]) {
    u is an ap.
}
```

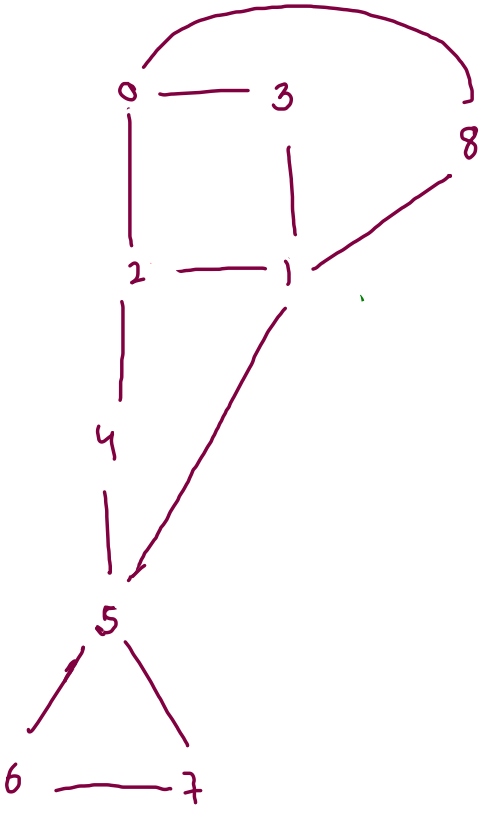


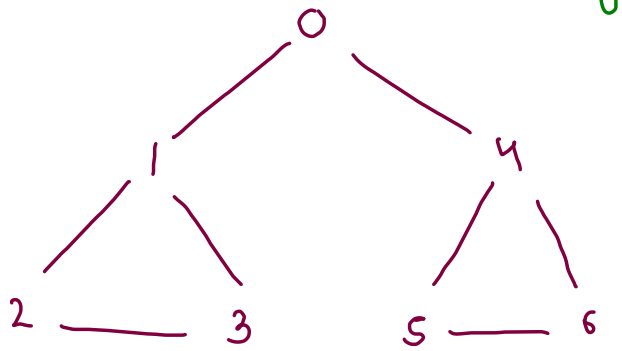

```
if (nbr == par) {
    //do nothing
}
else if (visited nbr) {
    low[src] = min(low[src], disc[nbr]);
}
else if (unvisited nbr)
    travel;
    low[src] = min(low[src], low[nbr]);
    //check ap condition src.
    if (disc[src] ≤ low[nbr]) {
        src is an ap;
    }
}
```

5 4 2

```
if (nbr == par) {
    //do nothing
}
else if (visited nbr) {
    low[src] = min (low[src], disc[nbr]);
}
else if (unvisited nbr)
    travel;
    low[src] = min (low[src], low[nbr]);
    //check ap condition src.
    if (disc[src] <= low[nbr]) {
        src is an ap;
    }
}
```

low[nbr]

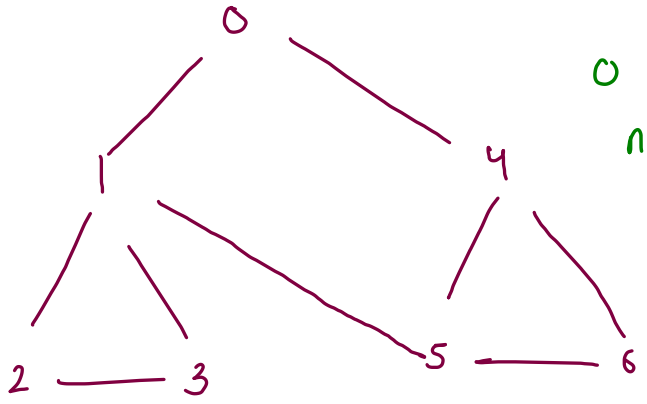




0 is ap

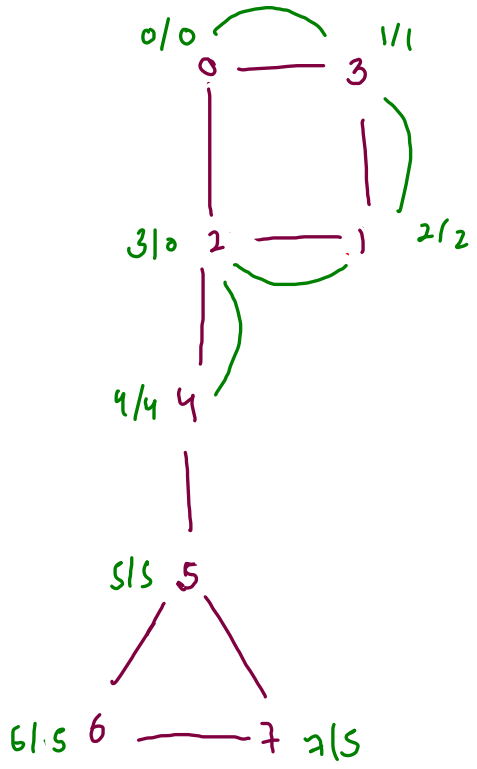
count how many times you have to call unvisited for original src.

call > 1, then original src is ap.



0 is not ap.

bridges




```
if (disc[src] < low[nbr]) {
        // src to nbr edge is
            a bridge.
}
```