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HW 4.1 Ohm's Law

Per ___ Name_____

1. The compressor on an air conditioner draws 90 A when it starts up. If the start up time is about 0.5 seconds, how much charge passes a cross-sectional area of the circuit in this time?

$I = 90A$
$t = 0.5s$
$Q = ?$

$Q = I \cdot t$
$= (90)(0.5)$
$= 45C$

45 C

2. A circuit contain a 9 V battery and a 500 Ω Resistor. What is the current in this circuit?

$V = 9V$
$R = 500\Omega$
$I = ?$

$V = IR$
$I = \frac{V}{R}$
$I = \frac{9}{500}$

0.018 A

3. A person notices a mild shock if the current along a path through the thumb and index finger exceeds 80 μA. What is the maximum allowable voltage without shock if your dry skin resistance is 4.0 E 5 Ω? What is the maximum allowable voltage without shock if your wet skin resistance is 2000 Ω?

$I = 80 \times 10^{-6} A$
$R_d = 4.0 \times 10^5 \Omega$
$R_w = 2000\Omega$
$V_d = ?$
$V_w = ?$

$V = IR$
$V_d = (80 \times 10^{-6})(4.0 \times 10^5)$
$V_d = 32V$

$V_w = (80 \times 10^{-6})(2000)$
$V_w = 0.16V$

32 V

0.16 V

4. All electrical devices are required to have an identifying plate that specifies their electrical characteristics. For example, the plate on an iron might state that the iron carries a current of 6 A when connected to a 120 V source. What is the resistance in the iron?

$I = 6A$
$V = 120V$
$R = ?$

$V = IR$
$R = \frac{V}{I} = \frac{120}{6} = 20\Omega$

20Ω

5. A typical color TV draws about 2.5 A when connected to a 120 V source. What is the overall resistance of the TV set?

$I = 2.5A$
$V = 120V$
$R = ?$

$V = IR$
$R = \frac{V}{I} = \frac{120V}{2.5A}$

48Ω

6. To charge the battery used for a boat trolling motor, a charger provides 4.5 A for 7 hours. How much charge passes through the battery?

$I = 4.5A$
$t = 7(3600)s$
$Q = ?$

$Q = I \cdot t$
$Q = (4.5)(7)(3600)$
$Q = 113,400$

113,400 C

7. The sticker on a portable CD player says it draws 300 mA of current at 9 V. What power does it dissipate?

$I = 0.3A$
$V = 9V$
$P = ?$

$P = V \cdot I$
$P = (9)(0.3) = 2.7W$

2.7W

8. How much charge runs through a 100 W light bulb connected to a 120 V source for one hour?

$Q = ?$
$P = 100W$
$V = 120V$
$t = 3600s$

$P = V \cdot I$ & $I = \frac{Q}{t}$
$P = \frac{V \cdot Q}{t}$
$Q = \frac{P \cdot t}{V} = \frac{(100)(3600)}{120}$

3000 C

9. An Ipod draws 0.900 Amps at 3 Volts. How much resistance does the Ipod have?

$I = 0.900A$
$V = 3V$
$R = ?$

$V = IR$
$R = \frac{V}{I} = \frac{3}{0.9}$

$3.\overline{3}\ \Omega$

10. A 1500 watt electric penguin draws 83 mA of current. What is the resistance of the penguin?

$P = 1500\ W$
$I = 0.083A$
$R = ?$

$P = I^2R$
$R = \frac{P}{I^2} = \frac{1500}{(0.083)^2} = 217738.42\ \Omega$

or → **218 kΩ**

11. If 5 mA of current runs through a wire in a CD player, how long would it take for 1.25 E 19 electrons to pass a point in this wire? (1 electron = 1.6 E –19 Coulombs)

$I = 0.005A$
$\#e = 1.25 \times 10^{19}$
$t = ?$
$Q = (1.25 \times 10^{19})(1.6 \times 10^{-19})$

$Q = I \cdot t$
$t = \frac{Q}{I} = \frac{(1.25 \times 10^{19})(1.6 \times 10^{-19})}{0.005}$

400 s

12. In a particular television tube, the beam current is 60 mA. How long does it take for 3.75 X 10^{14} electrons to strike the screen?

$I = 0.06A$
$Q = (3.75 \times 10^{14})(1.6 \times 10^{-19})$
$t = ?$

$Q = It$
$t = \frac{Q}{I} = \frac{(3.75 \times 10^{14})(1.6 \times 10^{-19})}{0.06}$

0.001 s

13. Find the current in the following devices when they are connected across a potential difference of 120 V.

a. A hot plate with a resistance of 48 Ω.
b. A microwave oven with a resistance of 20 Ω.

