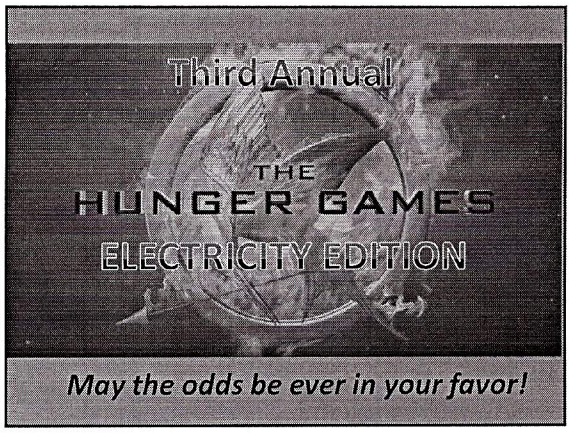
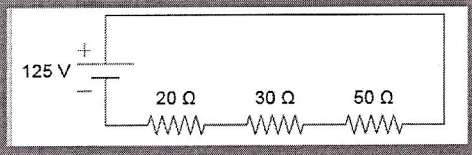


3

A kitchen in North America has three appliances connected to a 120 V circuit with a 15 A circuit breaker: an 850 W coffee maker, a 1200 W microwave oven, and a 900 W toaster.

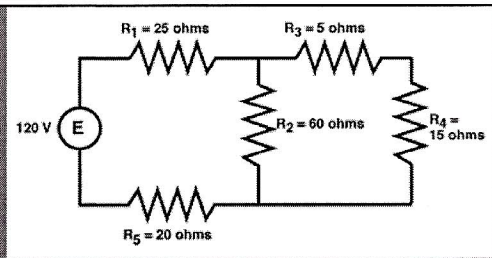
1. Draw a schematic diagram of this circuit.
2. Which of these appliances can be operated simultaneously without tripping the circuit breaker? [Find total power in circuit and then determine combinations]

1



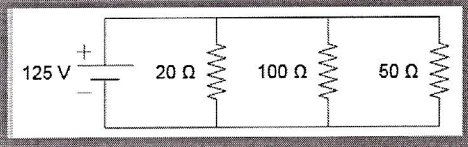
1. the equivalent resistance
2. the total current from the power supply
3. the current through the 30Ω resistor
4. the voltage drop across the 50 Ω resistor
5. the power dissipated in the 20 Ω resistor

4



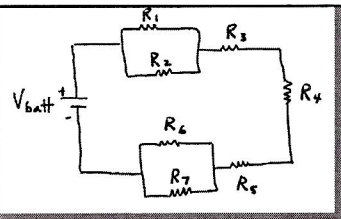
1. the equivalent resistance
2. the total current from the power supply
3. the current through R2
4. the voltage drop across R4
5. the power dissipated in R3

2



1. the equivalent resistance
2. the total current from the power supply
3. the current through the 20Ω resistor
4. the voltage drop across the 100 Ω resistor
5. the power dissipated in the 50 Ω resistor

5

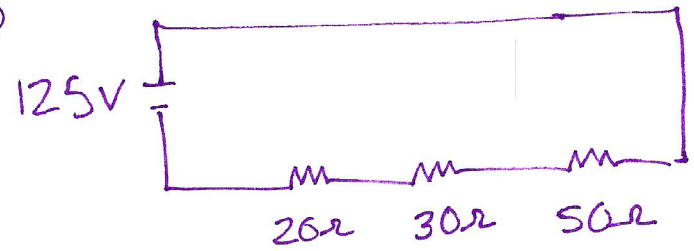


R_1=20Ω	R_2=20Ω	R_3=5Ω
R_4=10Ω	R_5=15Ω	R_6=25Ω
R_7=100Ω	V_{batt}=120V	

1. the equivalent resistance
2. the total current from the power supply

Hunger Games - 3rd Edition

①



Series

1. TOTAL RESISTANCE

$R_T = 20\Omega + 30\Omega + 50\Omega = 100\Omega$

2. TOTAL current

$I = \frac{V}{R_T} = \frac{125V}{100} = 1.25A$

3. Current on the 30Ω resister

1.25A [current is constant in series!]

