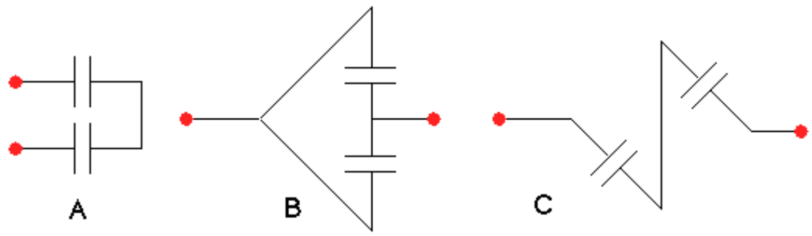
Which of the following groups of capacitors are joined in parallel?
Explain your reasoning.



Follow the wires!

Capacitors are connected in parallel when both of its terminals are connected to both terminals of another capacitor. The voltage between all of these are the same, but **for group B the capacitors are connected to another capacitor.** A and C appear to be connected in such a way, but they both have only one continuous line going from one terminal to another. That is not parallel.

This ensures they have the same what?

B. This is because from the connection I can see that for **the potential difference across the two plates of the capacitors is the same for the left hand and the right** hand. That is each plate of one capacitor is connected to each plate of the other capacitor.

Take care to distinguish "potential" from "potential drop"

B is in parallel. **The important thing about being connected in parallel is that each side of the capacitor should have the same potential drop** (the left side of one capacitor has to eventually connect to the left side of the second and same for the right sides). Capacitor A is connected on the right but not on the left and C is also only connected on one side of each capacitor.

Note: potential doesn't come or go, it just sits there

B. This is because for those examples, **the potential coming from the wires** on the left is joined to a place for both capacitors, and from the right they're joined to the other capacitors. On each other example the capacitors have a clear starting and ending path.

You have 3 identical capacitors, each having a capacitance of 6 mF (micro-farads). What different equivalent capacitances can be constructed by combining them together in various clever ways? Explain the combinations you need and how you get those values. (You must use all three capacitors for each combination.)

Problem: no way to troubleshoot this:

The three capacitors could all be in parallel with each other, giving a single capacitor of capacitance **18 mF.** You could have the three capacitors in series, giving a single capacitor of capacitance **1/2 mF.** You could have two of the capacitors in parallel with each other and the other in series with the other 2, giving a capacitance of **12 1/6 mF**, or you could have two in series and one in parallel with the series for a capacitance of **6 1/3 mF.**

Solution: show all the calculations clearly!

Option 1: **all capacitors are in parallel:**

C(equiv.)= (6mF+6mF+6mF)=18mF

Option 2: **all capacitors are in series:**

1/(C(equiv.)=1/(6mF) + 1/(6mF) + 1/(6mF)=3/(6mF) =1/(3mF)...

C(equiv)=3mF

Option 3: **two capacitors are in parallel and one is in series with the other two:**

C(equiv. of parallel)=(6mF+6mF)= 12mF

1/C(equiv of parallel capacitors in series with third)
= 1/(12mF) +1/(6mF)=3/(12mF)=1/(4mF)...

C(equiv) =4mF

Option 4: **two capacitors in series and one in parallel:**

1/C(equiv of series)=1/(6mF)+1/(6mF)=2/(6mF)=1/(3mF)....

C(equiv of series)=3mF

C(equiv of series capacitors in parallel with third) = 3mF+6mF=9mF....

C(equiv)=9mF

In retrospect, I do not believe that Option 3 is possible in reality. I do not see a way in which one capacitor could be in series with two different capacitors that are in parallel with each other. (dp – draw 'em!)

Warning: take care with reciprocals

You could connect all three of them in series. This would result in a total capacity of 1/2 mF, since it would be 1/6mF +1/6mF + 1/6mF. You could connect them all in parallel, and in that case, the total capacitance would be 18 mF. Since they are parallel, it would be 6 mF + 6mF + 6mF. **You could also keep two in series and one in parallel with of those, resulting in a net capacitance of 1/6mF + 1/6 mF + 6mF = 6.333 mF.**

When a particular capacitor is connected in a circuit, the potential difference between the two plates is measured to be 12 Volts. Later, after the circuit is altered, the potential drop is measured again and found to be 24 Volts. By what factor has the capacitance changed from the previous situation?

a. It is doubled
b. It is halved
c. It changes by some other factor
d. It is unchanged