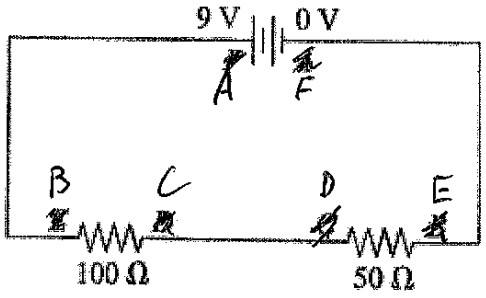
1. Refer to the diagram below ~~(Need to reverse~~ Name: KEY



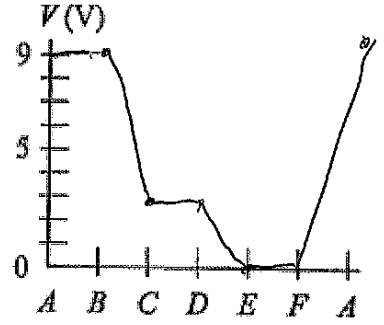
Find equivalent Resistance

$R_{eq} = 100\Omega + 50\Omega$

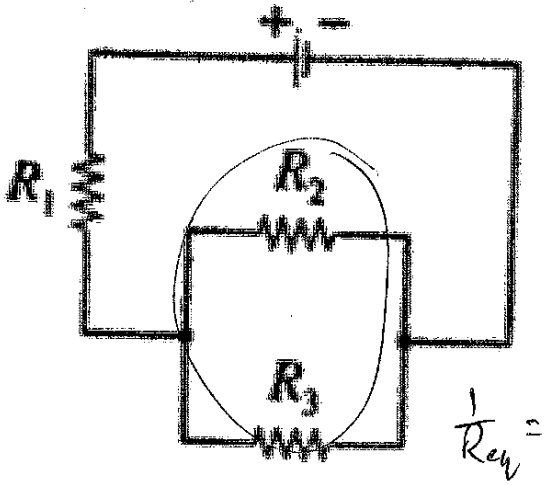
$= 150\Omega$

ΔV for equivalent resistor must be equal to battery

$I = \frac{9V}{150\Omega} = 0.06A$

Find the current in the circuit and then calculate the change in voltage across each resistor	**Draw a qualitative electric potential vs position graph**
$I = 0.06\ A$ Use I for each resistor (each has same I B/C series) $\Delta V_1 = I \cdot R = 0.06A \cdot 100\Omega = 6V$ $\Delta V_2 = I \cdot R_2 = 0.06A \cdot 50\Omega = 3V$	

2.



	V	I	R	P
Total	10	0.857	11.67	~~8.57~~
R_1	4.29	0.857	5	3.67 W
R_2	5.71	$\frac{V}{R} = 0.571$	10	3.26W
R_3	5.71	$\frac{V}{R} = 0.286$	20	1.63W

$\frac{1}{R_{eq}} = \frac{1}{10} + \frac{1}{20} = \frac{3}{20}$

$R_{eq} = \frac{20}{3} = 6.67\Omega$

$R_{tot} = 5\Omega + 6.67\Omega = 11.67\Omega$

V=10v $R_1 = 5\Omega$, $R_2 = 10\Omega$, $R_3 = 20\Omega$

a. Determine total resistance of the circuit

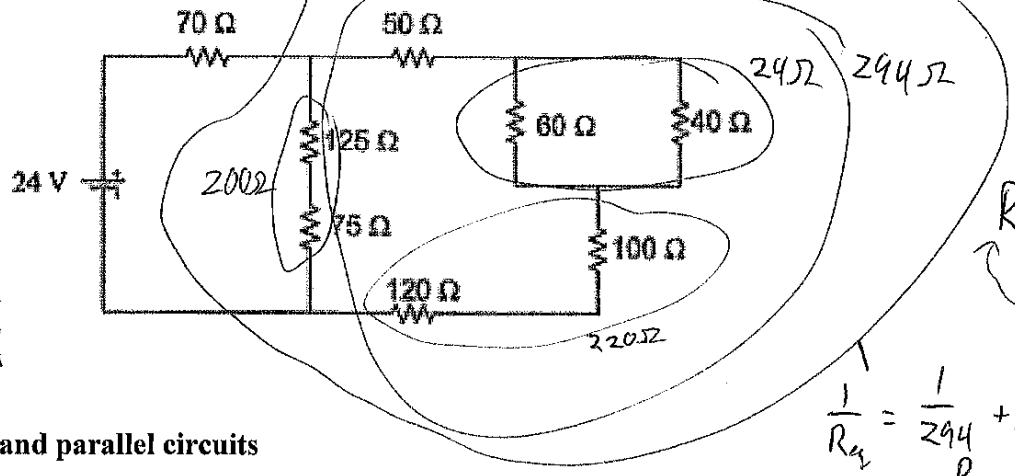
b. Determine the total current coming through the battery (which is the same as the equivalent circuit) $I = \frac{10V}{11.67} = 0.857$

