

Name: *Key*

Period: _____

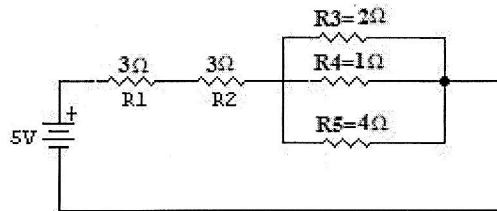
Date: _____

Electricity: Combined Electric Circuits problems 1

SERIES	PARALLEL	V=I/R
$V=V_1+V_2+V_3$	$V=V_1=V_2=V_3$	
$I=I_1=I_2=I_3$	$I=I_1+I_2+I_3$	$P=IV=I^2R$
$R=R_1+R_2+R_3$	$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$	

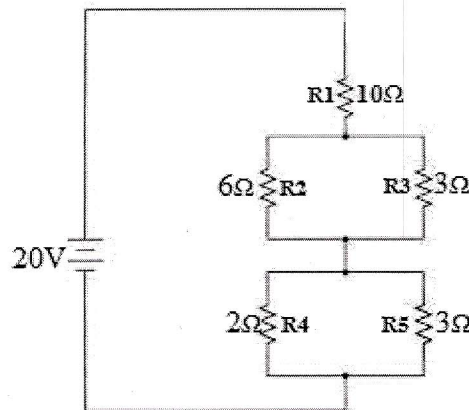
I. Simplify the following electric circuits and answer the following. Show your work to get full credit. You might need to work the problems in a different sheet of paper.

1.



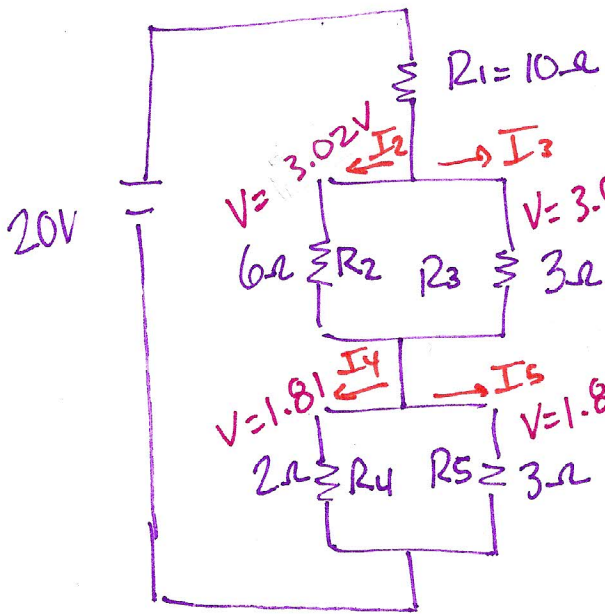
	R1	R2	R3	R4	R5	Total
V	2.28	2.28	0.43	0.43	0.43	5
I	.76	.76	.215	.43	.1075	0.76
R	3	3	2	1	4	6.57

2.



	R1	R2	R3	R4	R5	Total
V	15.1	3.02	3.02	1.81	1.81	20
I	1.51	0.51	1	0.91	0.6	1.51A
R	10	6	3	2	3	13.2

2



Simplify Parallel

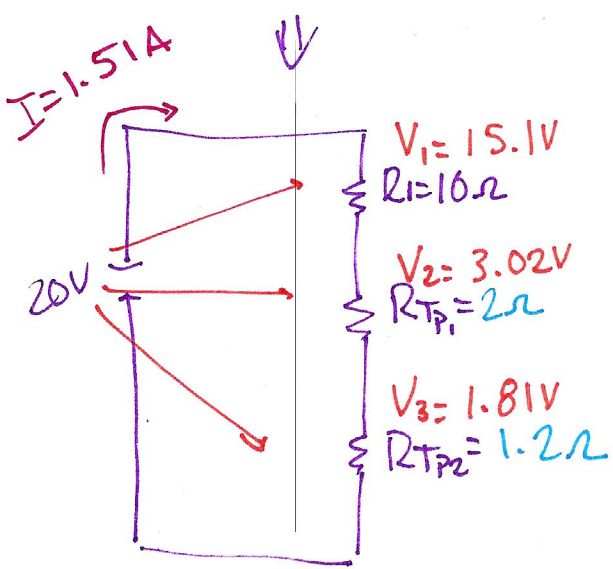
$$\frac{1}{R_{TP1}} = \frac{1}{6} + \frac{1}{3}$$

$$\frac{1}{R_{TP1}} = \frac{1+2}{6} = \frac{3}{6} = \frac{1}{2} \Rightarrow R_{TP1} = 2\Omega$$