4. Voltage on the 50Ω resister

$V = IR = (1.25A)(50) = 62.5V$

5. Power on the 20Ω resista

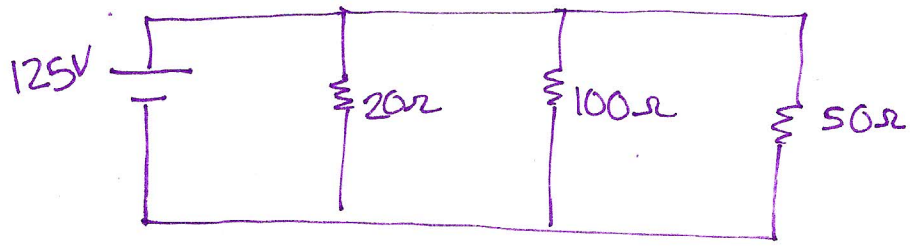
$P = IV = (1.25A)(25) = 31.25W$

Find voltage on the 20Ω

$V = IR = (1.25)(20)$

$V = 25V$

②



1. TOTAL Resistance

$$\frac{1}{R_T} = \frac{1}{20} + \frac{1}{100} + \frac{1}{50}$$

$$\frac{1}{R_T} = \frac{5+1+2}{100}$$

$$\frac{1}{R_T} = \frac{8}{100}$$

$R_T = 100/8 = 12.5\Omega$

2. TOTAL current

$$I = \frac{V}{R_T} = \frac{125V}{12.5} = 10A$$

3. Current on 20Ω Resister

$$I = \frac{V}{R} = \frac{125}{20} = 6.25A$$

*Voltage is constant in parallel, so V=125V

4. Voltage drop on the 50Ω

Voltage is constant!

V= 125V

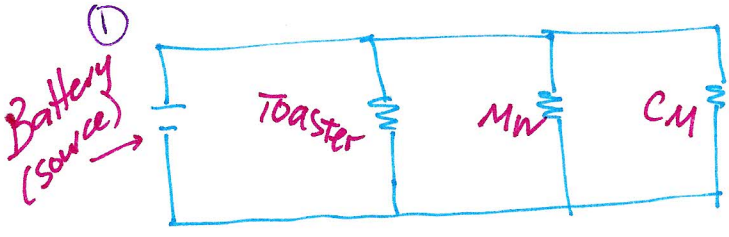
5. Power on the 50Ω resister

$I = \frac{125}{50} = 2.5$

$P = VI = (125)(2.5)$

$P = \underline{312.5W}$

③ Devices are connected in: Parallel



② $P = IV = (120V)(15A)$

$\underline{P = 1800W}$ ← MAX Power

CM + MW = 850W + 1200 = 2050W

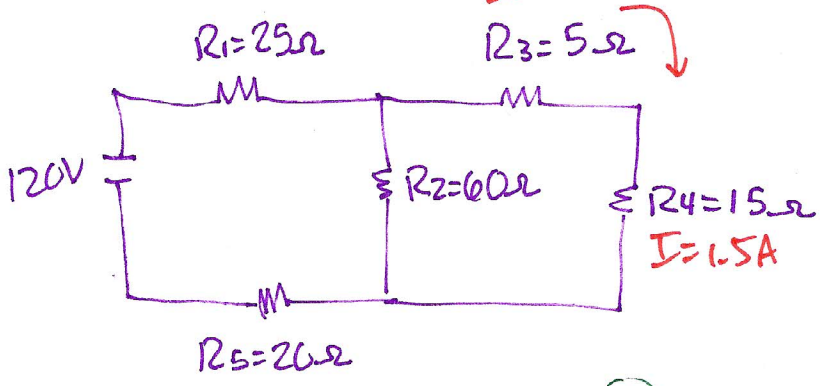
T + MW = 900 + 1200 = 2100W

T + CM = 900 + 850 = 1750W

↓

Toaster + Coffee Maker are the only ones that cant excede!

(4)



(S7)

$V_3 = IR_3 = 1.5(5) = 7.5V$

(4)

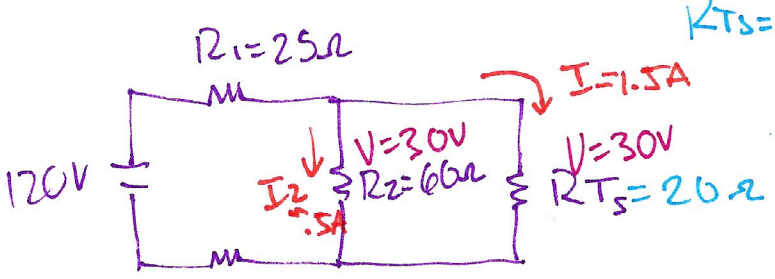
$V_4 = IR_4 = (1.5)(15) = 22.5V$

$P = IV = (1.5)(7.5) = 11.25W$

(5)

