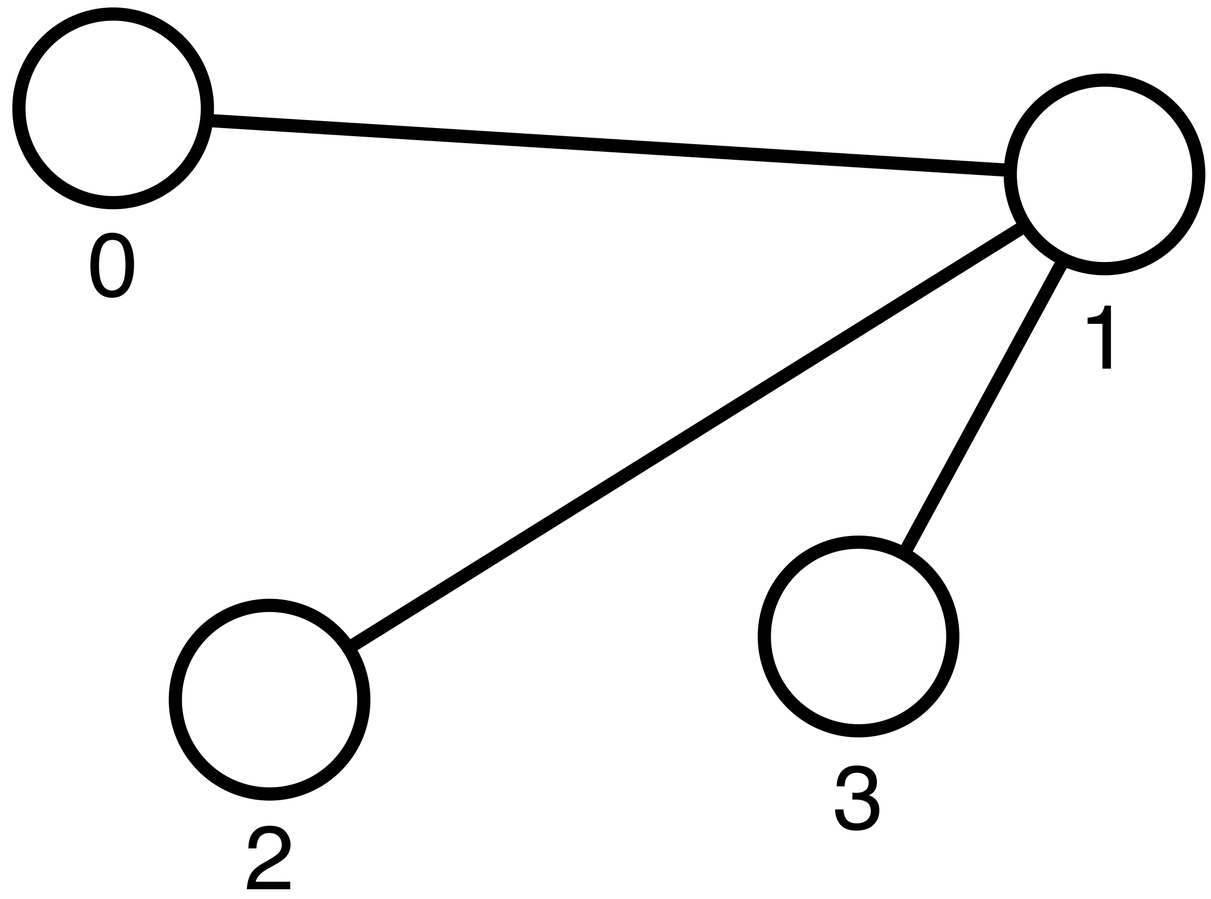
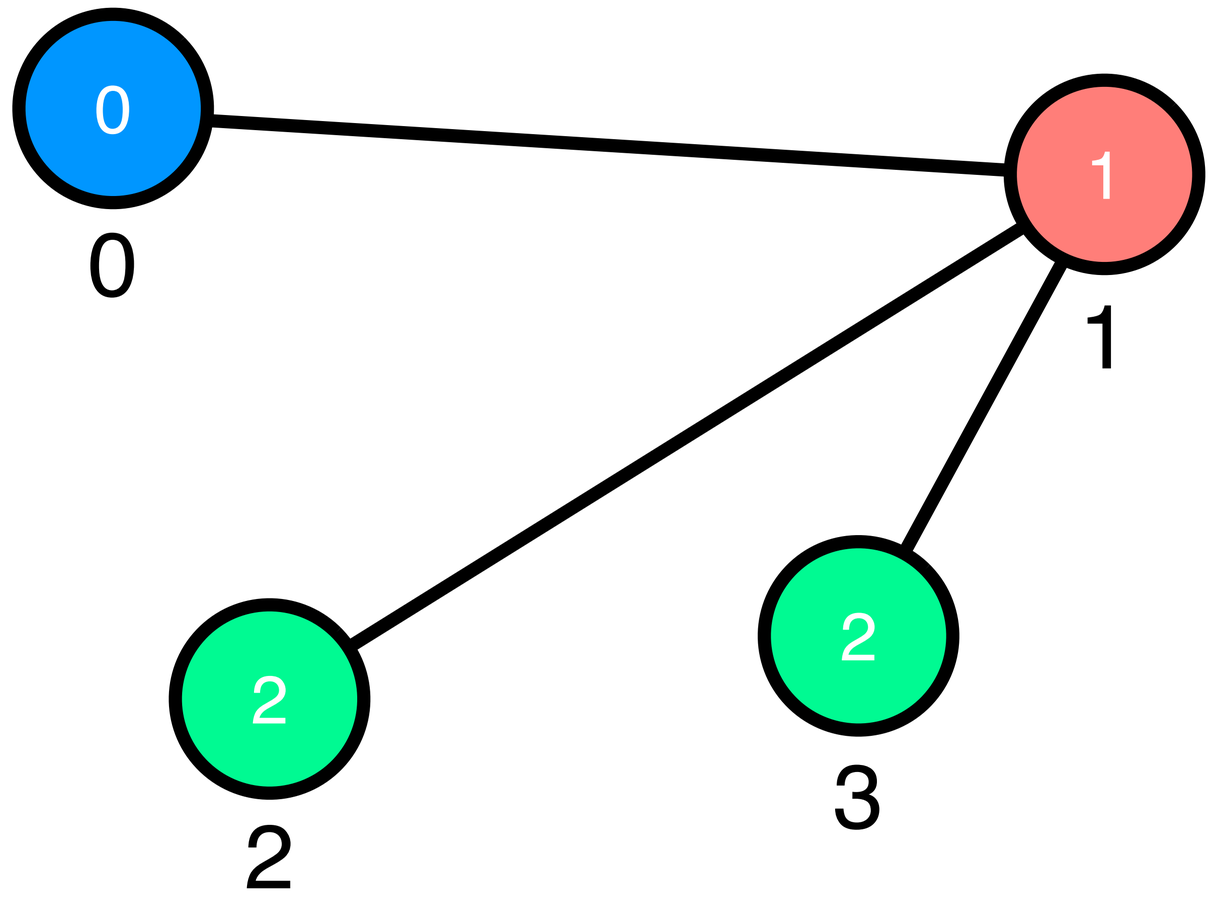
Discrete Optimization