c. Is there a resistor that experiences that current? Use that to determine its voltage. R_1: $V = IR = .857 \cdot 5\Omega = 4.29V$

d. What is the voltage drop across the remaining two resistors? Complete the remaining values.

$10 - 4.29 = 5.71V \rightarrow$ Same for R_2 + R_3

3. What is the total resistance of the following circuit (draw equivalent circuits to help)? What is the total current?



$I = \frac{24V}{184.03\Omega} = 0.127A$

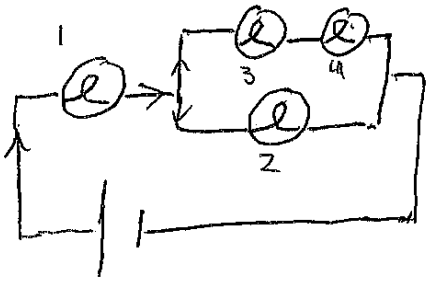
$R_{Tot} = 114.03 + 70 = 184.03\Omega$

$\frac{1}{R_{eq}} = \frac{1}{294} + \frac{1}{200}$

$R_{eq} = 119.03\Omega$

Applying Series and parallel circuits

4. Use the analogies and ideas of potential difference (voltage) and current in the following. Rate the bulbs in the circuit shown to the right according to their current, listing the brightest (highest current) bulb first. Indicate whether any bulbs are equally bright. Explain your ratings.

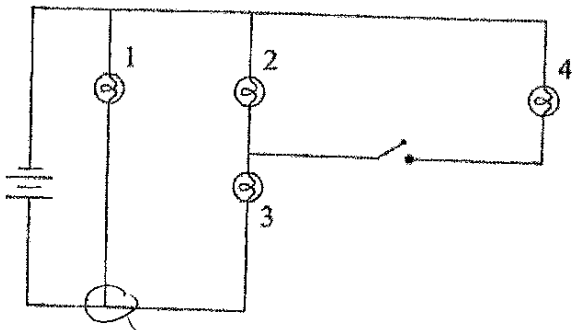


~~Change to a single bulb which splits into two parallel bulbs~~

Thinking about current:
Total current must flow thru (1).
Splits at junction → more flows to (2)
B/C top path has higher resistance.
(3) + (4) have same B/C no change in current for series elements.

1 > 2 > 3 = 4

5. Use the diagram to the right



a. Rate the bulbs in the circuit according to their brightness (current) when the switch is open.
4 = 0, no flow.

1 > 2 = 3

b. Now rate the bulbs in the circuit when the switch is closed.

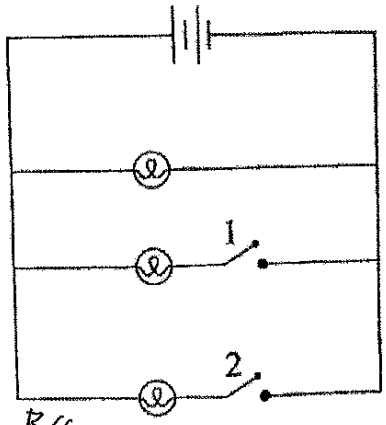
1 > 3 > 2 = 4

even split of current thru 3.

c. Indicate how the current through of the first three bulbs changes after the switch is closed

3 should increase: the split here now sees that the right hand equivalent resistance is less. There will be more flow in the right hand branch than ~~there~~ there was before.
Total current from the battery increased. R_{eq} ↓.

2. Use the diagram to the right



a. Predict how the brightness (current) of the top bulb changes when you close switch 1. Since bulbs are in parallel voltage differences must be same. Each path has ΔV equal to the battery because you must use up all V. No change of ΔV when ① is closed. $I = \Delta V \cdot R \rightarrow$ no change.

b. Predict how the brightness of the top bulb changes when you close switch 2 (switch 1 is open).

