Easy

1 $V = 9V$, $I = 117 mA$, $R_L = 72\,\Omega$, $R_i = ?$

The load resistor is in series with the battery, so we have $R_{TOT} = R_L + R_i$ and using Ohm's law, $R = V/I$

$$R_{TOT} = 9V/117mA = 76.9\,\Omega = R_L + R_i = 72\,\Omega + R_i$$

Thus $R_i = 76.9\,\Omega - 72\,\Omega$

$$\boxed{R_i = 4.9\,\Omega}$$

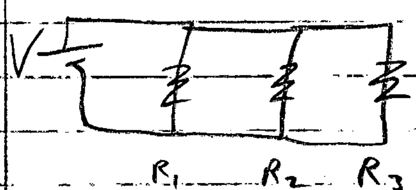
2 $R_1 = 4\,\Omega$, $R_2 = 8\,\Omega$, $R_3 = 12\,\Omega$, $V = 24\,V$

(a) series connection, find Req.
Def: $R_{eq}(\text{series}) = R_1 + R_2 + R_3 = \boxed{24\,\Omega = R_{series}}$

(b) current through each resistor: since they are in series, they all have the same current: $I = V/R_{eq} = 24V/24\Omega$

$$\boxed{I = 1.0 \text{ Amps}}$$

(c) parallel connection → Find Req: $\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$



$$R_{eq} = \left(\frac{1}{4} + \frac{1}{8} + \frac{1}{12}\right)^{-1} = \boxed{2.2\,\Omega}$$

Find current in each resistor: Since each resistor is connected in parallel to the battery, we can use Ohm's law separately for each one.

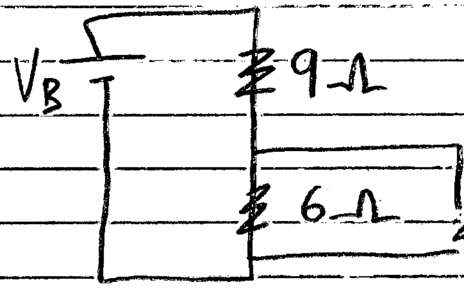
$$\boxed{\begin{aligned} I_1 &= V/R_1 = 6A \\ I_2 &= V/R_2 = 3A \\ I_3 &= V/R_3 = 2A \end{aligned}}$$

Note $I_1 + I_2 + I_3 = 11$ Amps

which is the total current that goes through the battery. We confirm it w/ $I_{TOT} = V/R_{eq} = 11$ amps. ✓

Easy

4



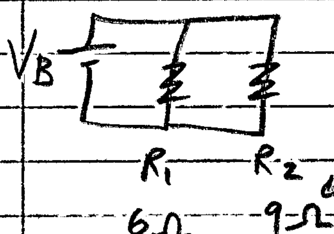
connect resistors in series

$\Delta V = 12V$ (a) This tells us the current through the circuit is $I = V/R = 12V/6\Omega = 2A$

And therefore the total Voltage $= I R_{eq} = 2A\,(6+9)\Omega$

$\boxed{V_{Batt} = 30V}$

(b) Now connect in parallel



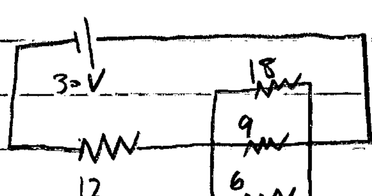
$I(9\Omega) = .25A$

Thus the voltage drop across the resistor is $V = IR = (9\Omega)(.25A)$

$V(R_2) = 2.25V$

And since it is in parallel with the battery, this must also be the voltage drop across the battery. $\boxed{V_B = 2.25V}$

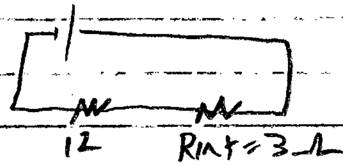
6



Find R_{eq}. First note the 18/9/6 Ω resistors are in parallel together with Rintermediate = Rint

$R_{int} = \left(\frac{1}{18} + \frac{1}{9} + \frac{1}{6}\right)^{-1} = 3\Omega$

Now we have:

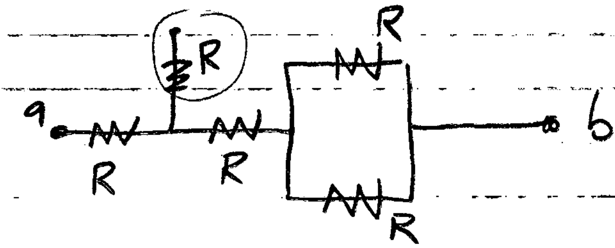


These two resistors are in series so we add them

$\boxed{R_{eq} = 15\Omega}$

Easy

[7] Find R_{eq} between a & b



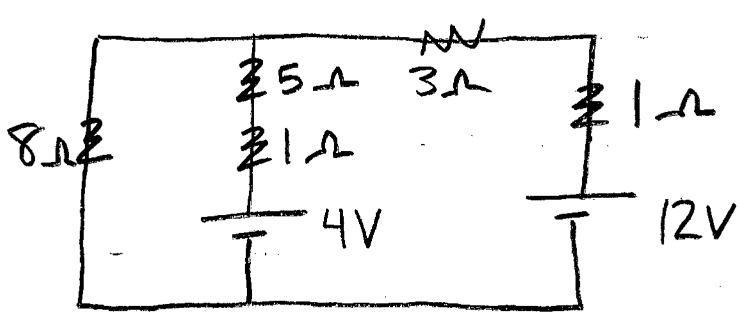
Note, since the circled resistor is not a part of any path from a → b, it will not contribute to the R_{eq}.

Now, the two resistors closest to (b) are in parallel so $R_{part} = (1/R + 1/R)^{-1} = R/2$.

Finally this R_{part} is in series with the first two resistors closer to (a) [remember to ignore the vertical circled resistor].

$$R_{eq} = R + R + R/2 = \boxed{5R/2 = R_{eq}}$$

[17] Determine the current in each branch:

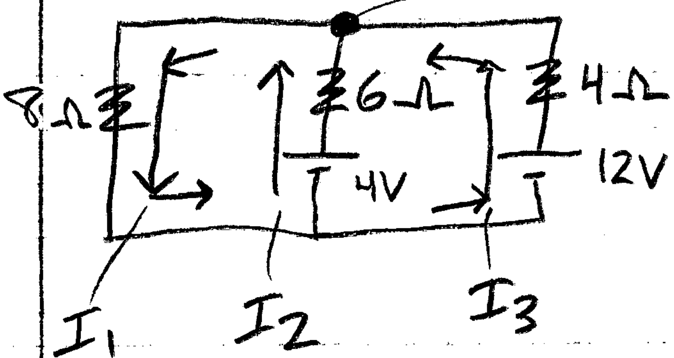


First define a current direction in each branch. Note, it does not matter if you pick correctly, so just choose the direction you think the current goes and don't worry. If you pick wrong, you will get a (−) sign in your answer.

- You can also redraw the circuit simpler by combining the resistors in series. →

Easy

Continuing 17



Apply the junction rule

① $I_2 + I_3 = I_1$

Now apply Kirchoff's loop rule $(\Sigma \Delta V = 0)$ to each:

Left loop ② $+4V - (6\Omega) I_2 - (8\Omega) I_1 = 0$

Right loop ③ $+12V - (4\Omega) I_3 + 6\Omega\, I_2 - 4V = 0$

($+$ b/c opposing current; $-$ b/c opposing battery)

Now solve the equations

② $4 - 6I_2 - 8I_1 = 0 \longrightarrow = 4 - 6I_2 - 8I_2 - 8I_3 = 0$ (2')

③ $8 + 6I_2 - 4I_3 = 0$

① $I_1 = I_2 + I_3$ Sub into ②

rewrite (2') $4 - 14I_2 - 8I_3 = 0$

" $[$③ $8 + 6I_2 - 4I_3 = 0 \,] \times (-2)$ and add

$$[4 + (8)(-2)] + [-14 + (6)(-2)]\, I_2 + \underbrace{[-8 + (-4)(-2)]}_{0}\, I_3 = 0$$

