**Series**

If multiple capacitors are placed in series in a circuit, charge will separate equally on each capacitor.

\[ Q_1 = Q_2 = Q_3 = Q \]

Moreover, the total voltage drop over all the capacitors is equal to the sum of the voltage drops over each capacitor.

\[ V_T = V_1 + V_2 + V_3 \]

Finally, from the previous unit: \[ Q = CV \] \[ V = \frac{Q}{C} \]

Therefore:

\[ V_T = V_1 + V_2 + V_3 \]

\[ \frac{Q}{C_{eq}} = \frac{Q}{C_1} + \frac{Q}{C_2} + \frac{Q}{C_3} \]

\[ \frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} \]

Equivalent capacitance in series

![Diagram of capacitors in series](image)
Parallel

If multiple capacitors are placed in parallel in a circuit, voltage drops across each will be the same.

\[ V_1 = V_2 = V_3 = V_{\text{total}} = V \]

The total charge separation for all of the capacitors will be the sum of the charge separation for all the capacitors.

\[ Q_{\text{total}} = Q_1 + Q_2 + Q_3 \]

Therefore:

\[ Q_{\text{total}} = Q_1 + Q_2 + Q_3 \]
\[ C_{\text{total}} = C_1 + C_2 + C_3 \]

Equivalent Capacitance

\[ C_{\text{total}} = C_1 + C_2 + C_3 \]

in Parallel

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\[ C_1 \quad C_2 \quad C_3 \]