Assignments: Graph Coloring

Graph Coloring



Graph Coloring



Graph Coloring

- *n* Nodes
- *e* Edges
- Edge list
- C_i color of node *i*

$$\begin{aligned}
&\text{minimize:} && \max_{i \in 0 \ldots n-1} c_i \\
&\text{subject to:} && \\
& && c_i \neq c_j \quad (\langle i, j \rangle \in E)
\end{aligned}$$

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\end{aligned}$$

Input

```
|N| |E|
u_1 v_1
u_2 v_2
...
u_|E| v_|E|
```

Output

```
obj opt
c_1 c_2 c_3 ... c_n
```

Graph Coloring

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&\text{subject to:} && \\
& && c_i \neq c_j \quad (\langle i, j \rangle \in E)
\end{aligned}$$

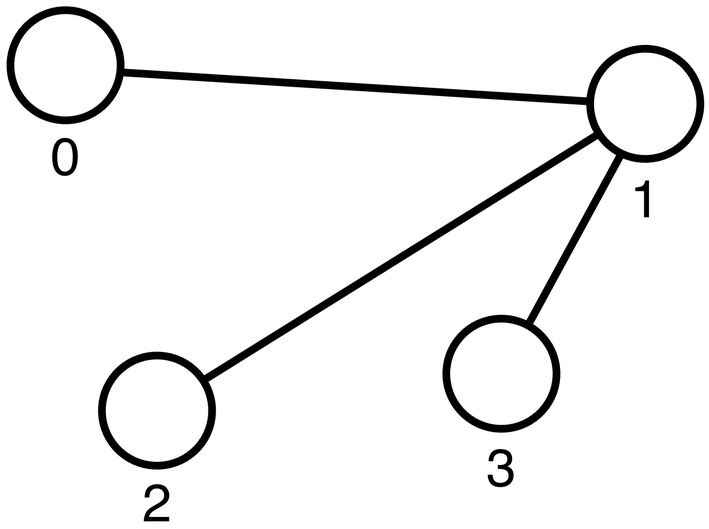
Input

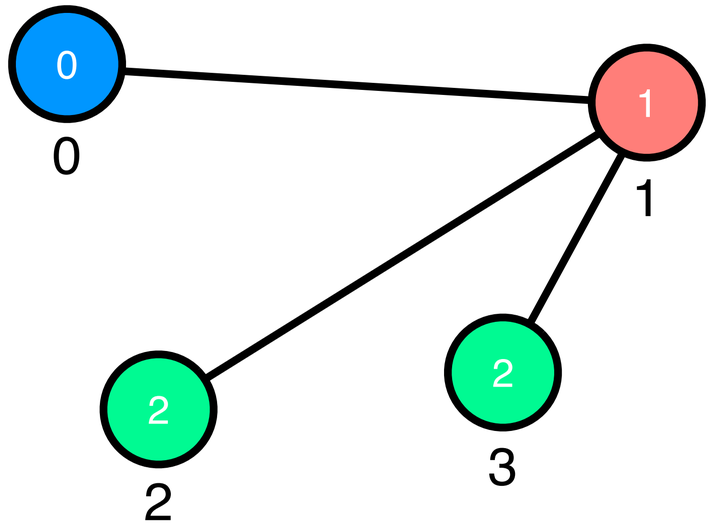
```
4 3
0 1
1 2
1 3
```

Output

```
3 0
0 1 2 2
```

Graph Coloring





Input

```
4 3
0 1
1 2
1 3
```

Output

```
3 0
0 1 2 2
```

Assignment Tips

- Node Degree

- Symmetries
  - 0 1 2 2
  - 2 0 1 1

- Easy Lower Bound

Have Fun!