$-12 - 26 I_2 = 0 \longrightarrow \boxed{I_2 = -6/13 \text{ Amps}}$

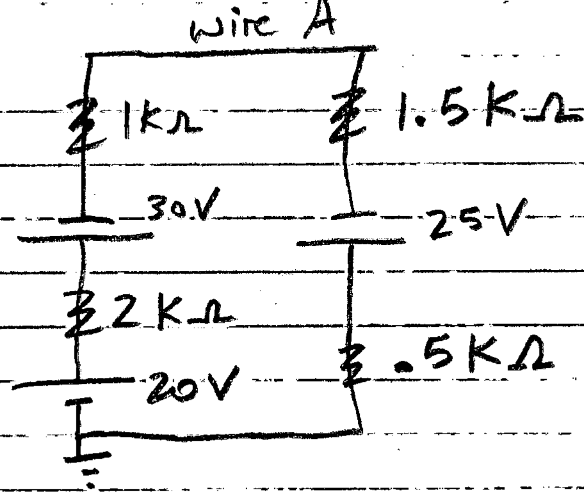
(−) means true dir. is opposite to my arrow.

from eq 2' $\rightarrow I_3 = [4 - 14(-6/13)]/8 = \boxed{I_3 = +17/13 \text{ A}}$

$I_1 = I_2 + I_3 = \boxed{+11/13 \text{ A} = I_1}$

19

Easy



(a) Find total current: define I as clockwise and apply loop rule.

$+20V \quad -2K\,I \quad -30V \quad -1K\,I \quad -1.5K\,I \quad +25V \quad -.5K\,I = 0$

$15V - (5K\Omega)I = 0 \rightarrow I = 15V/5K\Omega = \boxed{3mA = I}$

(b) Find potential of wire A rel to ground:
Work your way from ground up to wire A and add up all the ΔV as you go:

$+20V - (2K\Omega)(3mA) - 30V - (1K\Omega)(3mA) =$ wire A voltage

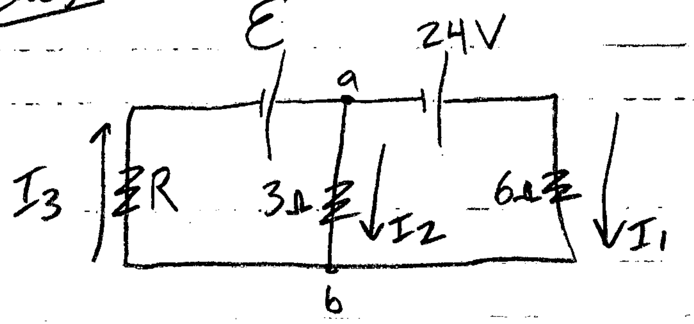
$20 - 6 - 30 - 3 = \boxed{-19V = V_{wire A}}$

(c) Find ΔV across the 1500 Ω resistor.
Using Ohm's Law, $\Delta V = IR = (3mA)(1500\,\Omega)$

$\boxed{\Delta V = 4.5V}$

Easy

20



Find I_2 & I_3 given

$I_1 = 3A$

Junction Rule at (a) $I_3 = I_2 + I_1$

Right hand loop Rule: (clockwise) $+24V - 6I_1 + 3I_2 = 0$

$\frac{24V - 6(3)}{-3} = \boxed{I_2 = -2 \text{ Amps}}$ (opp dir)

Note, since ε & R are not given we cannot use that loop.