$V = 120V$
$I_a = ?$
$I_b = ?$
$R_a = 48\Omega$
$R_b = 20\Omega$

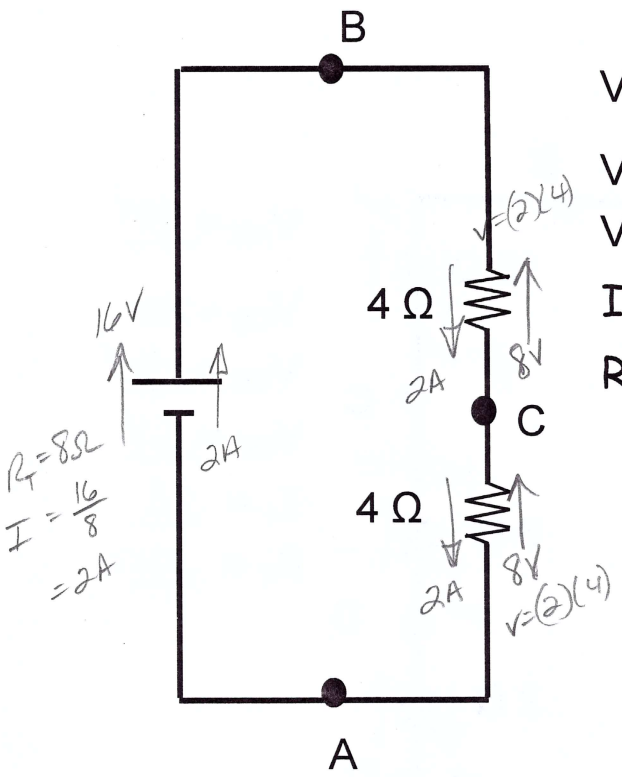
$V = IR$
$I = \frac{V}{R}$
$I_a = \frac{120}{48} = 2.5A$
$I_b = \frac{120}{20} = 6A$