Simplify Parallel

$$\frac{1}{R_{TP2}} = \frac{1}{2} + \frac{1}{3}$$

$$\frac{1}{R_{TP2}} = \frac{3+2}{6} = \frac{5}{6} \Rightarrow R_{TP2} = 1.2\Omega$$



Simplify Series

$$R_T = R_1 + R_{TP1} + R_{TP2}$$

$$R_T = 10 + 2 + 1.2$$

$$R_T = 13.2\Omega$$

Find Voltage Split [Current is constant]

$$V_1 = IR_1 = (1.51A)(10) = 15.1V$$

$$V_2 = IR_2 = (1.51A)(2) = 3.02V$$

$$V_3 = IR_3 = (1.51A)(1.2) = 1.81V$$

TOTAL current

$$I = \frac{V}{R_T} = \frac{20V}{13.2} = 1.51A$$

Find current split for R_{TP1} & R_{TP2} [Voltage is constant, so $R_{TP1} \rightarrow V=3.02$ $R_{TP2} \rightarrow V=1.81V$]

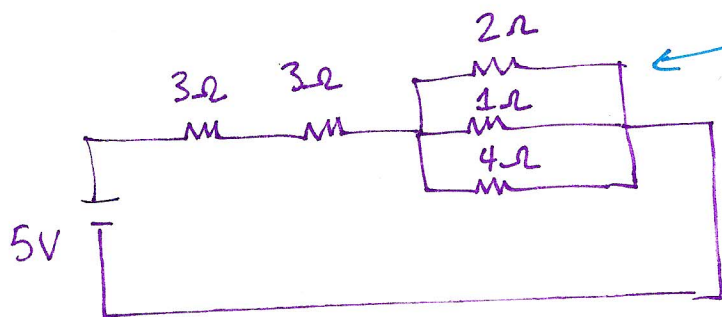
$$I_2 = \frac{V}{R_2} = \frac{3.02}{6} = 0.51$$

$$I_3 = \frac{V}{R_3} = \frac{3.02}{3} = 1$$

$$I_4 = \frac{V}{R_4} = \frac{1.81}{2} = 0.91$$

$$I_5 = \frac{V}{R_5} = \frac{1.81}{3} = 0.6$$

①



STEP 1: Simplify parallel

$$\frac{1}{R_T} = \frac{1}{2} + \frac{1}{1} + \frac{1}{4}$$

$$\frac{1}{R_T} = \frac{2+4+1}{4}$$

$$\frac{1}{R_T} = \frac{7}{4}$$

$$R_T = \frac{4}{7} = 0.57 \Omega$$

$$R_1 = 3\Omega \quad R_2 = 3\Omega \quad R_{TP} = 0.57\Omega$$



STEP 2: Simplify series

$$R_T = R_1 + R_2 + R_{TP}$$

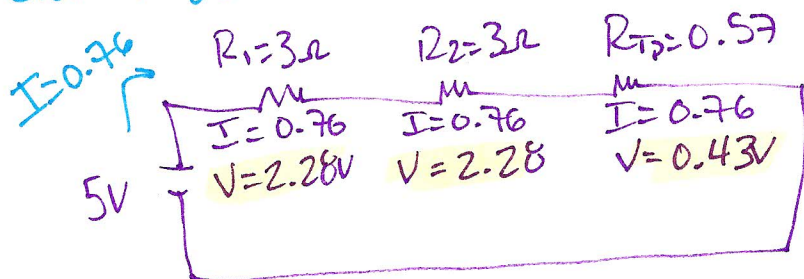
$$R_T = 3\Omega + 3\Omega + 0.57\Omega$$

$$R_T = \underline{\underline{6.57\Omega}}$$

STEP 3: Get Current in circuit

$$I = \frac{V}{R_T} = \frac{5}{6.57} = \underline{\underline{0.76\text{A}}}$$

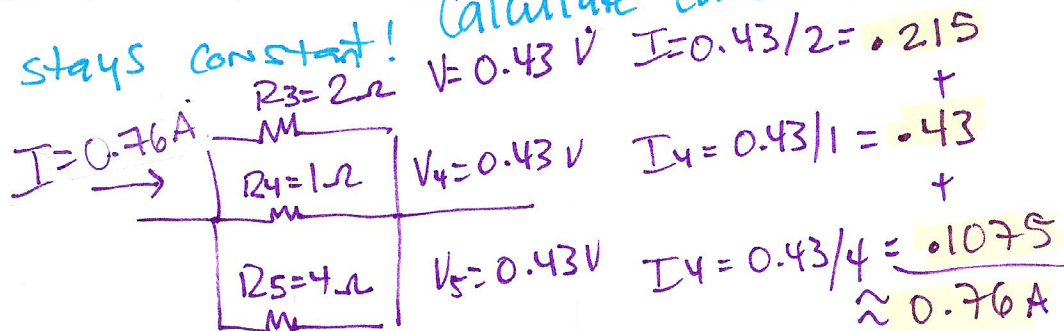
STEP 4: Go back to series circuit & split voltage



