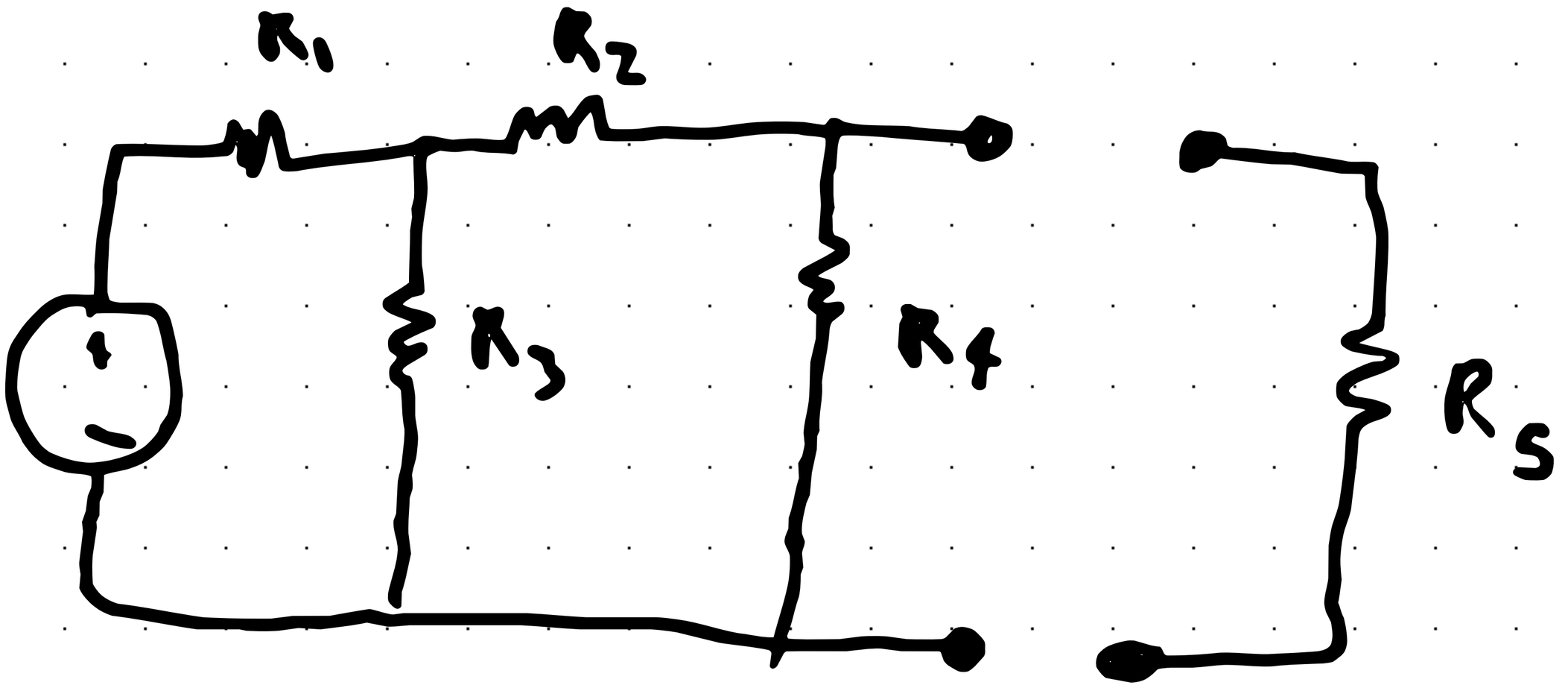
Tutorial One

Open Circuit (O.C)



