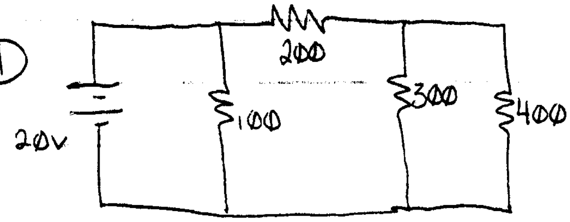
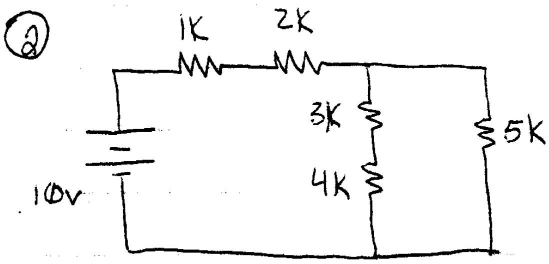
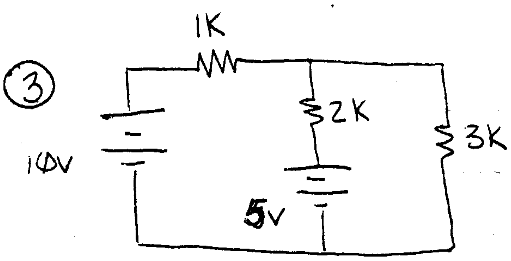
D.C. Circuit Exercises

① 

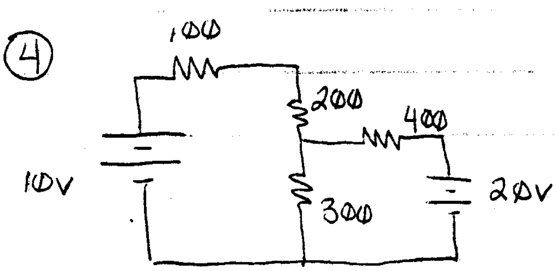
Find V_{200}

② 

Find V_{3K}

③ 

Find I_{3K}

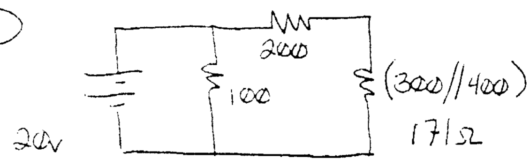
④ 

Find V_{200}

D.C. Circuit Exercises

Answers

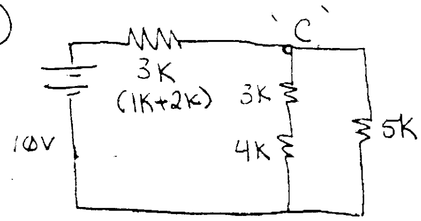
1



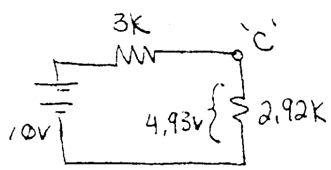
since the 100Ω is in parallel with the 20V source, it doesn't effect the voltage divider of 200, 171.

$$V_{200} = 20v \cdot \frac{200\,\Omega}{200 + 171\Omega} = \underline{10.78v}$$

2



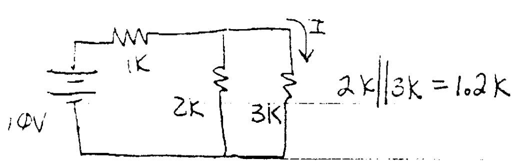
Find V_c first, then do a Volt. Div. on 3K, 4K. The 3K, 4K are in series. (7K). This result is in parallel with the 5K (2.92K)



$V_c = 10v \cdot \frac{2.92K}{3K + 2.92K} = 4.93v$ This voltage divides between the original 3K and 4K.

$$V_{3K} = 4.93v \cdot \frac{3K}{3K+4K} = \underline{2.11v}$$

3 super position.

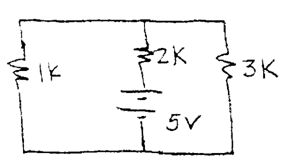


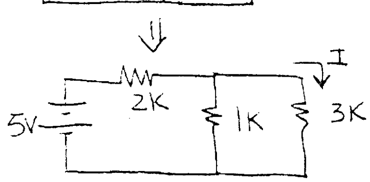
the drop across the 3K for this source is:

$$V_{3K} = 10v \cdot \frac{1.2K}{1.2K + 1K} = 5.45v$$

$$I_{3K} = \frac{5.45v}{3K} = 1.82\text{ mA } (\downarrow)$$

Redraw again!





1K||3K = 750Ω

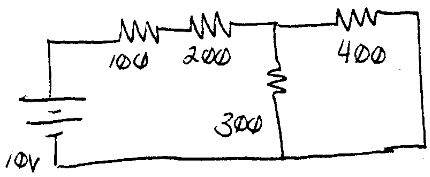
the drop across the 3K for this source is:

$$V_{3K} = 5v \cdot \frac{750\Omega}{2K + 750\Omega} = 1.364\,V$$

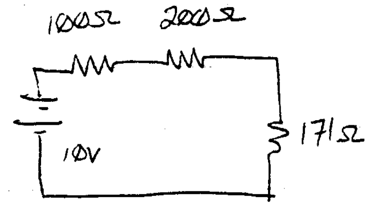
$$\text{Result} = 1.82\text{mA}(\downarrow) + \frac{1.364v}{3K\Omega}(\downarrow) = \mathbf{2.275\text{ mA}}(\downarrow)$$

D.C. circuit Exercises.

④ Superposition

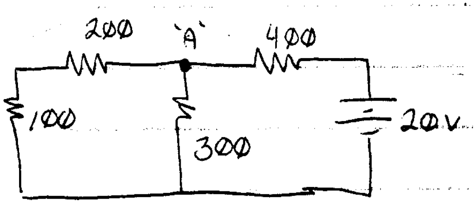


$300 // 400 = 171\Omega$

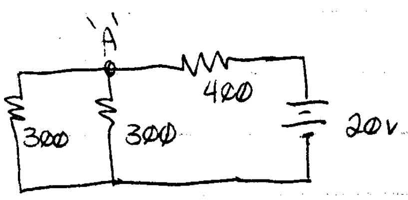


V_{200} for this source is found via voltage divider rule:

$$V_{200} = 10V \cdot \frac{200}{100 + 200 + 171} = 4.25V \ (+\ -)$$



IF we find V_A, we can get V_{200} from the voltage divider rule (200, 100). 100 is in series with 200.



$300 // 300 = 150\Omega$

$$V_A = 20V \cdot \frac{150\Omega}{150 + 400\Omega} = 5.45V$$

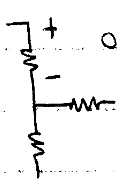
Therefore, $V_{200} = 5.45V \cdot \frac{200\Omega}{100 + 200}$

$V_{200} = 3.63V \ (-\ +)$

so, we have two sources "fighting" each other.

The net result is $4.25V - 3.63V = .62V$ (+ —ww— −)

(or



on the orignal diagram)