2.5 A

6 A

HW 4.2 Series Circuits
Copying is not allowed

Per _____ Name _____



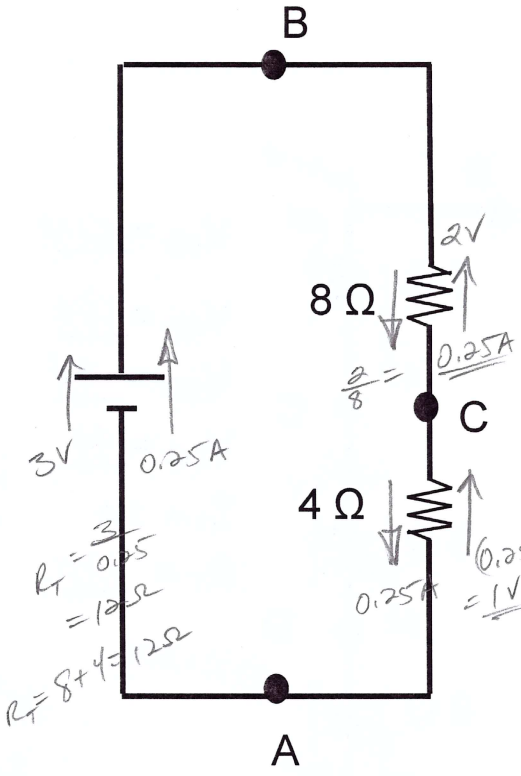
V_{AB} = 16V

V_{CB} = 8V

V_{AC} = 8V

I_1 = 2A

R_T = 8Ω



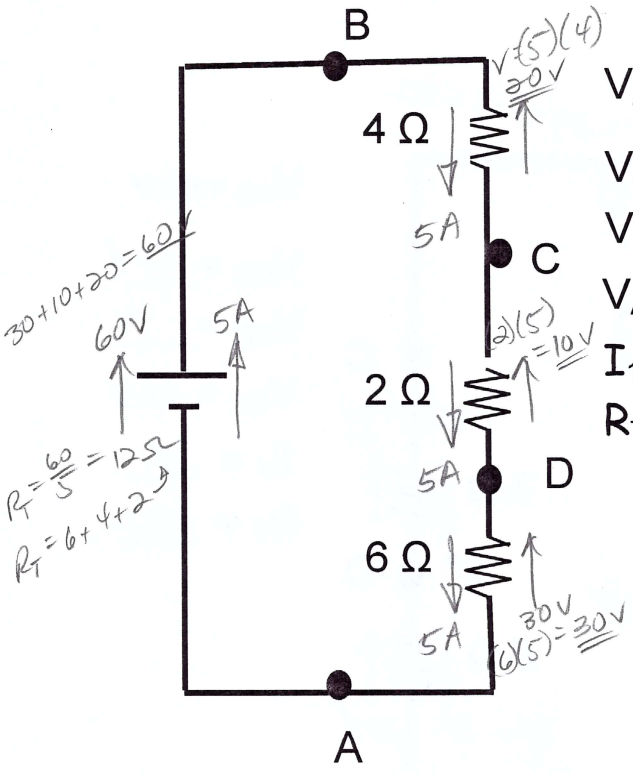
V_{AB} = 3V

V_{CB} = 2 V

V_{AC} = 1V

I_1 = 0.25A

R_T = 12Ω



V_{AB} = 60V

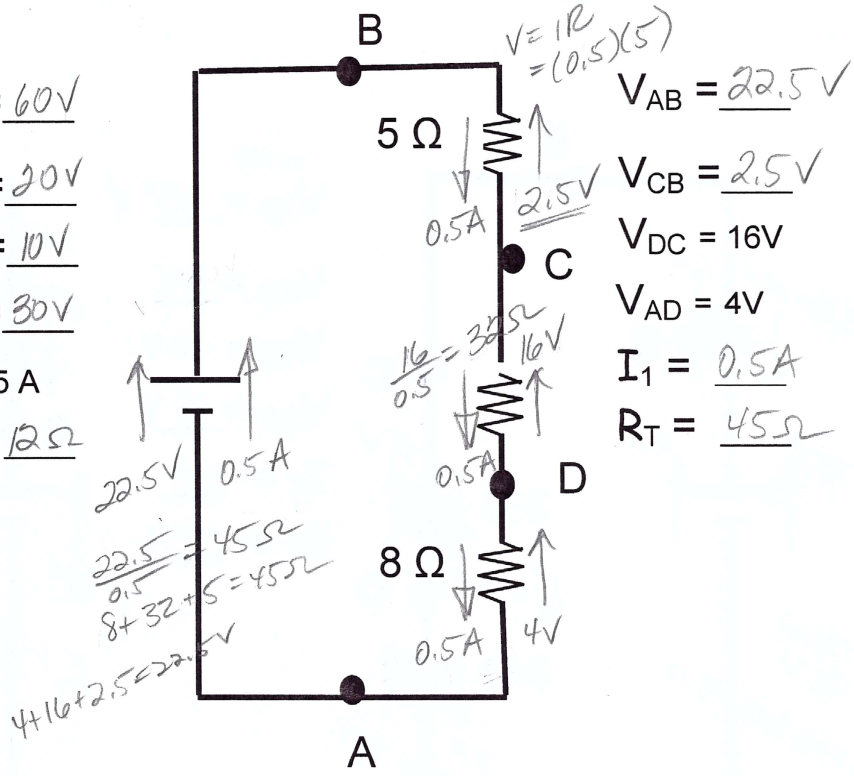
V_{CB} = 20V

V_{DC} = 10V

V_{AD} = 30V

I_1 = 5 A

R_T = 12Ω



V_{AB} = 22.5V