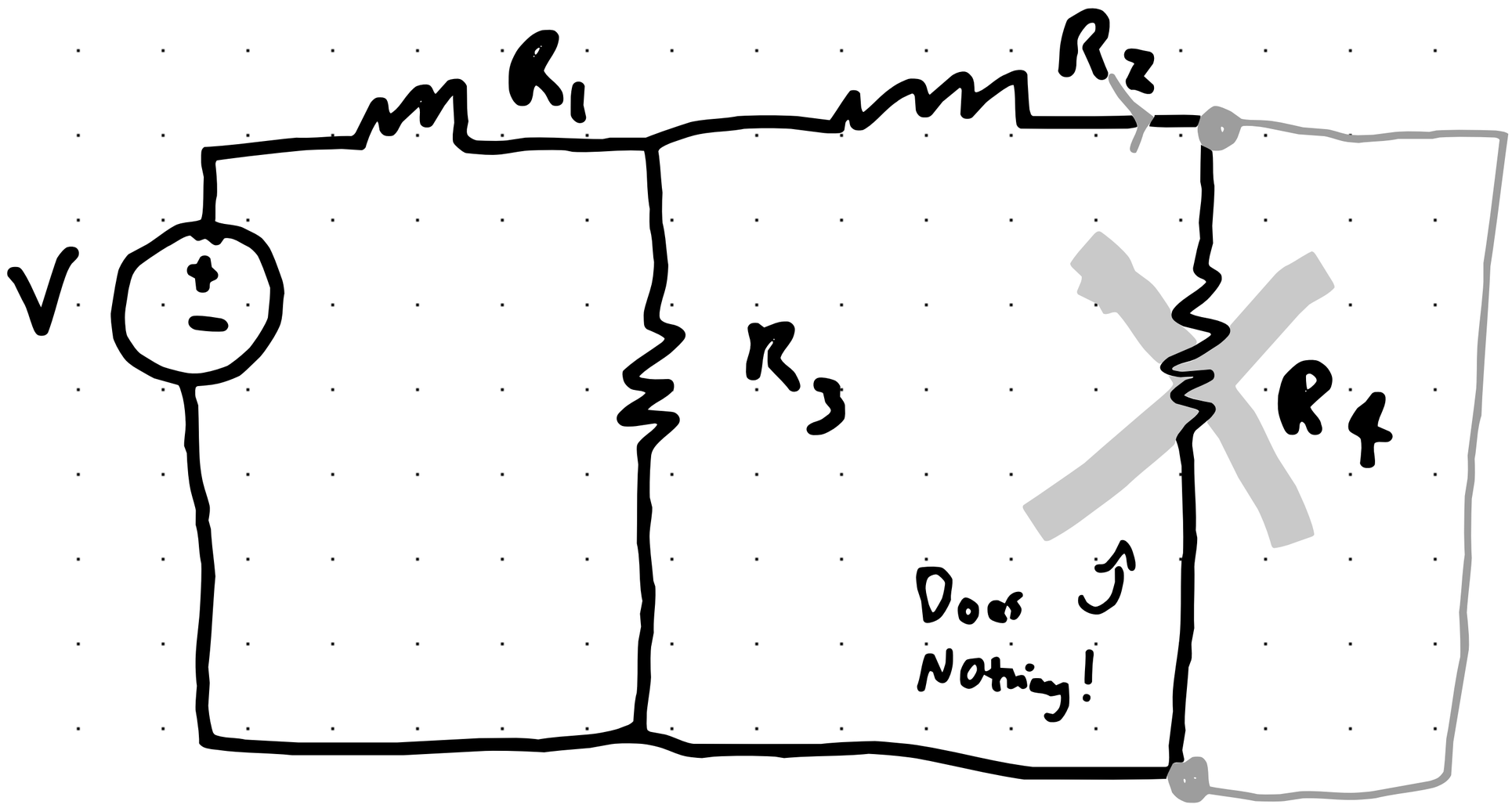
For an open circuit:

$$I = 0$$

But There is voltage!

Would you stick your fingers in an outlet?

Short Circuit (S.C)



Why would i go through a resistor when it doesn't have to?

Currents prefer lower resistance values.