Current stays constant in series!

$$V = IR \text{ Calculate Voltage!}$$

STEP 5: Go back to parallel segment. In parallel, the voltage stays constant! Calculate current! $I = V/R$



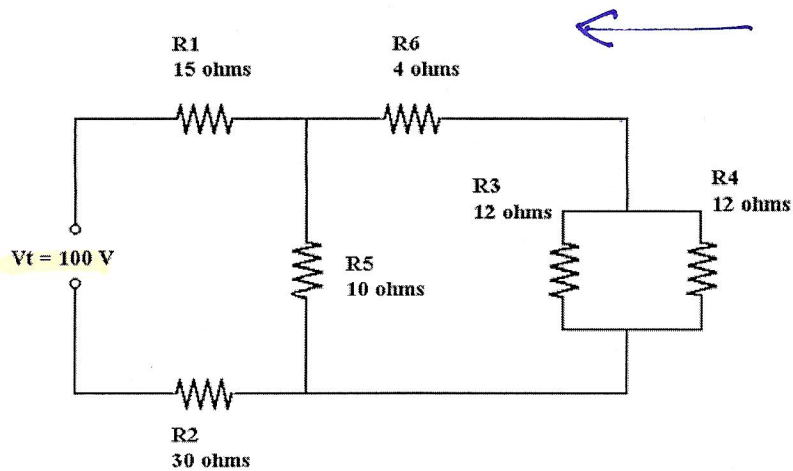
$$I_3 = 0.43/2 = 0.215$$

$$I_4 = 0.43/1 = 0.43$$

$$I_5 = 0.43/4 = 0.1075$$

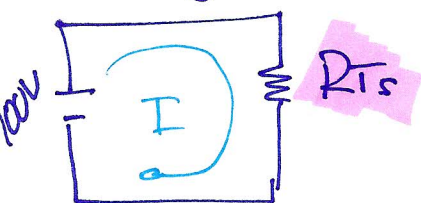
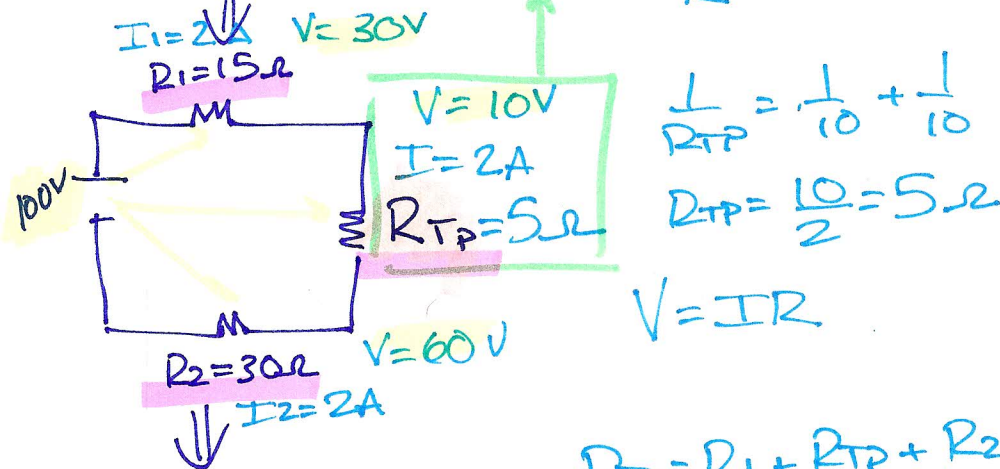
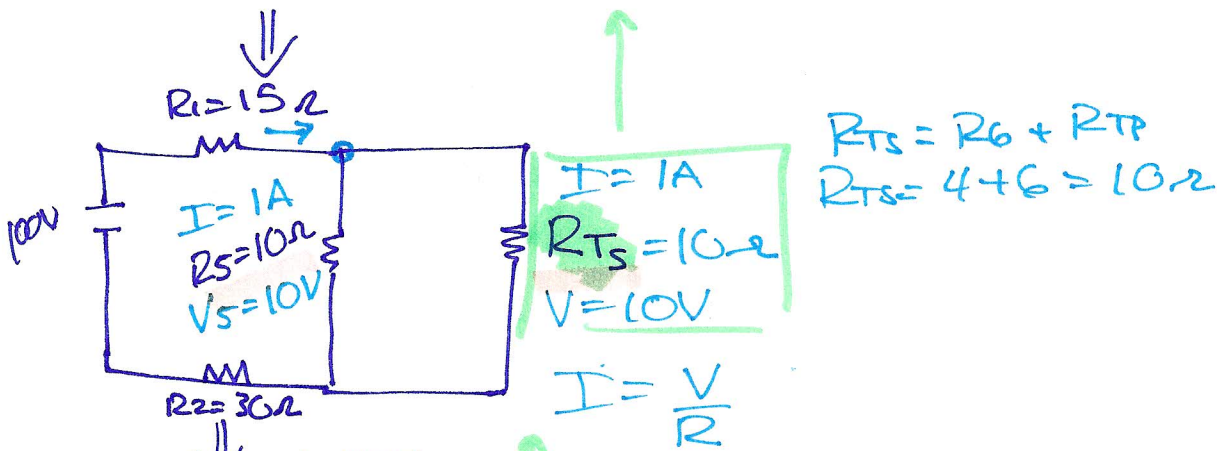