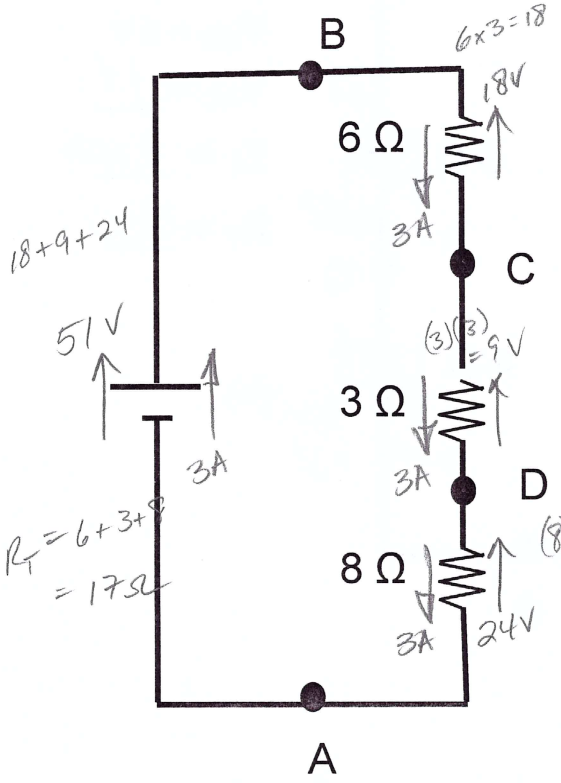
V_{CB} = 2.5V

V_{DC} = 16V

V_{AD} = 4V

I_1 = 0.5A

R_T = 45Ω



$V_{AB} = 51\,V$

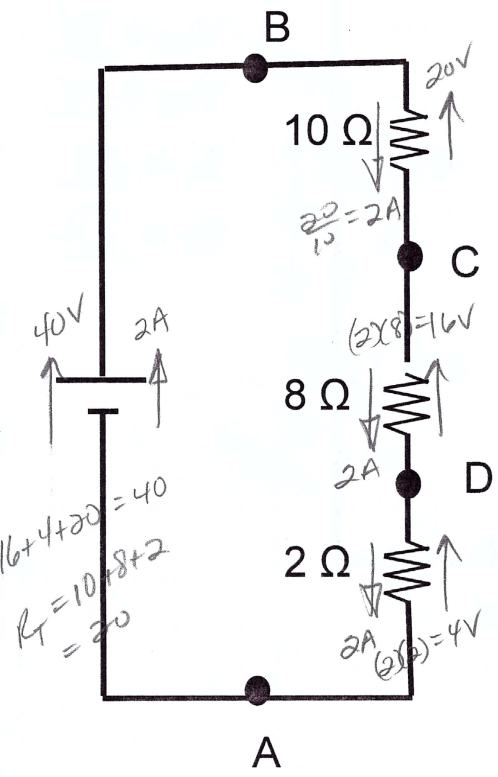
$V_{CB} = 18\,V$

$V_{CD} = -9\,V$

$V_{DC} = 9\,V$

$I_1 = 3\,A$

$R_T = 17\Omega$



$V_{AB} = 40\,V$

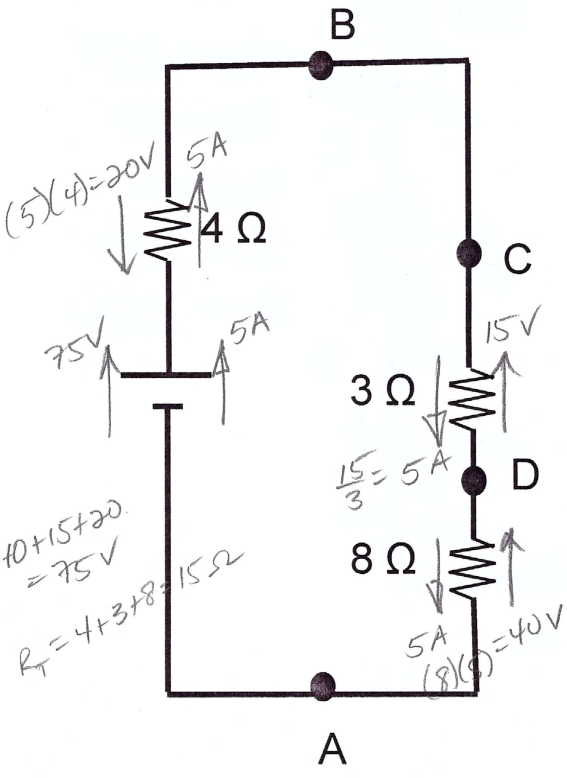
$V_{CB} = 20V$

$V_{CD} = -16\,V$

$V_{DC} = 16\,V$

$I_1 = 2A$

$R_T = 20\Omega$



75-20

$V_{AB} = 55\,V$