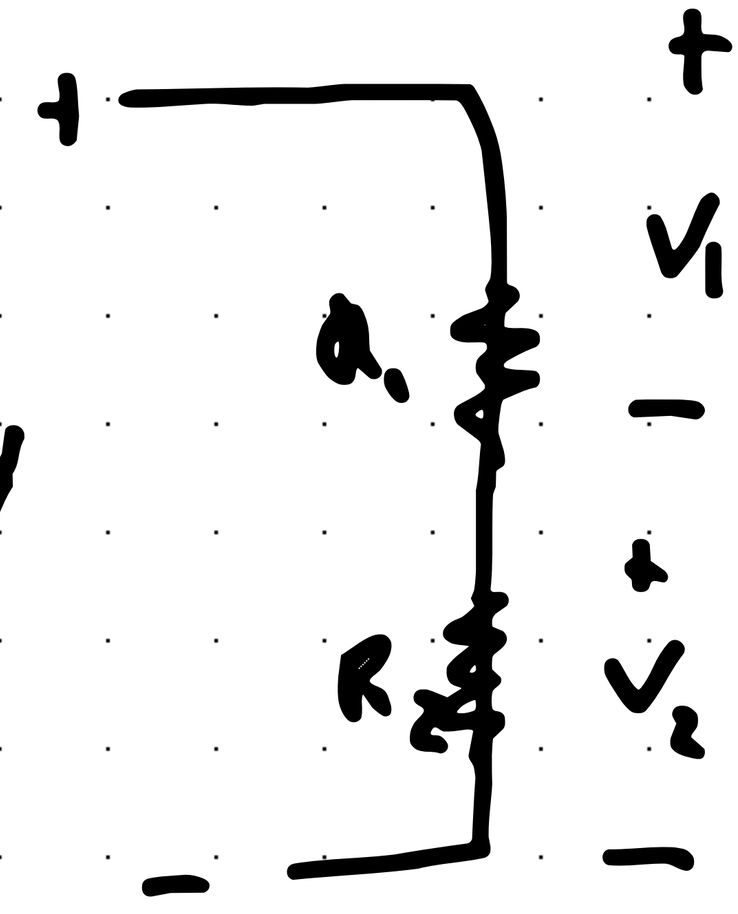
There is a current in the short circuit branch, but the voltage is equal to Zero.

