

How To Find the Capacitance of a Conductor Configuration

Capacitance is the amount of charge something can hold for a given applied potential difference between separated parts of the conductor: $C = Q/\Delta V$. So the overall strategy here is to find the potential difference ΔV corresponding to a particular Q on an object, then take the ratio.

1. First, assign charge $+Q$ and $-Q$ to the “plates” of the capacitor (“plates” meaning the separated charged surfaces... of course they need not really be flat plates). **Don’t** try to *find* Q : you *assume* a particular Q and find the ΔV corresponding to that Q ; then when you calculate the capacitance $Q/\Delta V$, the Q will cancel out.
2. Find the electric field \vec{E} in the region between the plates. Often it’s appropriate to use Gauss’ Law. See the first howto.
3. Using the electric field you have calculated, find the potential difference $\Delta V_{AB} = -\int_A^B \vec{E} \cdot d\vec{l}$ between the plates. See the first howto.
4. Now calculate $C = Q/\Delta V$. The arbitrary Q you assigned in step 1 should cancel out.
5. Capacitance is positive, so check your signs if you end up with a negative number.