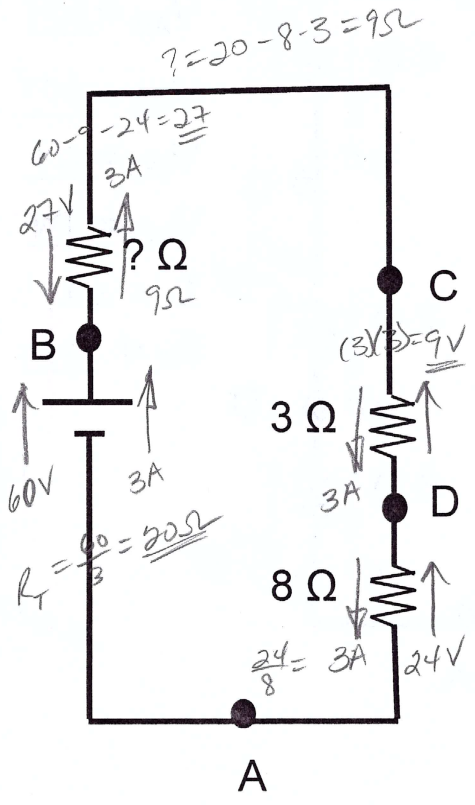
$V_{CB} = 0\,V$

$V_{CD} = -15\,V$

$V_{DC} = 15\,V$

$I_1 = 5A$

$R_T = 15\Omega$



$V_{AB} = 60\,V$

$V_{CB} = 27\,V$

$V_{CD} = -9\,V$

$V_{DA} = -24\,V$

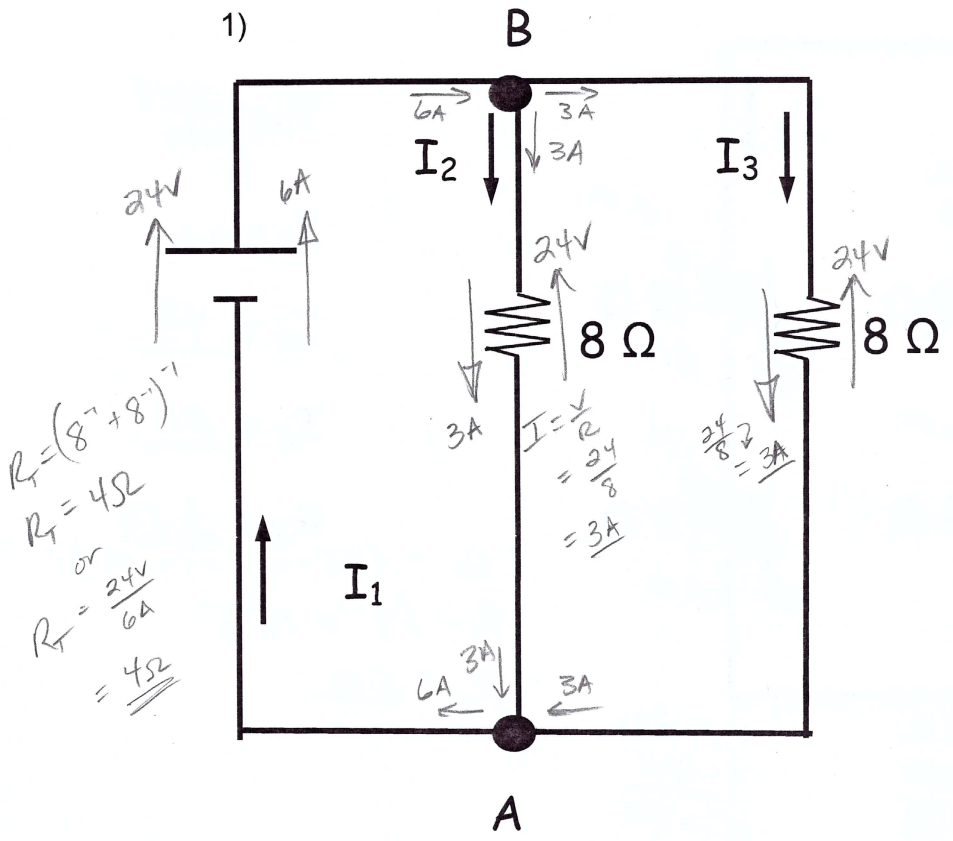
$I_1 = 3A$

$R_T = 20\Omega$

HW 4.3 Parallel Circuits
No Copying is Allowed

Per ____ Name _____

1)



V_{AB} = 24V

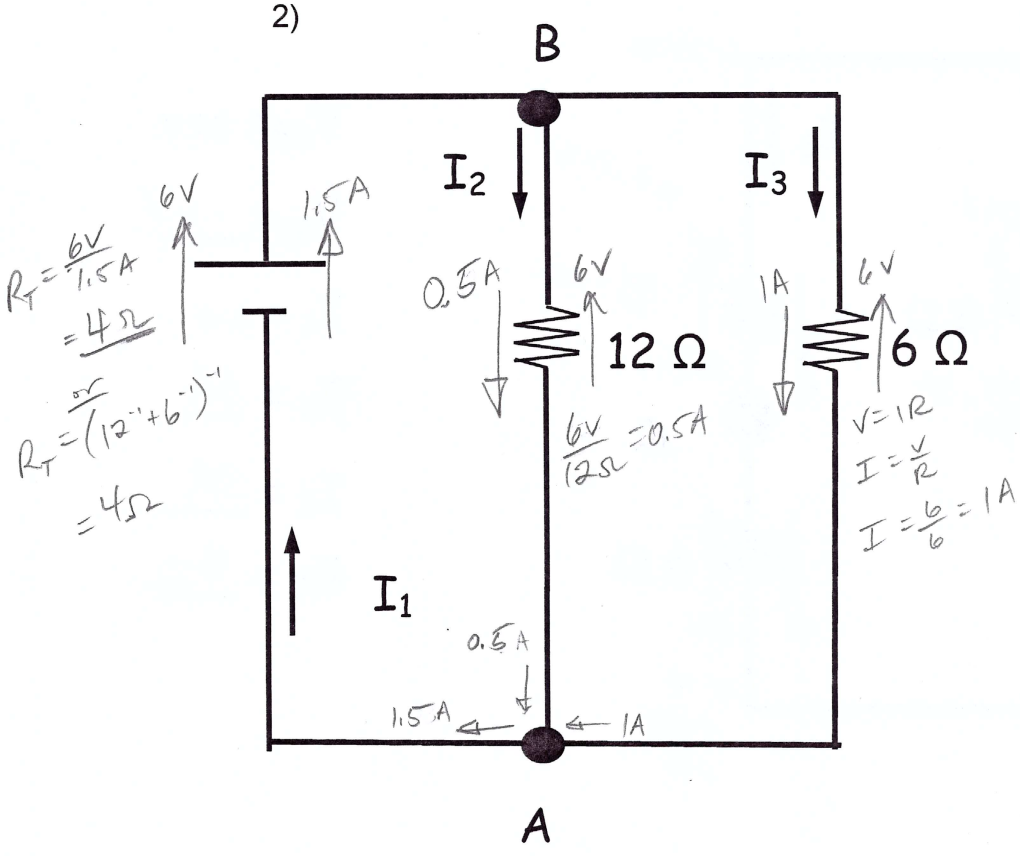
I_1 = 6A

I_2 = 3A

I_3 = 3A

R_T = 4Ω

2)