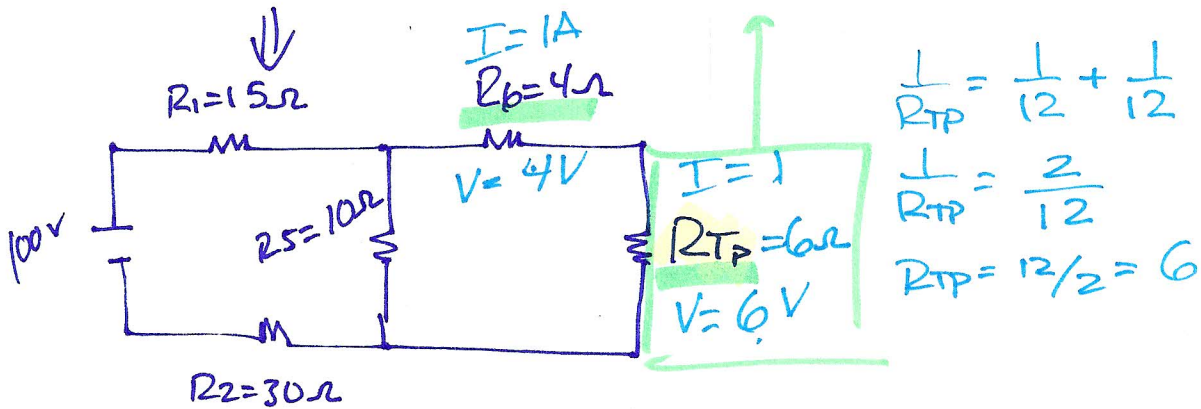
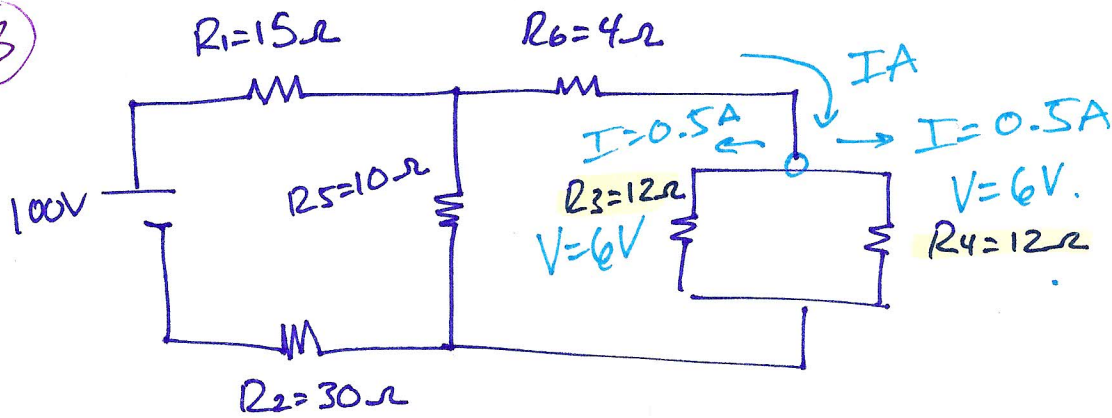
$$\approx 0.76\text{A}$$

3.



	R1	R2	R3	R4	R5	R6	Total
V	30	60	6	6	10	4V	100V
I	2	2	.5	.5	1	1	2A
R	15	30	12	12	10	4	50Ω

3



$$R_{TS} = R_1 + R_{TP} + R_2$$

$$R_{TS} = 15 + 5 + 30 = \underline{\underline{50\Omega}}$$

Find current

$$I = \frac{V}{R} = \frac{100}{50} = \underline{\underline{2A}}$$

← TOTAL resistance in circuit