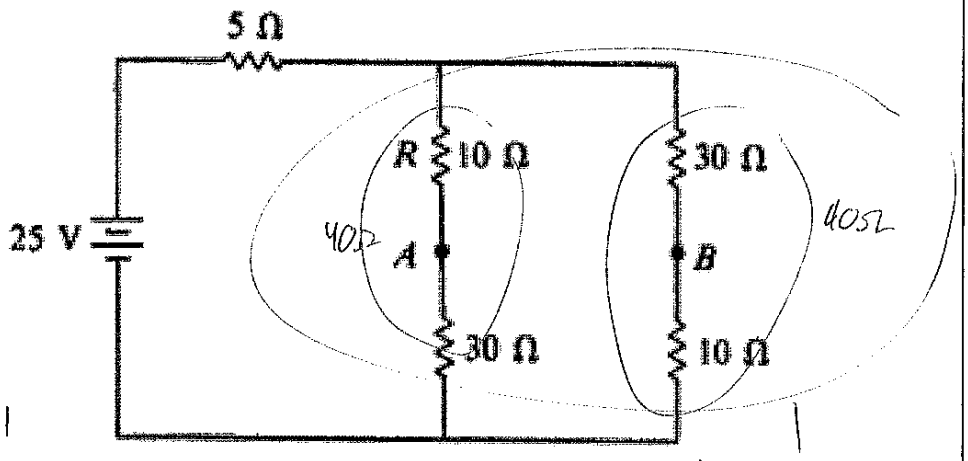
No change (same as above)

Note that total current coming out of the battery is not constant during this, B/C total resistance goes down each time.

c. If there were a bulb placed directly to the left of the battery (in series with the battery), how would its current change as switch 1 and then also switch 2 were closed? Why? (First think about total resistance and total current) See above, Brightness would go up each time.

$R_{eq} \downarrow$, $I_{tot} \uparrow$

Five resistors are connected as shown above to a 25-V source with zero internal resistance.



a. Rank resistors, in order of largest to smallest, current through each.

5Ω, all others equal

b. Explain how the current at points A & B compare and justify your answer.

Same. Each path has same total resistance, so current will split equally.

$\frac{1}{R_{eq}} = \frac{1}{40} + \frac{1}{40}$

$R_{eq} = 20$

c. What is the voltage drop of the 5Ω resistor? (Same process as second problem)

$I_{tot} = \frac{25V}{R_{tot}} = 1A$

$\Delta V_{5\Omega} = I \cdot R = 5V$

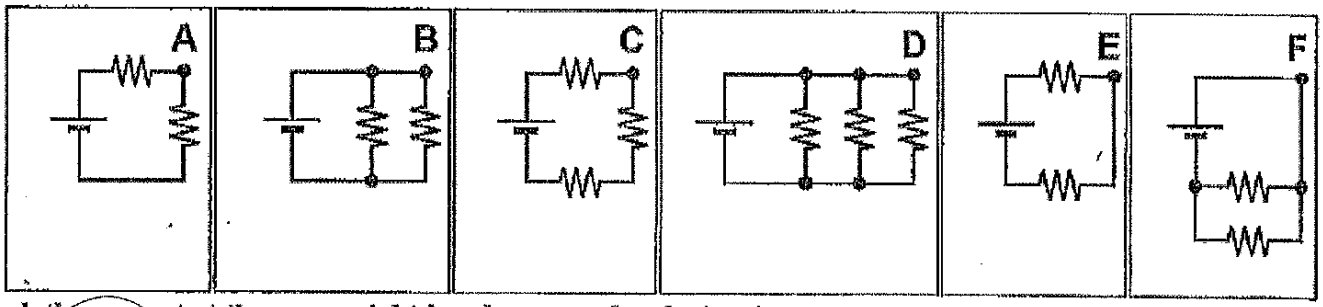
d. How would the current across the 5Ω resistor change if the two resistors around the 'B' were removed from the circuit? Explain your reasoning.

↓ Switched to wires.

Overall resistance would go down.

→ I_{Tot} ↑, so $I_{5\Omega}$ ↑

All of the resistors in the circuits shown are identical, as are all of the batteries.



Rank the current at the upper right-hand corner of each circuit.

F > B = D > A = E > C OR ☐ All the same ☐ All zero ☐ Cannot determine

1 Greatest 2 3 4 5 6 Least

Explain your reasoning.

