

CR9

Q: DRAW CIRCUIT DIAGRAMS FOR HW PROBLEMS 19 & 20 SHOWING ALL INFORMATION GIVEN AND REQUESTED.

HW19-20

FOR ALL CIRCUITS

AGENDA

K1 & K2 REVIEW  
SERIES VS. PARALLEL  
CIRCUIT ANALYSIS

$V = IR$  FOR THE PATH BETWEEN ANY 2 POINTS IN CIRCUIT  
K1 (VOLTAGE LOOPS) - VOLTAGE CHANGES ADD TO ZERO AROUND ANY LOOP IN CIRCUIT  
K2 (CURRENT BRANCHES) - CURRENT DIVIDES AT BRANCHES AND JOINS AT JUNCTIONS

SERIES CIRCUITS

VS.

PARALLEL CIRCUITS

VOLTAGE DIVIDED BETWEEN SEGMENTS  
 $V_T = V_1 + V_2 + V_3 + \dots$  (BIGGER RESISTORS EAT MORE VOLTAGE)  
EACH SEGMENT GETS FULL CURRENT  
 $I_T = I_1 = I_2 = I_3 = \dots$

RESISTANCES ADD UP  
 $R_T = R_1 + R_2 + R_3 + \dots$

CURRENT DROPS AS RESISTORS ARE ADDED

EACH PATH GETS FULL VOLTAGE

$V_T = V_1 = V_2 = V_3 = \dots$   
CURRENT DIVIDED BETWEEN PATHS  
 $I_T = I_1 + I_2 + I_3 + \dots$  (SMALLER RESISTANCE PATHS DRAW MORE CURRENT)

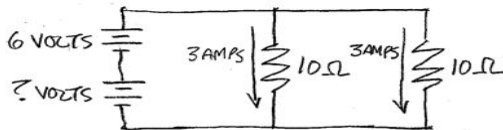
TOTAL RESISTANCE DECREASES AS PATHS ARE ADDED AND IS ALWAYS LESS THAN ANY PATH RESISTANCE

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots$$

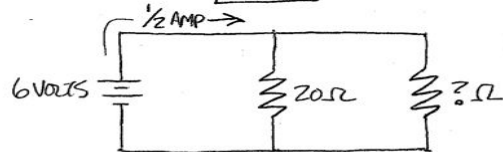
TOTAL CURRENT INCREASES AS PATHS ARE ADDED

AG

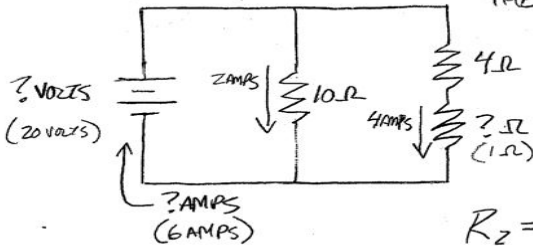
HW19



HW20



A BATTERY OF UNKNOWN VOLTAGE SUPPLIES CURRENT TO 2 PARALLEL CIRCUIT PATHS. THE FIRST PATH HAS A SINGLE 10 OHM RESISTOR, WHICH GETS 2 AMPS. THE SECOND PATH HAS A 4 OHM RESISTOR IN SERIES WITH AN UNKNOWN RESISTOR, AND 4 AMPS FLOWS THROUGH THE UNKNOWN RESISTOR. FIND  $I_T$ ,  $V_T$  AND  $R_3$ .



$$I_T = I_1 + I_2 = (2 + 4) \text{ AMPS} = \boxed{6 \text{ AMPS}}$$

$$V_T = V_1 = I_1 R_1 = (2 \text{ AMPS})(10 \Omega) = \boxed{20 \text{ VOLTS}}$$

$$V_T = V_2 + V_3 = I_2 R_2 + I_3 R_3 = I_3 (R_2 + R_3)$$

$$R_2 + R_3 = \frac{V_T}{I_3} \quad R_2 = \frac{V_T}{I_3} - R_3$$

$$R_2 = \frac{20 \text{ VOLTS}}{4 \text{ AMPS}} - 4 \Omega = \frac{20 \text{ AMP} \cdot \Omega}{4 \text{ AMPS}} - 4 \Omega = (5 - 4) \Omega = \boxed{1 \Omega}$$