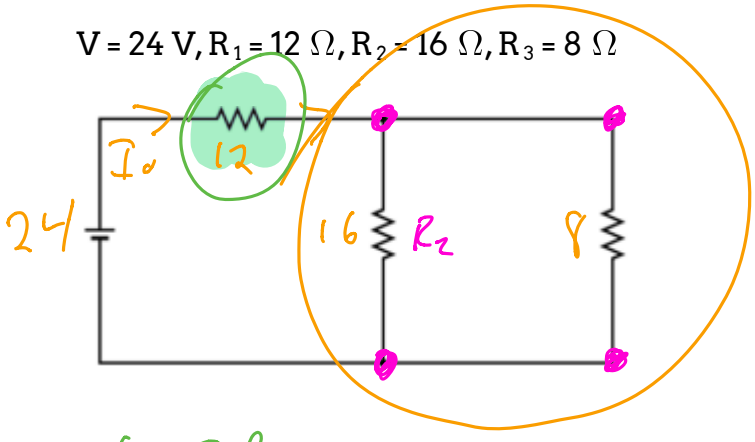
C-C-C-C-Combo!

Let's put it all together.

Series + Parallel = Most_Awesomest_Circuits

- Combination circuits have sections that are in series and sections that are in parallel
- To solve these we will simplify them until we have the simplest version of the circuit and then find the fundamental properties
- We start with sections furthest from the battery and simplify working towards the battery

V = 24 V, R_1 = 12 Ω, R_2 = 16 Ω, R_3 = 8 Ω



$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R_p} = \frac{1}{16} + \frac{1}{8}$$

$$= \frac{3}{16}$$

$$R_p = \frac{16}{3} = 5.33\ \Omega$$

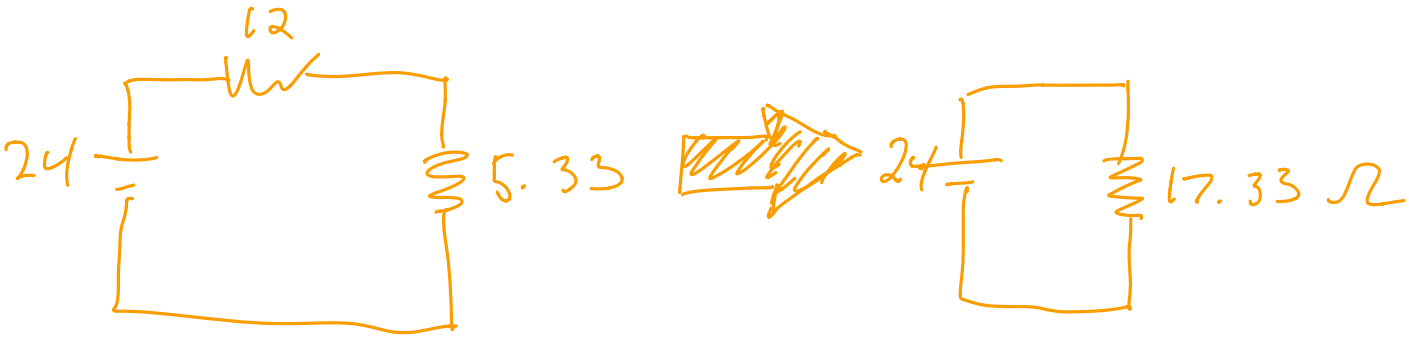
$V_1 = I_1 R_1$
$= 1.38(12)$
$= 16.6$ V

$V_2, V_3 = 24 - 16.6$
$= 7.4$ V

$V_2 = I_2 R_2$
$7.4 = I_2\ 16$
$\frac{7.4}{16} = I_2$
$0.46 = I_2$

$V_3 = I_3 R_3$
$7.4 = I_3\ 8$
$\frac{7.4}{8} = I_3$
$.92 = I_3$

We're missing too much information to move forward.
Let's see if combining the parallel resistors will help:

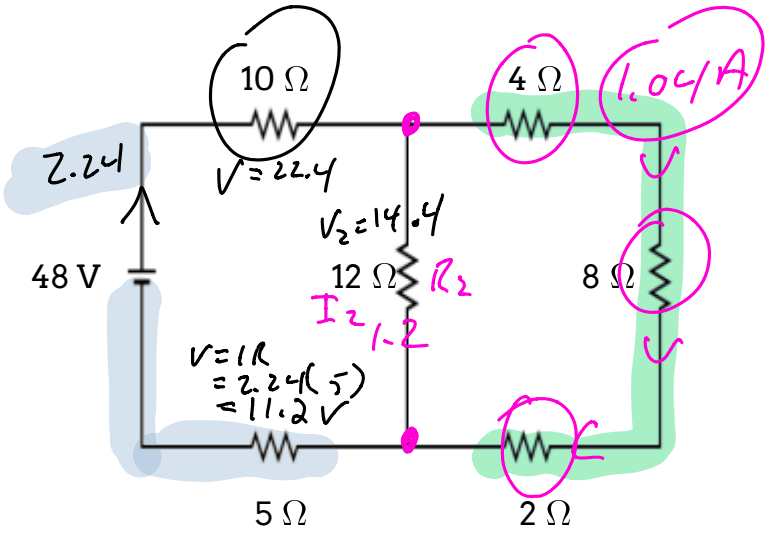


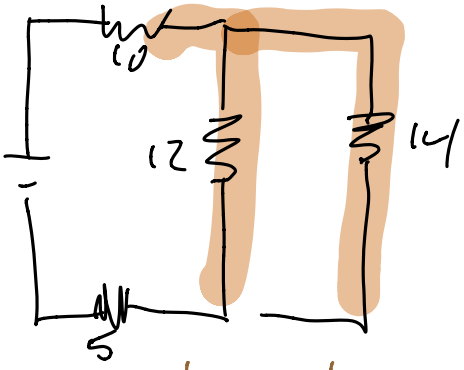
$$V = I_0 R$$
$$24 = I_0 \, 17.33$$
$$\frac{24}{17.33} = I_0$$
$$1.38\,A = I_0$$

$V = 2.24(10)$

$V = 22.4$

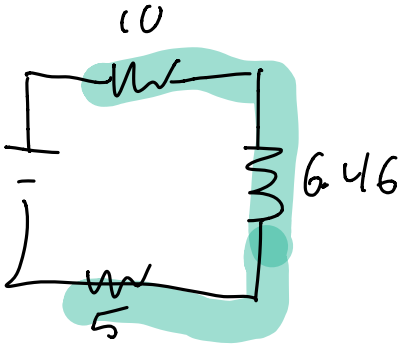
$V = IR$





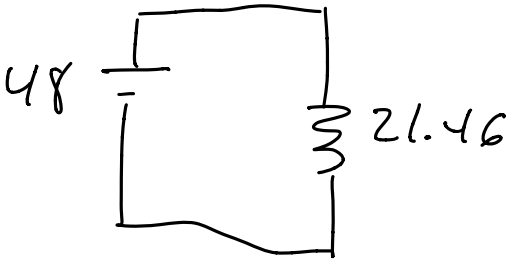
$$\frac{1}{R_p} = \frac{1}{12} + \frac{1}{14}$$