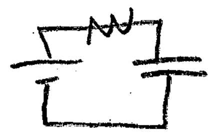
$I_3 = -2A + 3A$

$\boxed{I_3 = 1A}$

31 $C = 6\mu F$
$R = 2M\Omega$
$\mathcal{E} = 20V$
(in series)

(a) time constant?
$\tau = RC = (6\mu F)(2M\Omega) = \boxed{12s = \tau}$

(b) max charge on capacitor?



when max charged, the capacitor contains the full voltage drop of the battery. $Q = CV \rightarrow Q_{max} = CV_{Batt}$

$Q_{max} = (6\mu F)(20V) = \boxed{120\mu C = Q_{max}}$

32 $C = 20\mu F$
$R = 100\Omega$
$\Sigma = 9V$
(series)

(a) $\tau = RC = 2ms = 2\times10^{-3}s = \tau$
(b) $Q_{max} = CV_{Batt} = 1.8\times10^{-4}C = Q_{max}$
(c) $Q(t = 1\tau = RC)$

$Q = Q_{max}(1 - e^{-t/\tau}) = Q_{max}(1 - e^{-\tau/\tau})$ ↙ $t=\tau$

$= Q_{max}(1 - e^{-1}) = .632\, Q_{max}$

$\boxed{Q = 1.14\times10^{-4}c}$

Easy

37 $P = 1300\,W$ heater
$P = 1000\,W$ toaster
$P = 1500\,W$ grill

} parallel to 120V circuit

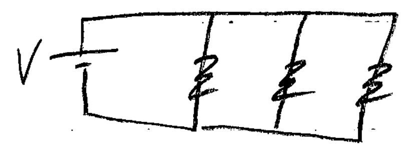
ⓐ current for each? $P = IV \rightarrow I = P/V$

$I_{heater} = 10.8\,A$; $I_{toaster} = 8.3\,A$; $I_{grill} = 12.5\,A$

ⓑ A 30A circuit breaker will cause the circuit to shut down b/c $I_{TOT} = 31.6\,A$

38 lamp $R = 150$
heater $R = 25$
fan $R = 50$

} parallel 120V



ⓐ $I_{TOT} = ?$ $I = V/R \rightarrow$ $I_{lamp} = .8\,A$
$I_{heat} = 4.8\,A$
$I_{fan} = 2.4\,A$

Since currents in parallel will all go through battery

$I_{TOT} = \Sigma I = \boxed{8 \text{ Amps} = I_{TOT}}$

ⓑ $\Delta V_{fan} = \Delta V_{Batt}$ since it is in parallel: $\boxed{\Delta V_{fan} = 120V}$

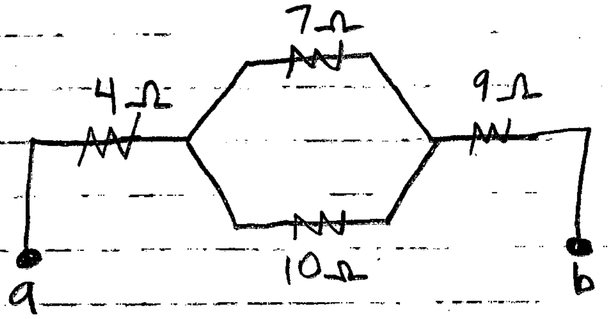
ⓒ current in lamp (from ⓐ) $= \boxed{I_{lamp} = .8\,A}$

ⓓ Power out of heater? $P = IV = (4.8A)(120V)$

$\boxed{P_{heater} = 576 \text{ Watts}}$

Medium

5



(a) Find R_{eq} ($a \to b$)

(1) Two middle resistors in parallel $\left(\frac{1}{7} + \frac{1}{10}\right)^{-1} = 4.1\Omega$

(2) first, equivalent, third = series

$R_{eq} = 4 + 4.1 + 9 = \boxed{17.1\Omega}$

(b) $V_{ab} = 34V$
find current everywhere
→ First, we know the equivalent current is $I_{eq} = V/R_{eq}$
$I_{eq} = 1.99A$. This current flows through the first and last (4Ω & 9Ω) resistors b/c there are no branches for current to split off.
For the two center resistors, the current will split between them, such that the voltage drop (IR) for each is the same.

