# Example Hierarchy
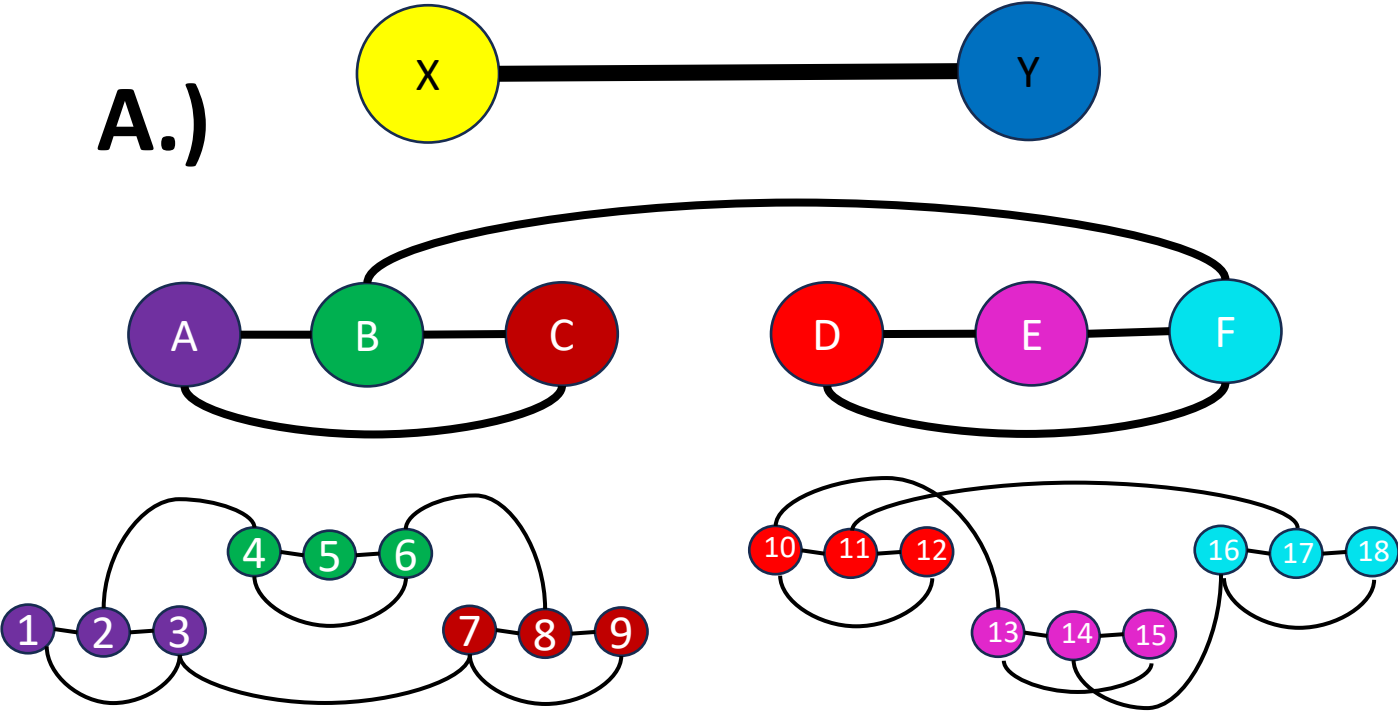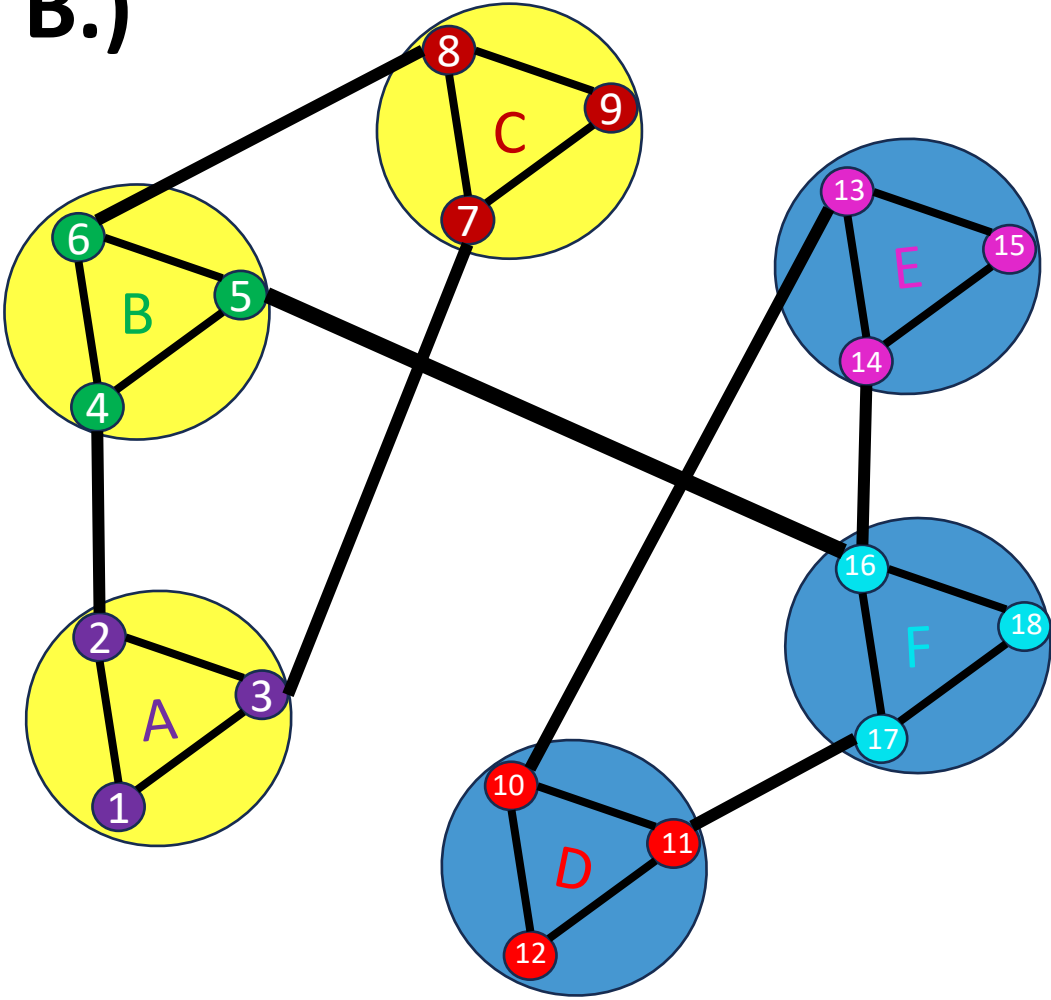
**For 6 communities:**

Modularity for communities 1,3,4,6

$$4 \times \left[ \frac{2 \times 3}{2 \times 25} - \left( \frac{3+3+2}{2 \times 25} \right)^2 \right] = 4 \times \left[ \frac{6}{50} - \left( \frac{8}{50} \right)^2 \right] = 4 \times 0.0944 = 0.3776$$

Modularity for communities 2 and 5

$$2 \times \left[ \frac{2 \times 3}{2 \times 25} - \left( \frac{3+3+3}{2 \times 25} \right)^2 \right] = 2 \times \left[ \frac{6}{50} - \left( \frac{9}{50} \right)^2 \right] = 2 \times 0.0876 = 0.1752$$

Total Modularity $= 0.3776 + 0.1752 \approx 0.553$

**For 2 communities:**

$$2 \times \left[ \frac{2 \times 12}{2 \times 25} - \left( \frac{2(2+3+3) + (3+3+3)}{2 \times 25} \right)^2 \right] = 2 \times \left[ \frac{24}{50} - \left( \frac{25}{50} \right)^2 \right] = 2 \times 0.229 \approx 0.46$$