V_{AB} = 6V

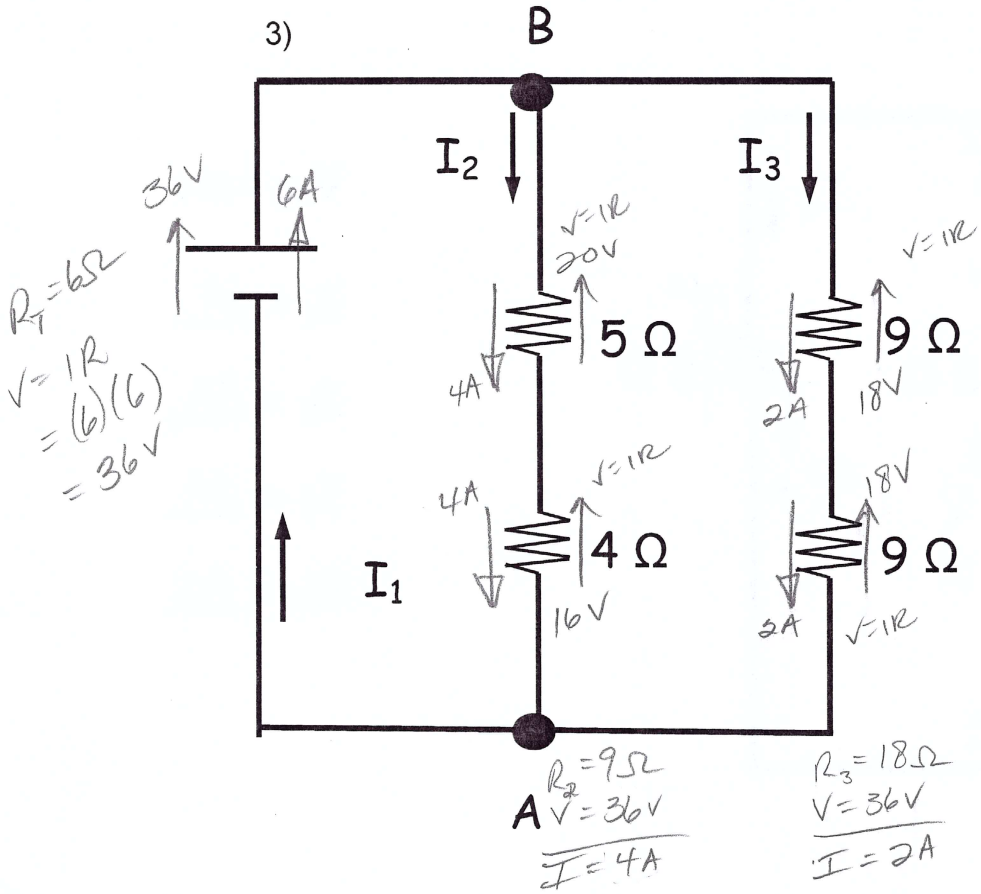
I_1 = 1.5A

I_2 = 0.5A

I_3 = 1A

R_T = 4Ω

3)



