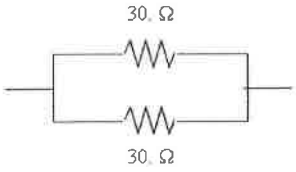
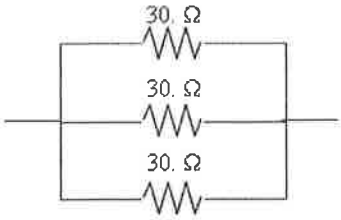
Have ready by class on Tuesday 6/4.

7. Calculate the equivalent resistance of each resistor segment below.

Shortcut for identical parallel resistors:



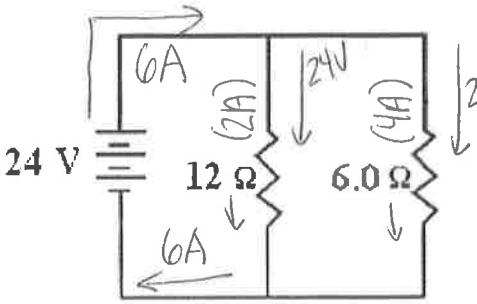


Equivalent resistance is the resistance of one divided by # of resistors in circuit.

$R_{eq}\left(\frac{1}{30\Omega}+\frac{1}{30\Omega}\right)^{-1}=\left(\frac{1}{15\Omega}\right)^{-1}=\left(\frac{1}{R_T}\right)^{-1}=15\Omega$

$R_{eq}=\left(\frac{1}{30.\Omega}+\frac{1}{30.\Omega}+\frac{1}{30.\Omega}\right)^{-1}=10.\Omega$

8. Calculate the voltage drop across each resistor and the current through each resistor. Calculate the total current in the circuit and the equivalent resistance of the circuit.

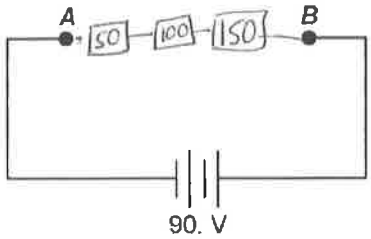


$24V\ R_{eq}=\left(\frac{1}{12\Omega}+\frac{1}{6\Omega}\right)^{-1}\quad R_{eq}=4\Omega=R_T$

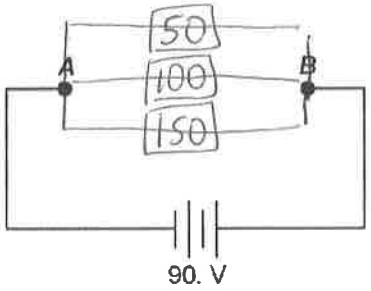
$I_T=\frac{V_T}{R_T}=\frac{24V}{4\Omega}=6A$

$V_T=I_TR_T$

9. A 50. Ω, a 100. Ω and a 150. Ω resistor are to be connected in the circuit below between A and B. What type of connection will have the highest resistance? The lowest resistance? Complete each circuit and calculate each current.



highest R_T



lowest R_T

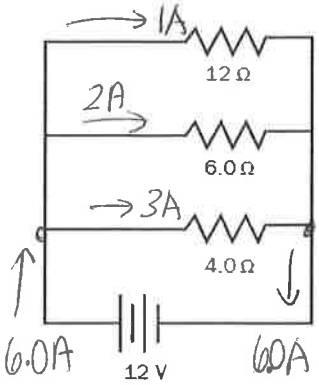
$R_T=300\Omega$

$I_T=\frac{V_T}{R_T}=\frac{90.V}{300\Omega}=\boxed{0.30A}$

$R_{eq}=\left(\frac{1}{50.\Omega}+\frac{1}{100\Omega}+\frac{1}{150.\Omega}\right)^{-1}=27\Omega$

$I_T=\frac{90.V}{27\Omega}=\boxed{3.3A}$

10. *Calculate* the voltage drop across each resistor and the current through each resistor. Calculate the total current in the circuit and the equivalent resistance of the circuit.

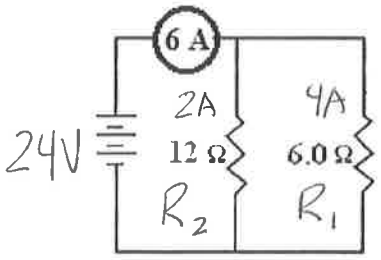


R	I	V
12Ω	1.0A	12V
6.0Ω	2.0A	12V
4.0Ω	3.0A	12V

$V = IR$

$R_{eq} = 2\,\Omega \quad V_T = 12V \quad I_T = 6.0A$

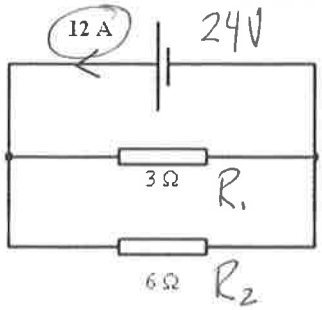
11. Determine the current through each resistor by using a proportion.



