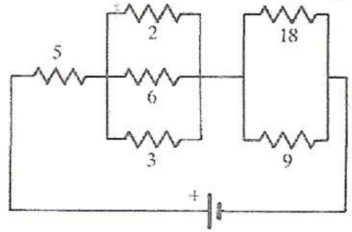
1. 6 resistors are connected to the 9 V battery as shown.




a. Find total resistance of this circuit.

$\frac{1}{R_2} = \frac{1}{2} + \frac{1}{6} + \frac{1}{3} = 1 \quad R_2 = 1\,\Omega \qquad R_3 = \frac{1}{9} + \frac{1}{18} = \frac{3}{18} = \frac{1}{6} \quad R_3 = 6\,\Omega$

$R_{total} = 5 + 1 + 6 = 12\,\Omega$

b. Find current through resistor 5 Ω

$I_5 = I_{total} = \frac{V_{total}}{R_{total}} = \frac{9\,V}{12\,\Omega} = 0.75\,A$

c. Find voltage drop across 2 Ω resistor

$V_2 = V_{R_2} = I_{total} R_2 = 0.75 \times 1 = 0.75\,V$

d. Find current through 6 Ω resistor.

$I_6 = \frac{V_6}{6} = \frac{V_{R_2}}{6} = \frac{0.75}{6} = 0.125\,A$

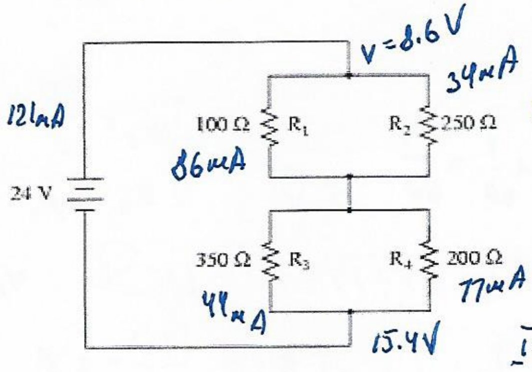
d. Find voltage drop across 9 Ω resistor.

$V_5 = I_5 \times 5 = 3.75\,V \quad V_9 = V_{R_3} = V_{total} - V_5 - V_{R_2} = 9 - 3.75 - 0.75 = 4.5\,V$

e. Find current through 18 Ω resistor.

$I_{18} = \frac{V_{18}}{18} = \frac{V_{R_3}}{18} = \frac{4.5}{18} = 0.25\,A$

*A series-parallel combination circuit*

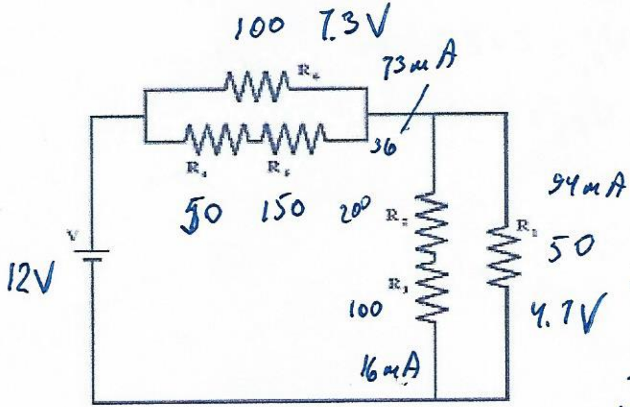



$$\frac{1}{100} + \frac{1}{250} = \frac{5}{500} + \frac{2}{500} = \frac{7}{500} \qquad \frac{500}{7} \approx 71.4\,\Omega$$

$$\frac{1}{200} + \frac{1}{350} = \frac{7}{1400} + \frac{4}{1400} = \frac{11}{1400} \qquad \frac{1400}{11} \approx 127.3$$

$$\frac{500}{7} + \frac{1400}{11} = \frac{5500 + 9800}{77} = \frac{15300}{77} \approx 198.7\,\Omega$$