$V = I(0)$
R

Voltage Divider

$$V_1 = \left(\frac{R_1}{R_1 + R_2}\right) V$$

$$V_2 = \left(\frac{R_2}{R_1 + R_2}\right) V$$

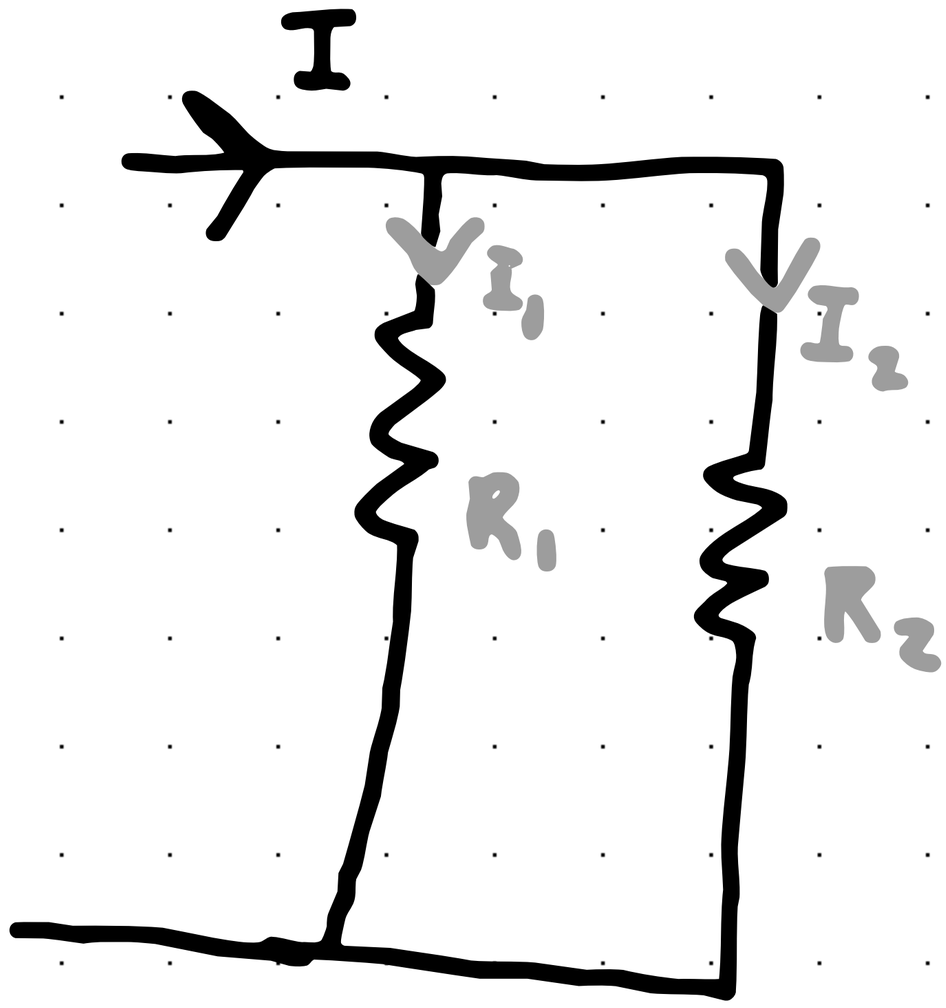


This applies for resistors in series!

Current divider

$$I_1 = I \frac{R_2}{R_1 + R_2}$$

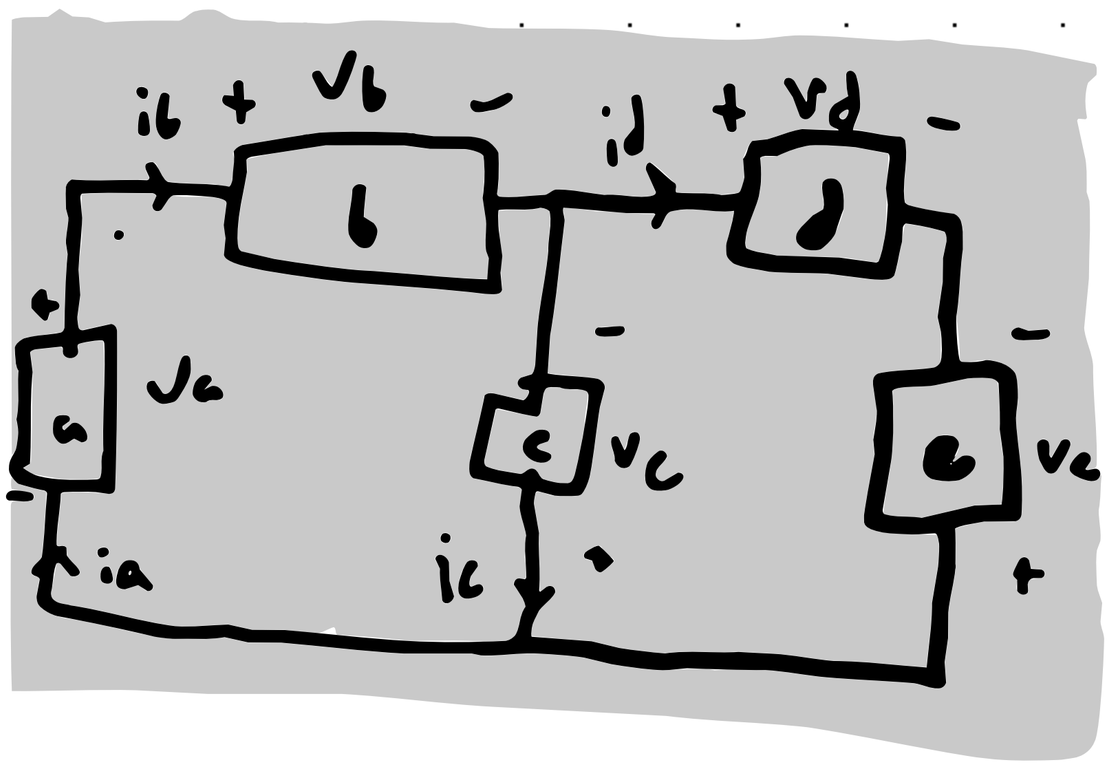
$$I_2 = I \frac{R_1}{R_1 + R_2}$$



This Applies to resistors in parallel!

Problem 1:

Does the interconnect satisfy the Power Check?