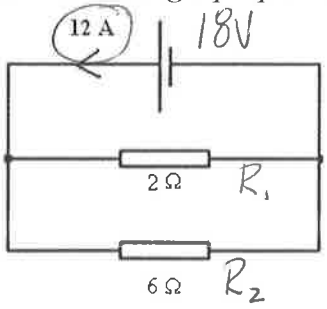
$\frac{R_2}{R_1} = \frac{I_1}{I_2} \qquad \frac{12\,\Omega}{6.0\,\Omega} = \frac{4.0A}{2.0A}$

2:1 ratio

12. Determine the current through each resistor in the circuits below *using a proportion.*



$\frac{R_1}{R_2} = \frac{I_2}{I_1}$



1:2 ratio $\quad \frac{3\,\Omega}{6\,\Omega} = \frac{4A}{8A}$

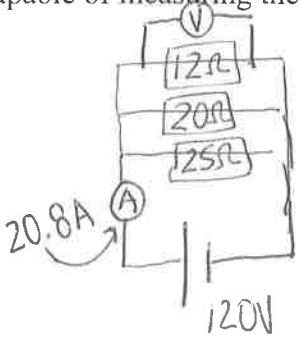
1:3 ratio $\quad \frac{2\,\Omega}{6\,\Omega} = \frac{3A}{9A}$

13. A 12 Ω heater, a 20 Ω hair dryer, and a 25 Ω toaster are connected in parallel to a 120. volt power source. Sketch an appropriate schematic. Include a meter capable of measuring the total current and a meter capable of measuring the voltage drop across the heater. Find the reading on each meter.

$I_T =$

$V_T =$

$R_{eq} =$



$V_T = 120V \qquad R_{eq} = 5.77\,\Omega$

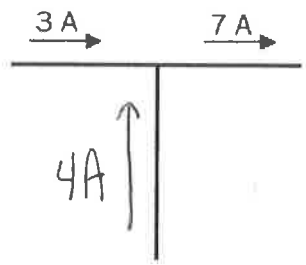
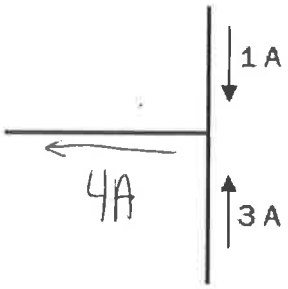
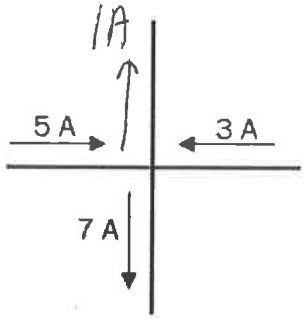
V_{drop} across 12 Ω = 120V

$I_T = \frac{120V}{5.77\,\Omega} = 20.8A$

Junctions

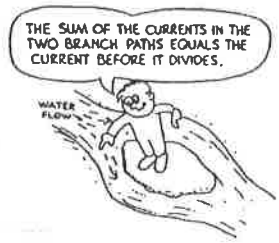
Junction: place where two or more wires meet in a circuit

1. Determine the magnitude and direction of the current in the unlabeled wire.

Junction A	Junction B	Junction C
		

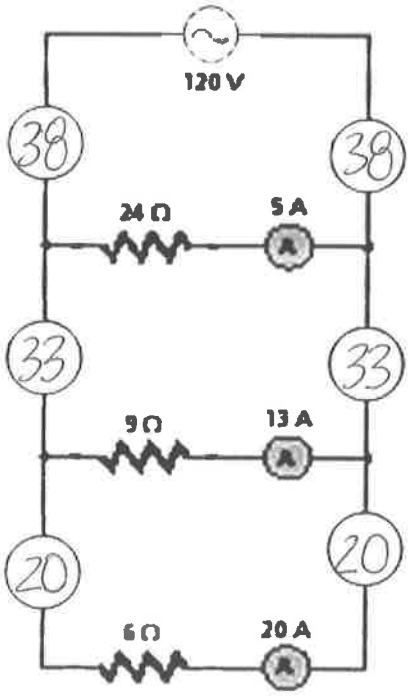
Kirchhoff's First Law (Current Law, Junction Rule):

The total current directed into a junction must equal the total current directed out of the junction.