$$I = \frac{24}{198.7} \approx 121\text{ mA}$$



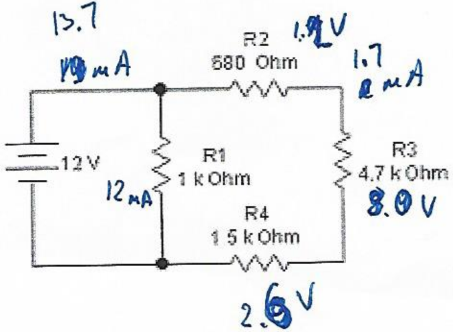

$$\frac{1}{100} + \frac{1}{200} \vdash \frac{200}{3} \approx 66.7\,\Omega$$

$$109.6\,\Omega$$

$$\frac{1}{50} + \frac{1}{300} = \frac{7}{300} \qquad \frac{300}{7} \approx 42.9\,\Omega$$

$$\frac{12}{109.6} \approx 109\text{ mA}$$

✓




$680 + 4700 + 1500 = 6880\ \Omega$

$\frac{1}{R_t} = \frac{1}{1000} + \frac{1}{6880} = 0.001145$

$R_t = 873\ \Omega$

~~873~~ $873\ \Omega$

$I_t = \frac{12}{873} = 0.0137\ A$

$I_{R_1} = \frac{12}{1000} = 0.012\ A$

$I_{R_2} = I_{R_3} = I_{R_4} = I_t - I_{R_1}$

$= 0.0137 - 0.012$

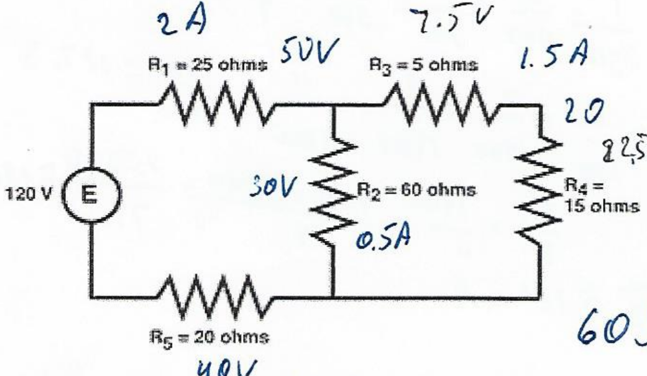
$= 0.0017\ A$

$V_{R_2} = I_{R_2} R_2$

$V_{R_3} = I_{R_3} R_3$

$V_{R_4} = I_{R_4} R_4$

✓




$\frac{1}{20} + \frac{1}{60} = \frac{4}{60}$ $15\Omega$

$I_{R2} = \frac{30}{60} = 0.5A$

$I_{R3} = I_{R4} = 2 - 0.5 = 1.5A$

$R_t = 25 + 15 + 20 = 60\Omega$

$V_{R3} = 1.5 \times 5 = 7.5$

$60\Omega$ $I_t = I_{R1} = I_{R5} = \frac{120}{60} = 2A$

$V_{R4} = 1.5 \times 15 = 22.5V$

$V_{R3} = 2 \times 20 = 40V$

$V_{R2} = 120 - 50 - 40 = 30V$

$V_{R1} = 2 \times 25 = 50V$

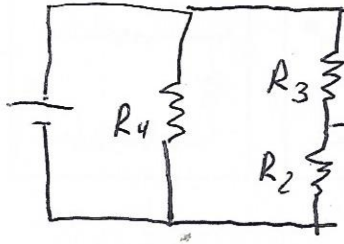
$V_{R2} =$

$V_{R3} = 2 \times 20 = 40V$

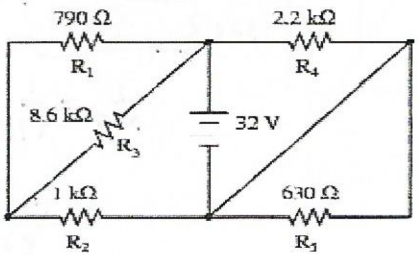
Series-parallel

4.5V

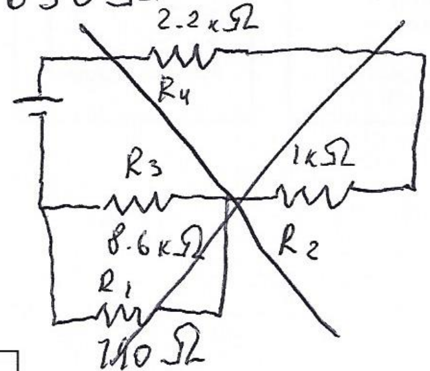

| | $R_1$ | $R_2$ | $R_3$ | Total |
|---|---|---|---|---|
| V | | | | |
| I | | | | 10 mA |