$R_T = 6\Omega$

$V = IR$

$= (6)(6)$

$= 36V$

$R_2 = 9\Omega$

$V = 36V$

$I = 4A$

$R_3 = 18\Omega$

$V = 36V$

$I = 2A$

$V_{AB} = \underline{36\ V}$

$I_1 = 6\ A$

$I_2 = \underline{4A}$

$I_3 = \underline{2A}$

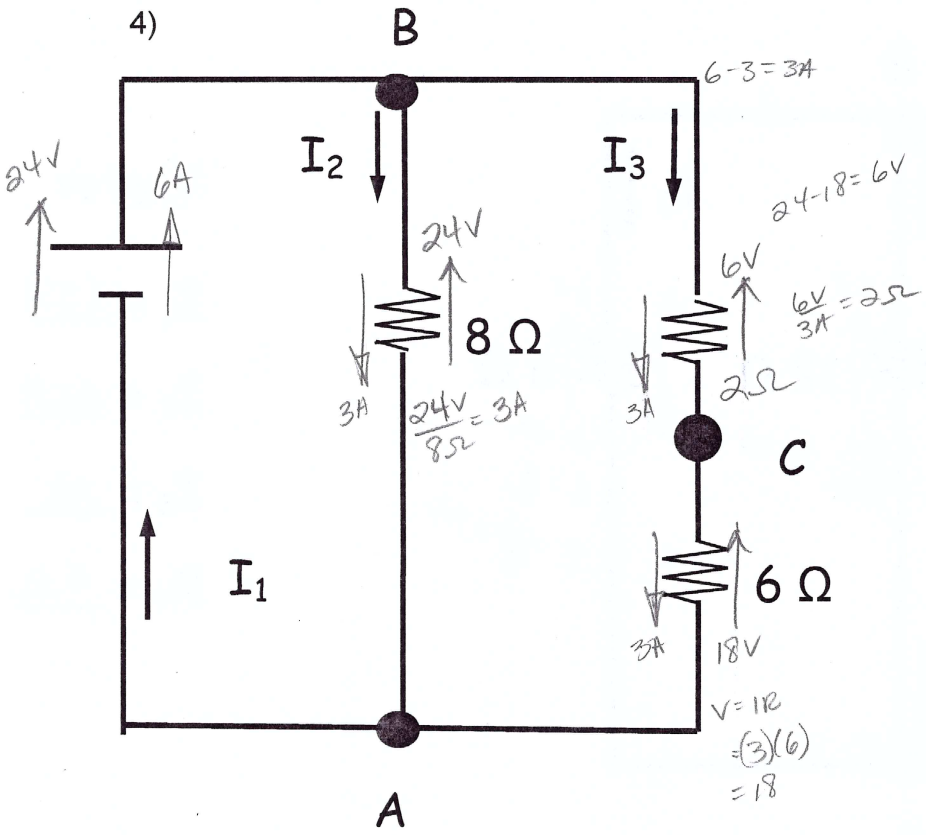
$R_T = \underline{6\Omega}$

$R_T = ((5+4)^{-1} + (9+9)^{-1})^{-1}$

$R_T = (9^{-1} + 18^{-1})^{-1}$

$R_T = 6\Omega$

4)



$V_{AB} = 24\ V$

$V_{BC} = \underline{-6\ V}$

$I_1 = 6\ A$

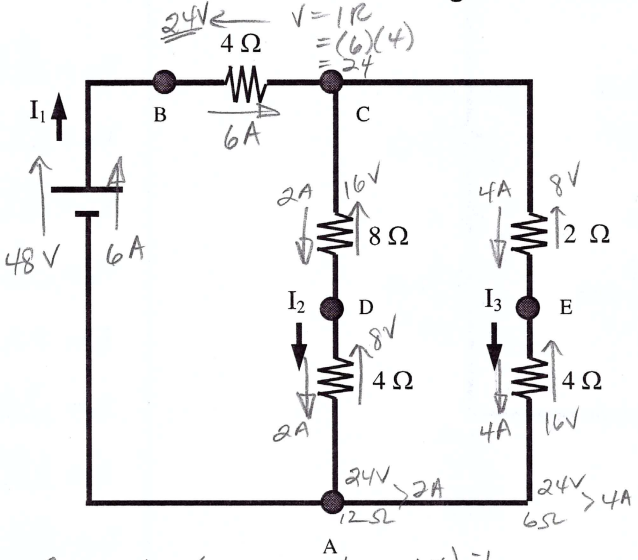
$I_2 = \underline{3A}$

$I_3 = \underline{3A}$

$R_T = \underline{4\Omega}$

HW 4.4 Combination Circuits Per ____ Name_____

You must show all voltage and current arrows!

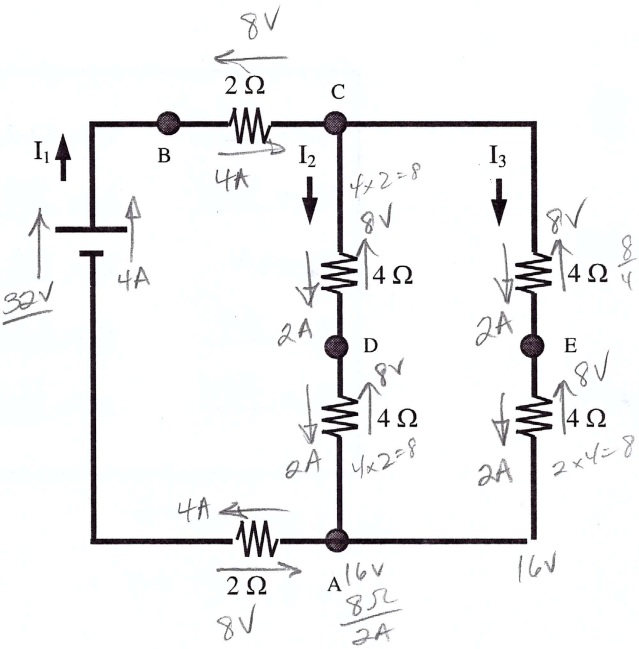


$R_T = 8\Omega$
$I = \frac{48}{8}$
$I = 6A$

$R_T = 4 + ((8+4)^{-1} + (2+4)^{-1})^{-1}$

$R_T = 8\Omega$

V_{AB} = 48 V	I_1 = 6A
V_{CB} = 24V	I_2 = 2A
V_{AD} = 8V	I_3 = 4A
V_{EC} = 8V	R_t = 8Ω
V_{AC} = 24V	



$8+8+8+8=$

V_{ab} = 24 V	I_1 = 4A
V_{cb} = 8 V	I_2 = 2A
V_{ad} = 8 V	I_3 = 2A
V_{ec} = 8 V	R_t = 8Ω
V_{ac} = 16 V	