$R_p = 6.46\ \Omega$



$R_T = 10 + 6.46 + 5$

$= 21.46\ \Omega$

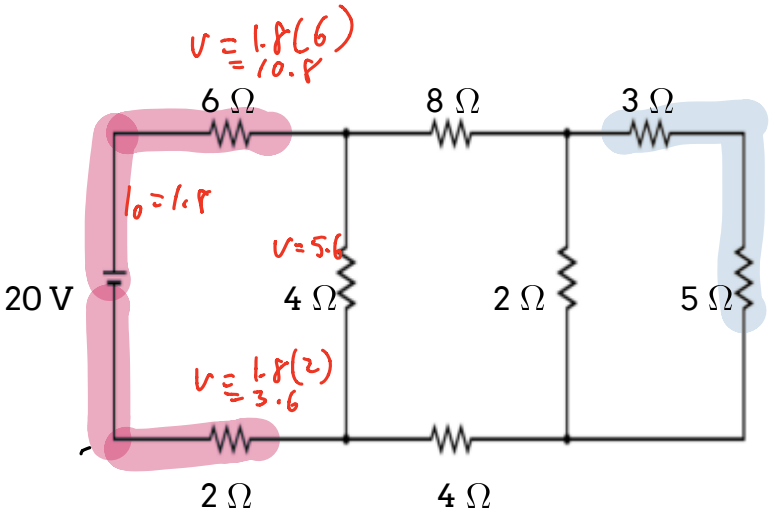


$V = IR$

$48 = I\ 21.46$

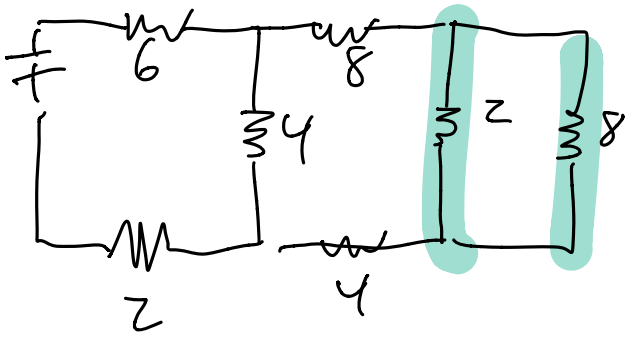
$\frac{48}{21.46} = I$

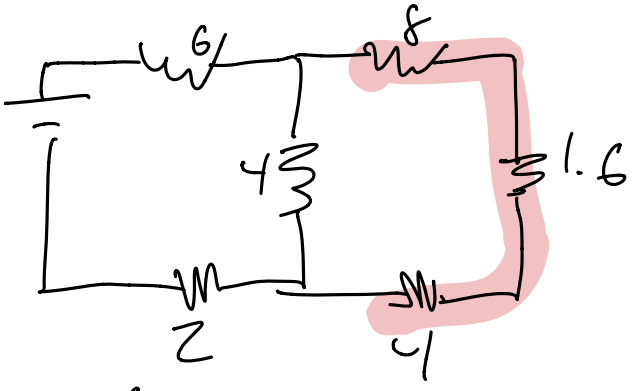
$2.24A. = I_0$

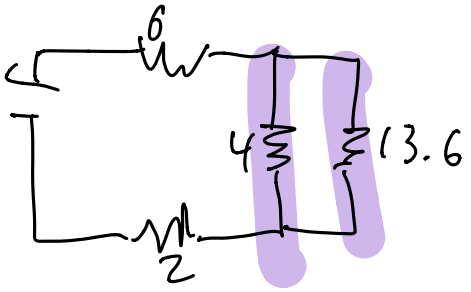


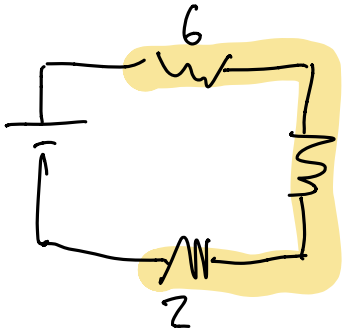
$$\frac{1}{R_p} = \frac{1}{2} + \frac{1}{8}$$

$$R_p = 1.6\,\Omega$$



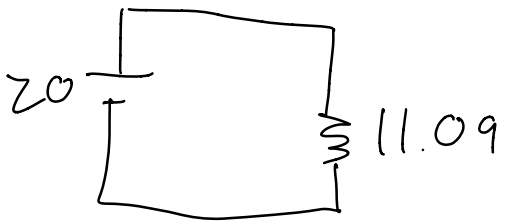






$$\frac{1}{R_p} = \frac{1}{4} + \frac{1}{13.6}$$

$$R_p = 3.09\,\Omega$$



$V = IR$

$\frac{20}{11.09} = I$

$1.8A = I$