Element	voltage	Current
a	50	5
b	30	5
c	-20	-3
d	25	2
e	-30	2

P_{gen} = ⊖ to ⊕

P_{abs} = ⊕ to ⊖

$P_a = -V_a i_a = -50(5) = -750W$ (A)

$P_b = V_b i_b = +(30)(5) = 150W$ (P)

$P_c = -V_c i_c = -(-20)(-3) = -60W$ (A)

$P_d = V_d i_d = +(25)(2) = 50W$ (P)

$P_e = -V_e i_e = -(-30)(2) = 60W$ (P)

A is Active
Current goes low to high
$(P_{gen}, -V_a i_a)$

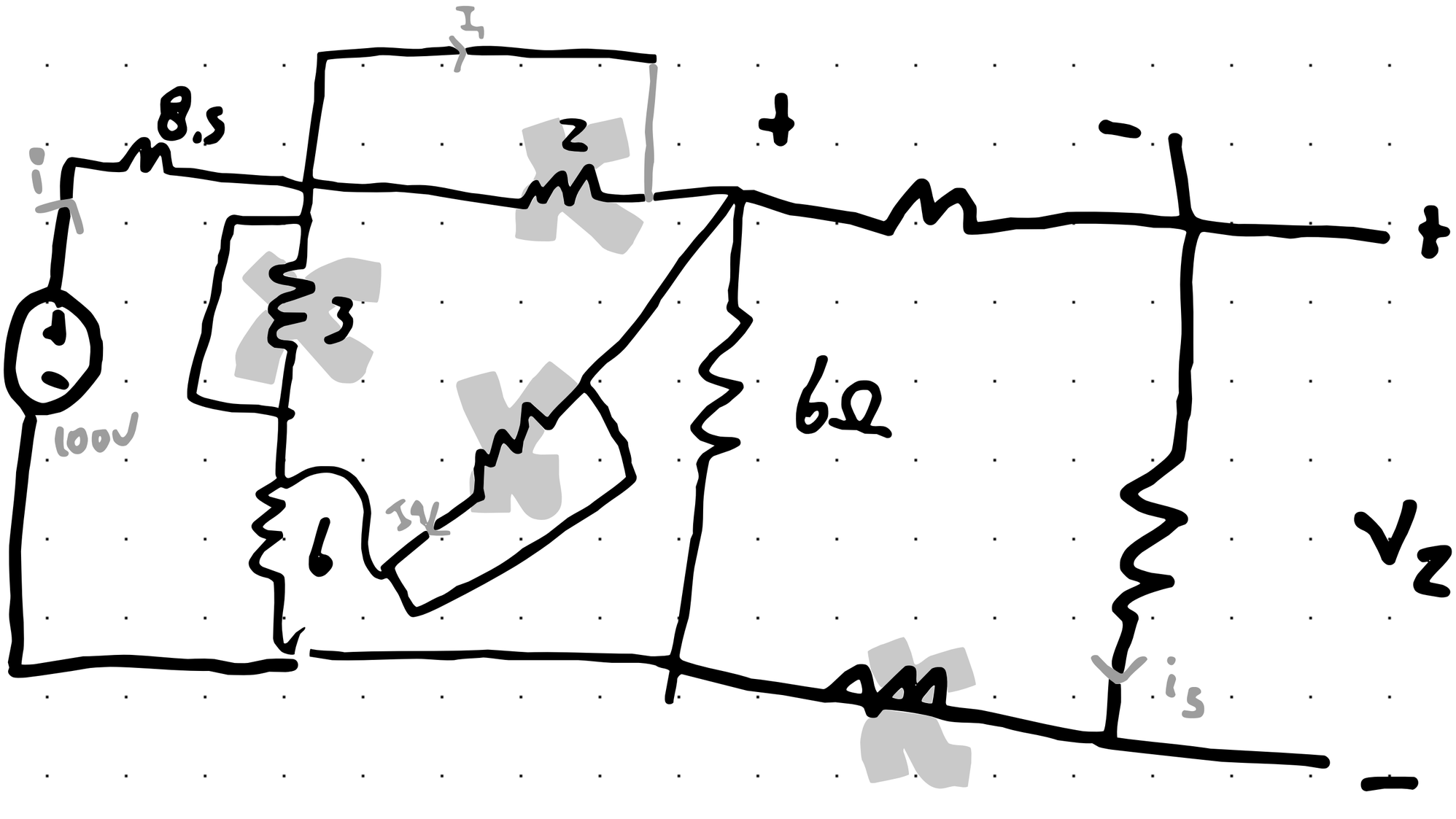
B is passive
(current goes high to low)
$(P_{abs}, V_b i_b)$

we have given the wrong polarity but it's okay!