$R_T = 2 + ((4+4)^{-1} + (4+4)^{-1})^{-1} + 2$

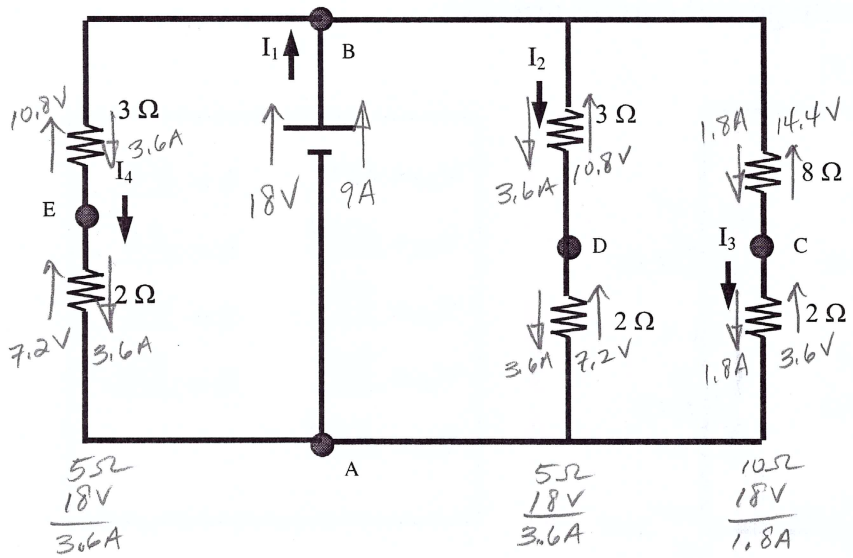
$R_T = 8\Omega$

$R_T = \frac{32V}{4A} = 8\Omega$

$R_T = 2\Omega$

$V_{AB} = IR_T = 9(2)$

$V_{ec} = -7.2V + 3.6V$



5Ω 18V 3.6A

5Ω 18V 3.6A

10Ω 18V 1.8A

$V_{ab} =$ 18V

$V_{cb} =$ 14.4V

$V_{ac} =$ 3.6V

$V_{ec} =$ -3.6V

$I_1 =$ 9 A

$I_2 =$ 3.6A

$I_3 =$ 1.8A

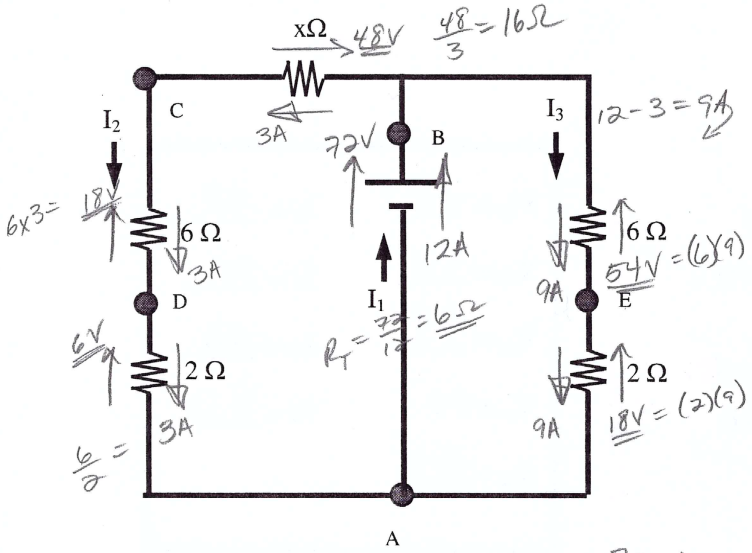
$I_4 =$ 3.6A

$R_t =$ 2Ω

$R_T = \left((3+2)^{-1} + (3+2)^{-1} + (8+2)^{-1}\right)^{-1} = 2\Omega$

$72 - 18 - 6 = 48V$

$\frac{48}{3} = 16\Omega$



$V_{AB} = 54 + 18 = 72V$

$V_{ab} =$ 72V

$V_{cb} =$ 48V

$V_{ad} =$ 6 V

$V_{ec} =$ 6V

$V_{ac} =$ 24V

$I_1 =$ 12 A

$I_2 =$ 3A

$I_3 =$ 9A

$R_t =$ 6Ω

xΩ = 16Ω

$V_{ec} = 54 - 48 = 6$

$V_{ac} = 6 + 18 = 24$