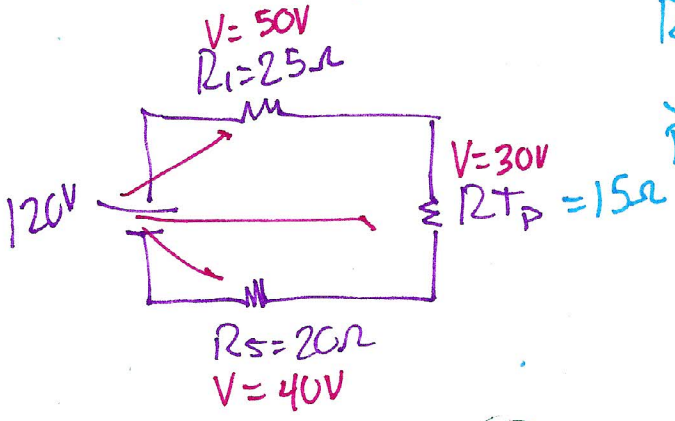
(S1)

$R_{TS} = 5 + 15 = 20\Omega$



(S6) (3)

$I_2 = \frac{V}{R} = \frac{30}{60} = 0.5A$ $I_3 = \frac{30}{20} = 1.5A$



(S2)

$\frac{1}{R_{TP}} = \frac{1}{20} + \frac{1}{60}$

$\frac{1}{R_{TP}} = \frac{3+1}{60}$

$\frac{1}{R_{TP}} = \frac{4}{60}$

$R_{TP} = \frac{60}{4} = 15\Omega$

(S3)

$R_T = 25 + 15 + 20 = 60\Omega$ (1)

(S4)

TOTAL CURRENT

$I = \frac{V}{R_T} = \frac{120}{60}$

$I = 2$

(2)

(S5)

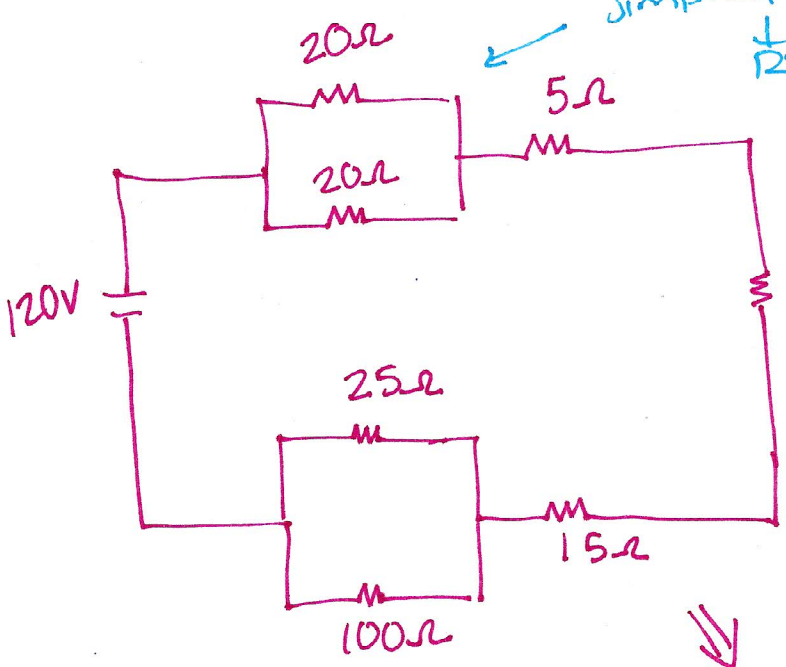
Voltage split

$V_1 = IR_1 = (2)(25) = 50$

$V' = IR_{TP} = (2)(15) = 30$

$V_5 = IR_5 = (2)(20) = 40$

⑤



Simplify Parallel

$\frac{1}{R_T} = \frac{1}{20} + \frac{1}{20}$

$\frac{1}{R_T} = \frac{2}{20}$

$R_T = \frac{20}{2} = 10\Omega$

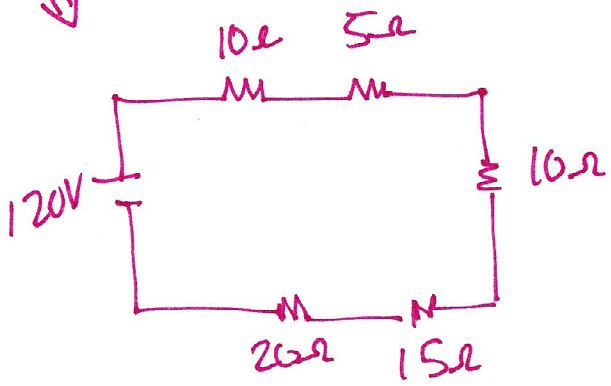
Simplify Parallel

$\frac{1}{R_T} = \frac{1}{25} + \frac{1}{100}$

$\frac{1}{R_T} = \frac{4+1}{100}$

$\frac{1}{R_T} = \frac{5}{100}$

$R_T = \frac{100}{5} = 20\Omega$



Simplify Series

$R_T = 10+5+10+15+20$

$R_T = 60\Omega$

$I = \frac{V}{R_T} = \frac{120}{60} = 2A$