A = Active
P = passive

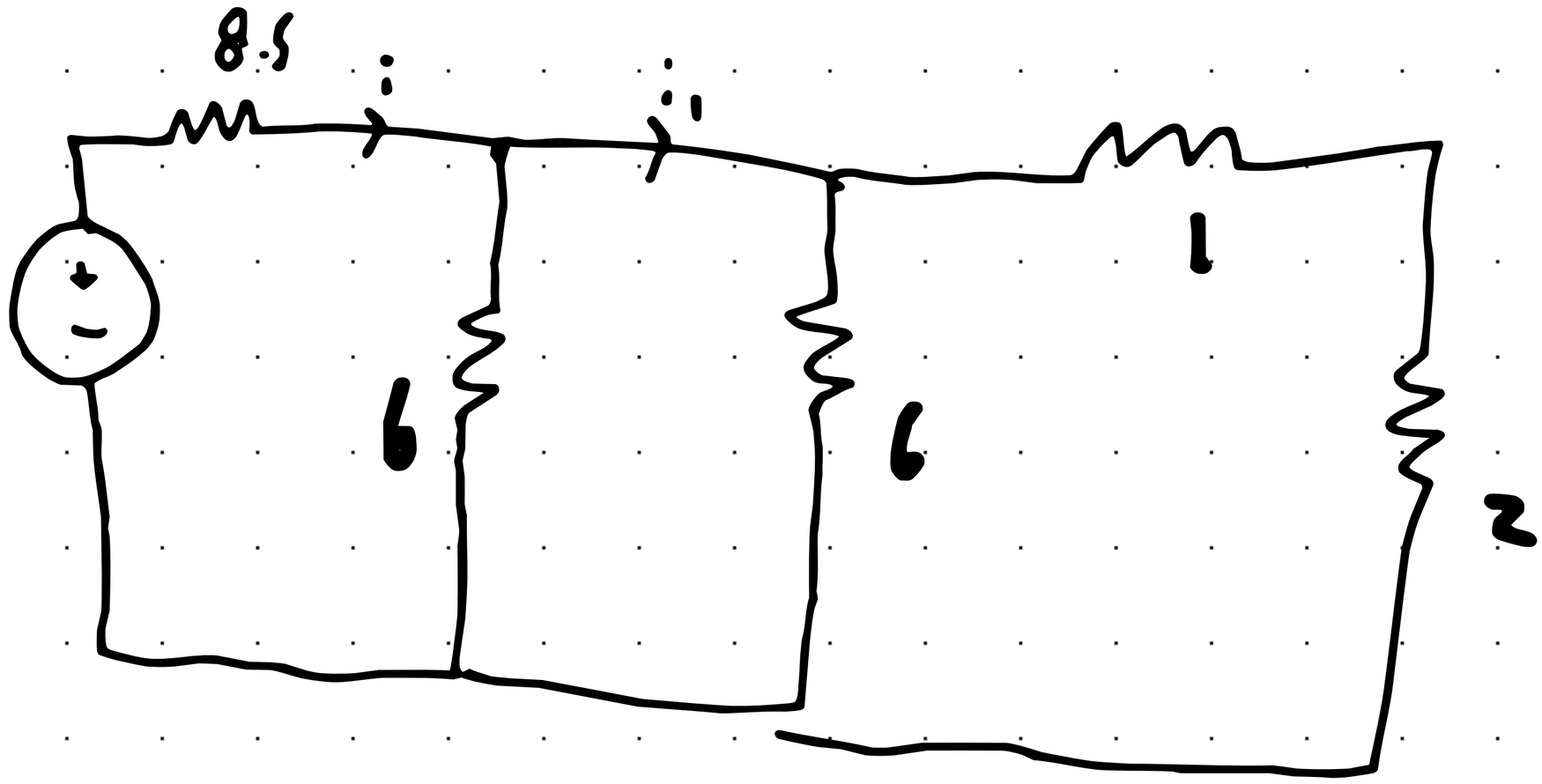
$P_{gen} = -310W \neq P_{abs} = 260W$