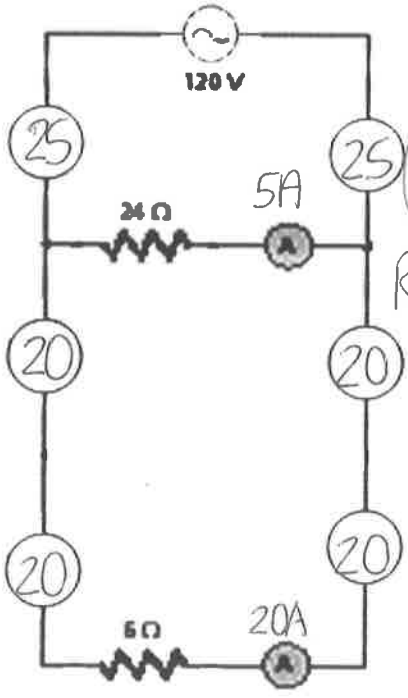


NOTE: conservation of charge principle

2. Determine the reading on each blank ammeter.



3. Determine the new readings now that the 9 Ω resistor is removed.



$V_T = 120V$

$\left(\frac{1}{24\Omega} + \frac{1}{6\Omega}\right)^{-1} = R_{eq}$

$R_{eq} = 4.8\Omega$

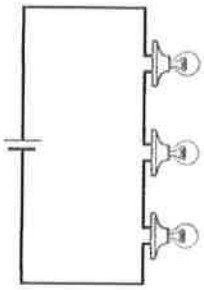
$I_T = \frac{120V}{4.8\Omega}$

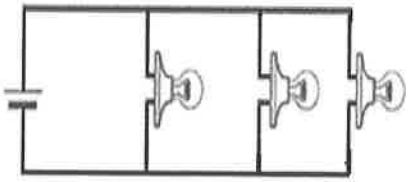
$I_T = 25A$

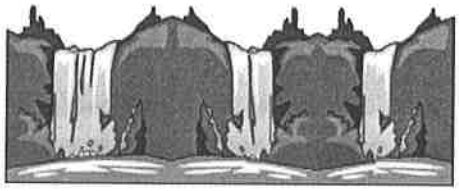
Review - Resistors in Series or in Parallel

IB 11

Parallel Connection

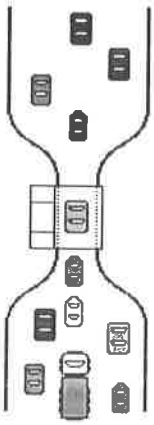




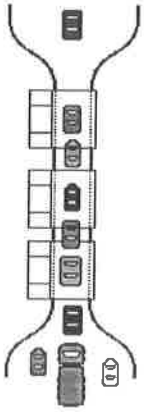


Characteristic	Series Circuit	Parallel Circuit
Number of pathways for current	one	multiple
Current	same	sum of all the pathways
Potential Difference (Voltage)	sum of all the drops	same
Overall resistance	sum of R (high)	sum of $\frac{1}{R_T}$ (low)
Power	low	high

Influencing the Flow Rate on a Tollway



A Single Resistor



Three Resistors Placed in Series

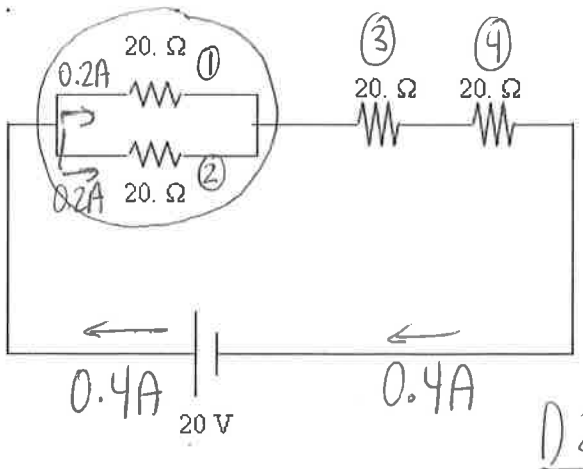
Three Resistors Placed in Parallel

Combination Circuits

IB 11

In each circuit below, determine the voltage drop across each resistor and the current through each resistor.

1.

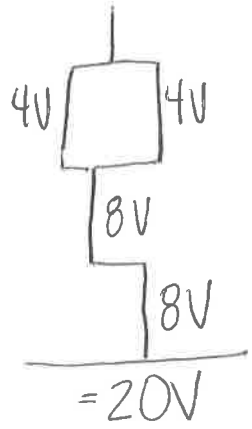


$R_T = 50.\Omega$

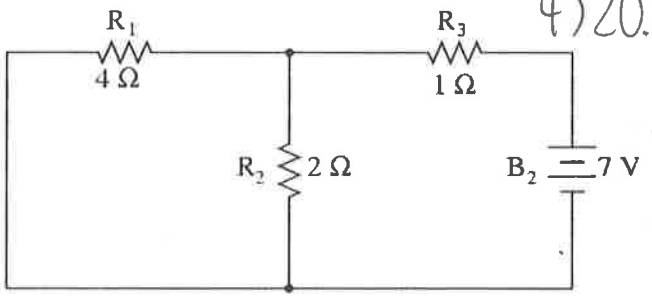
$V_T = 20V$

$I_T = \frac{20V}{50.\Omega} = 0.4A$

	R	V	I
1)	20.Ω	4V	0.2A
2)	20.Ω	4V	0.2A
3)	20.Ω	8V	0.4A
4)	20.Ω	8V	0.4A



2.



3.