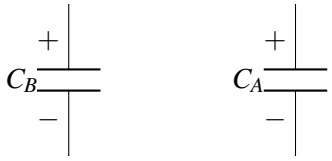
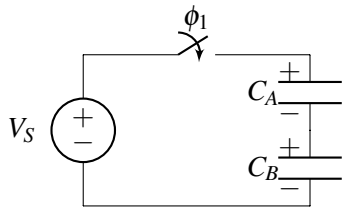
EECS 16A Designing Information Devices and Systems I
Fall 2021 Discussion 9A

1. Capacitors and Charge Sharing Revisited

(a) Consider two capacitors, C_A and C_B that have been charged to Q_{A_1} and Q_{B_1} repectively. Compute the voltages across each one, V_{A_1} and V_{B_1}.



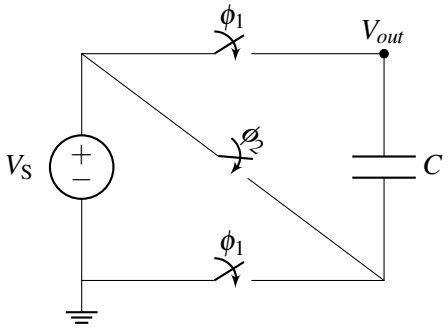
(b) Consider the following circuit set up with an open switch. Given that these were the same charged capacitors as in the previous part, in phase 1, what is the charge and voltage across both capacitors, **before** the switch is closed?



(c) Now the switch is closed, and the circuit is allowed to settle. Compute V_{B_2}, the final voltage drop across C_B, in terms of the given capacitances, the voltages computed in part (a), and V_S.

2. Voltage Booster

We have made extensive use of resistive voltage dividers to reduce voltage. What about a circuit that boosts voltage to a value greater than the supply $V_S = 5V$? We can do this with capacitors!



(a) In the circuit above switches ϕ_1 are initially closed and switch ϕ_2 is initially open. Calculate the value of the output voltage, V_{out} with respect to ground, and the amount of charge stored on capacitor, C, at that state (phase 1).

(b) Now, after the capacitors are charged, switches ϕ_1 are opened and switch ϕ_2 is closed. Calculate the new voltage output voltage, V_{out}, at steady state.