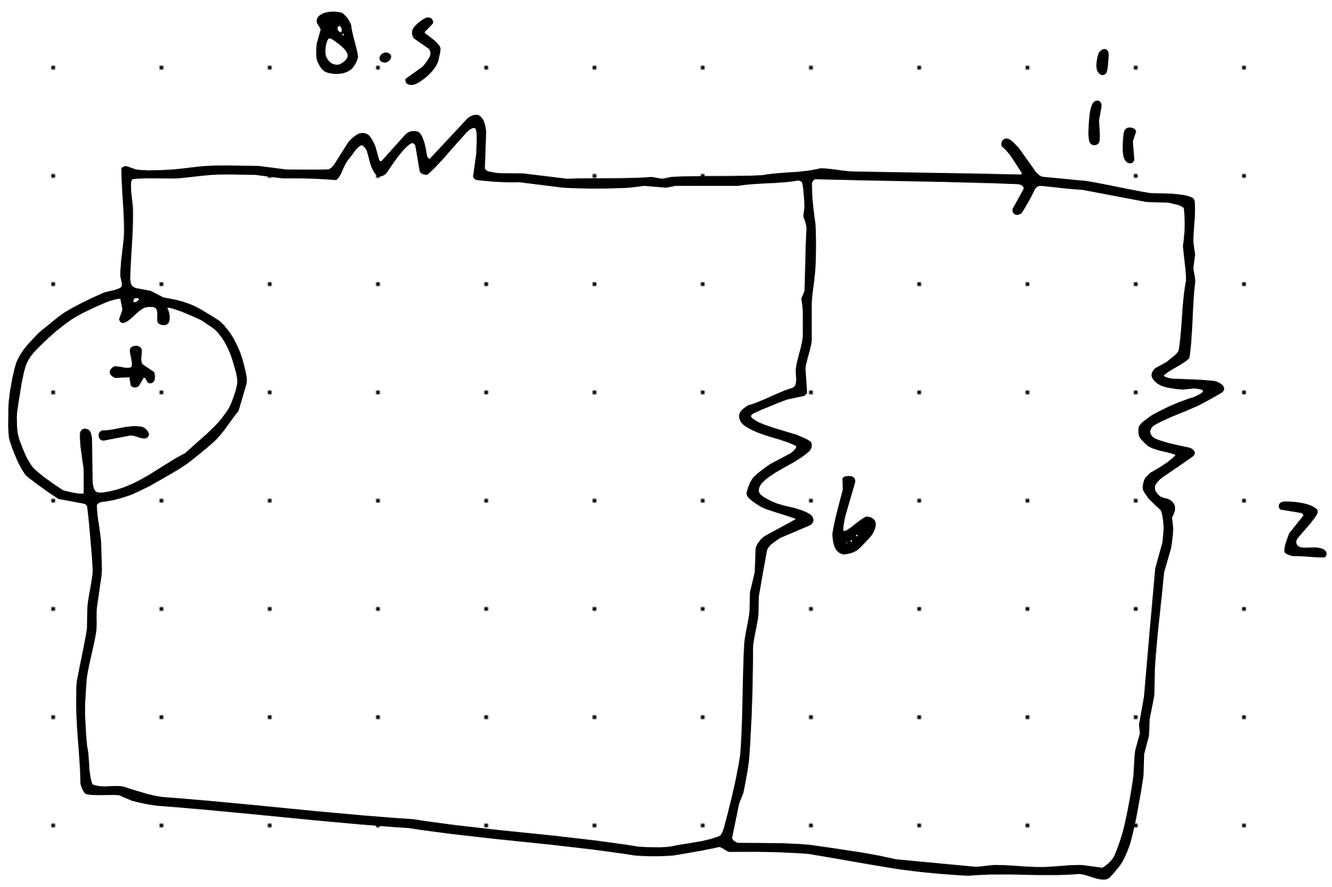
Problem 2



Because of Short Circuit:

$$i_3 = i_2 = i_4 = i_1 = 0$$





$$R_T = \left(\frac{2(6)}{2+6}\right) + 8.5$$

1ohm 5ohms

$$R_T = 10\Omega$$

$$V = IR$$

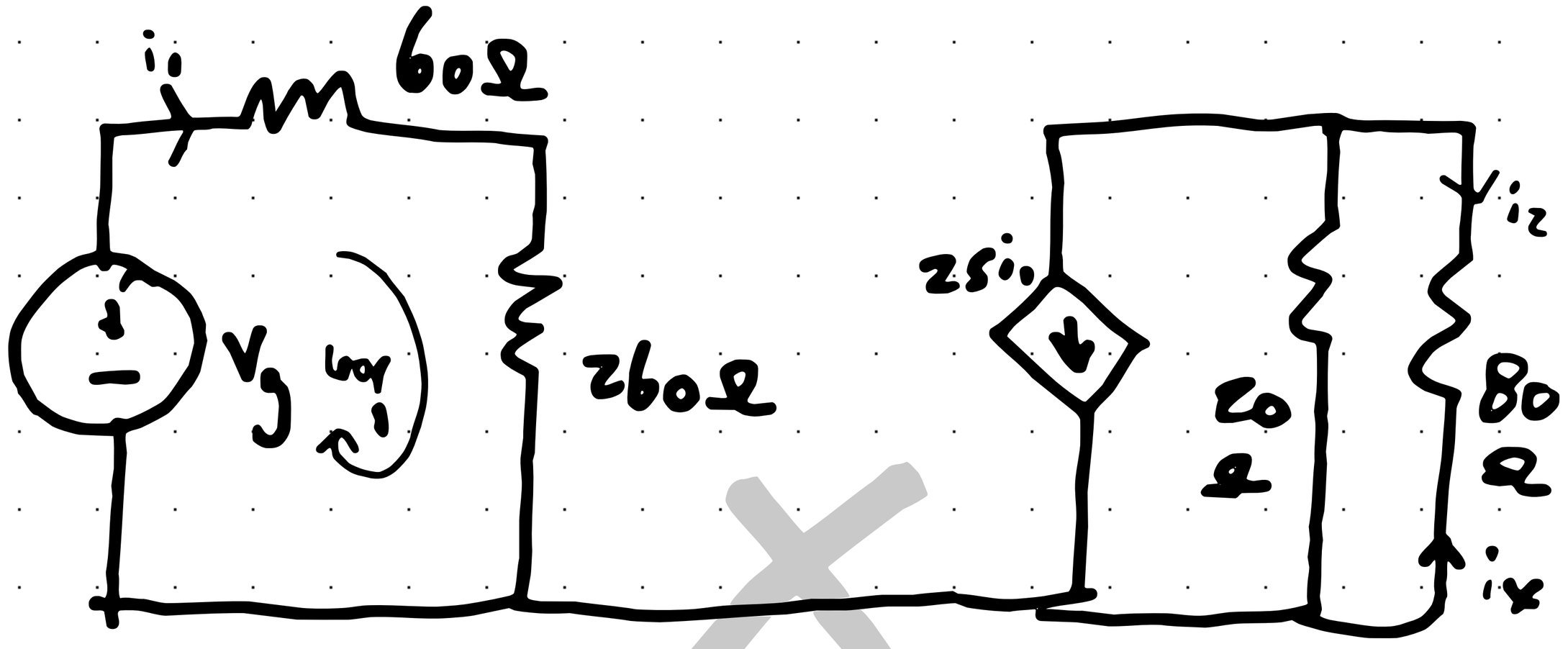
$$10V = I(1\Omega)$$

$$I = 10A$$

Using the Current divider

$$i_1 = i\left(\frac{6}{6+2}\right) = 10\left(\frac{6}{8}\right)$$

7.5A



Solve for V_g and i_z

if $i_1 = 1A$

No Current on a unclosed loop!

Loop one

$$V_g - i_1(60) - i_1(260) = 0$$

$$V_g = 320V$$

Current divider

$$i_x = 25\left(\frac{20}{100}\right) = 5A$$