| R | 4.7 kΩ | 2.7 kΩ | 3.9 kΩ | |
| P | | | | |




Complete the table of values for this circuit:




630 Ω shortcuted




| | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $R_5$ | Total |
|---|---|---|---|---|---|---|
| V | | 18.56 V | | 32 | 0 | 32 |
| I | | 18.56 A | | 14.55 mA | 0 | 33.11 mA |
| R | 790 Ω | 1 kΩ | 8.6 kΩ | 2.2 kΩ | 630 Ω | 966.4 |
| P | | | | | | |

$$\frac{1}{8600} + \frac{1}{790} = 0.00138$$

$$I_t = \frac{32}{966.4} = 0.03311$$

$$V_{R_2} = 18.56 \times 10^{-3} \times 1000 = 18.56\ V$$

$$\frac{1}{0.00138} = 723.5\ \Omega$$

$$I_{R_4} = \frac{32}{2200} = 0.01455\ A$$

$$V_{R_1} = V_{R_3} = 32 - 18.56 = 13.44\ V$$

$$723.5 + 1000 = 1723.5\ \Omega$$

$$I_{R_2} = 33.11 - 14.55 = 18.56\ A$$

$$I_{R_1} = \frac{13.44}{790}$$

$$I_{R_3} = \frac{13.44}{8600}$$

$$\frac{1}{R_t} = \frac{1}{2200} + \frac{1}{1723.5} = 0.001035$$

$$R_t = ~~1000~~\ 966.4\ \Omega$$

$$R_3 + R_4 = 600\,\Omega$$

$$\frac{1}{(R_1 R_3 R_4)} = \frac{1}{600} + \frac{1}{1000} = 0.00267$$

$$(R_1 R_3 R_4) = 375\,\Omega$$

uit

$$R_t = 500 + 375 = 875\,\Omega$$

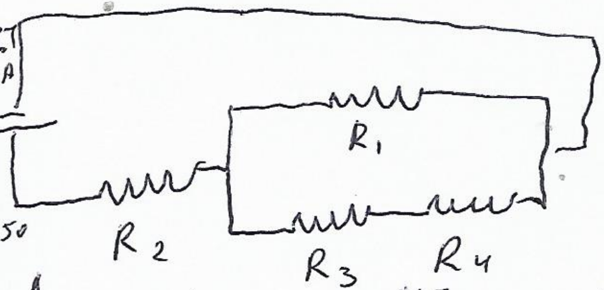
$$I_t = I_{R_2} = \frac{11}{875} = 12.57\,mA$$

$$V_{R_2} = 500 \times 0.01257 = 6.3\,V$$

$$I_{R_2 R_3} = 12.57 - 4.7 = 7.87\,mA$$

$$V_{R_3} = 7.87 \times 150 \times 10^{-3}$$

$$V_{R_4} = 0.00787 \times 450$$




$$V_{R_1} = 11 - 6.3 = 4.7\,V \quad I_{R_1} = \frac{4.7}{1000} = 4.7\,mA$$