Each parallel path has ΔV equal to the battery, so each will have current of $I = \frac{\Delta V_{Bat}}{R}$

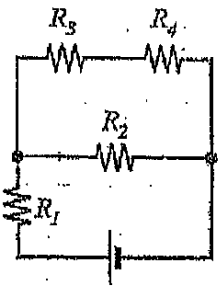
Identical circuit. Each resistor will only get half the voltage of the battery (series)

Highest resistance overall.

Has multiple resistors in parallel feeding into the top right. Each of the two paths at bottom has $I = \frac{\Delta V_{Bat}}{R}$, so it has 2x that current at (F)

D2-SCT41: Four Resistor Circuit I—Current

In the circuit shown, the sizes of the resistors vary as $R_3 > R_1 > R_2 > R_4$. Four students discussing the currents in this circuit make the following statements:



Ajay: *"I think the current in R_1 will be the largest because all of the current from the battery goes through it."*

Belen: *"Right, and after R_1 the current splits into two parts at the junction. The current through R_2, R_3, and R_4 will all be the same because there are two branches in the circuit and each branch will get half of the current."*

Clara: *"From Ohm's law, current is biggest where resistance is smallest. I think the current through R_2 will be largest because that branch has the lowest resistance in the circuit."*

Damaris: *"Also using Ohm's law, I think the current in R_3 will be the smallest because R_3 has the largest resistance. The current in R_4 will be largest, because that resistor has the smallest resistance."*

Efren: *"The current in R_2 will be the same as the current in R_4 because they are in the same branch."*

With which, if any, of these students do you agree?

Ajay (X) Belen ____ Clara ____ Damaris ____ Efren (X) None of them ____

Explain your reasoning.

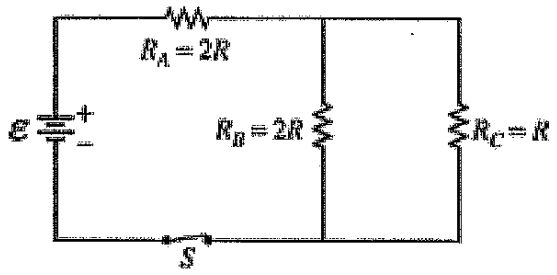
A: R_1 experiences the total current in the circuit.

B: Current does not split equally when resistances are not equal.

C: R_2 being smallest makes it experience more current than R_3 & R_4, but it cannot have as much as R_1 because the current splits.

D: See E.

E: Resistors in series have the same current.



2007B3. The circuit above contains a battery with negligible internal resistance, a closed switch S, and three resistors, each with a resistance of R or 2R.

a. i. Rank the currents in the three resistors from greatest to least, with number 1 being greatest. If two resistors have the same current, give them the same ranking.

1 I_A 3 I_B 2 I_C

ii. Justify your answers.

R_A gets all current from battery. It is split between B & C. R_C & R_B will have same ΔV, but $R_C < R_B$, so $I_C > I_B$.

b. i. Rank the voltages across the three resistors from greatest to least, with number 1 being greatest. If two resistors have the same voltage across them, give them the same ranking.

1 V_A 2 V_B 2 V_C

ii. Justify your answers.

$\Delta V = I \cdot R$

$\Delta V_A > \Delta V_B$ because more current must go thru A than B.

$\Delta V_B = \Delta V_C$ B/C they are parallel.

For parts c. and d., use E = 12 V and R = 200 Ω.

c. Calculate the equivalent resistance of the circuit.

$\frac{1}{400} + \frac{1}{200} = \frac{1}{R_{par}}$

$133.\overline{3}\,\Omega = R_{par}$

$R_{tot} = R_A + R_{par} = 533.\overline{3}\,\Omega$

d. Calculate the current in resistor R_C.

Need to know ΔV_C. Can find ΔV_A by using equivalent circuit.

$I_{tot} = \frac{\Delta V_{tot}}{R_{tot}} = \frac{12\,V}{533.3\,\Omega} = 0.0226\,A$

$\Delta V_A = I \cdot R_A = 0.0226\,A \cdot 400\,\Omega = 9\,V$

$\Delta V_C = \Delta V_{tot} - \Delta V_A = 3\,V$

$I_C = \frac{\Delta V_C}{R_C} = \frac{3\,V}{200\,\Omega} = \boxed{0.015\,A}$