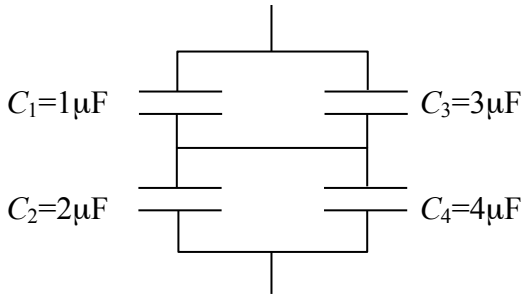
Inside a Network of Capacitors

Here is configuration of capacitors, with some capacitance values. Suppose we apply 12 V top to bottom. What is the charge on cap 2?



Work our way out with equivalent capacitors:

- Top pair are in parallel, C_{13}=4μF. Bottom pair are in parallel, C_{24}=6μF.
- Those two are in series, C_{1324}=12/5 μF

Now work our way back in:

- C_{13} and C_{24} are in series, so we need to use the fact that these equivalent capacitors have the same charge…
  - $Q_{1234} = C_{1234}V_{1234} = \left(\frac{12}{5}\mu\text{F}\right)(12\,\text{V}) = 28.8\mu\text{C}$
  - $Q_{24} = Q_{1234} = 28.8\mu\text{C}$ (also $= Q_{13}$ but we don't need that fact for this problem)
- C_2 and C_4 are in parallel, so we need to use the fact that these capacitors have the same potential difference across them…
  - $V_{24} = \frac{Q_{24}}{C_{24}} = \frac{28.8\mu\text{C}}{6\mu\text{F}} = 4.8\,\text{V}$
  - $V_2 = V_{24} = 4.8\,\text{V}$ (also $= V_4$ but we don't need that fact for this problem)
- Finally, we need the charge on cap 2 instead of voltage,
  $Q_2 = C_2\Delta V_2 = (2\,\mu\text{F})(4.8\,\text{V}) = 9.6\,\mu\text{C}$