$\underbrace{I_7(7) = I_{10}(10)}_{I_7 = \frac{10}{7} I_{10}}$ & $I_7 + I_{10} = I_{eq} = 1.99A$

$\left(\frac{10}{7} + 1\right) I_{10} = 1.99A$

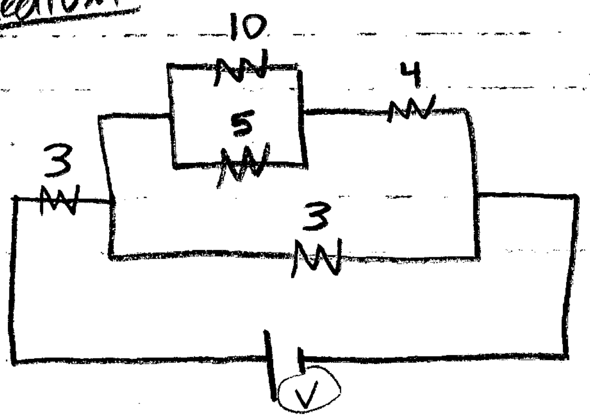
$\boxed{I_{10} = .819A}$

$\boxed{I_7 = 1.17A}$

$\boxed{I_4 = I_9 = 1.99A}$

Medium

8



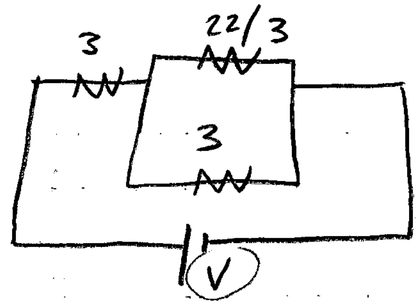
[all units are Ohms]

(a) Find R_{eq} : 1) combine 10 & 5 parallel:

$$\left(1/10 + 1/5\right)^{-1} = 10/3$$

2) combine 10/3 & 4 in series: $10/3 + 4 = 22/3$.

3) Redraw:



4) combine 22/3 & 3 in parallel: $\left(\frac{3}{22} + \frac{1}{3}\right)^{-1} = 2.13$

5) combine 2.13 & 3 in series: $2.13 + 3 = 5.13$

Thus $\boxed{R_{eq} = 5.13\ \Omega}$

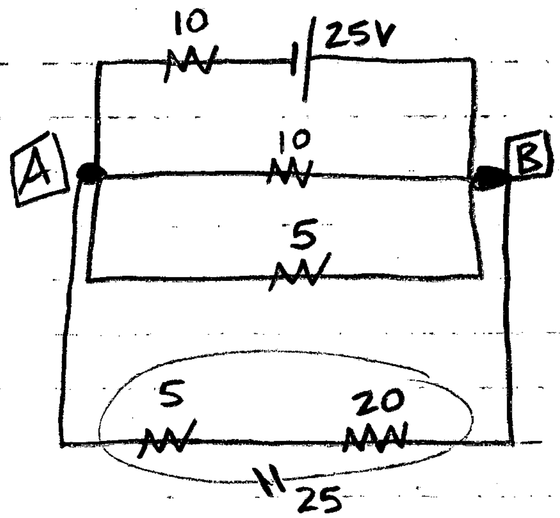
(b) $P = 4.00W$
find Voltage

We know $P = IV = V^2/R$ so $\sqrt{PR} = V$

$$V = \sqrt{(4\ W)(5.13\ \Omega)} = \boxed{V = 4.53\ \text{Volts}}$$

<u>Med</u>

9 Drawn slightly diff than book.

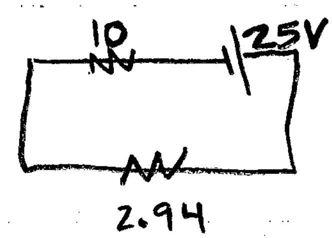


(a) find current in 20-Ω resistor

Notice that the bottom 3 branches are all in parallel so we combine them

$$\left(\frac{1}{10} + \frac{1}{5} + \frac{1}{25}\right)^{-1} = 2.94$$

Redraw:



Thus $R_{eq} = 10 + 2.94$
$= 12.94\,\Omega$

Now we can find the current out of the battery

$I_T = V/R_{eq} = 1.93\,A$

Now lets find $V_{AB} = 25V - (10\,\Omega)\,I_T = 5.7V$

This potential difference (5.7V) is the voltage across all 3 parallel branches of the circuit.

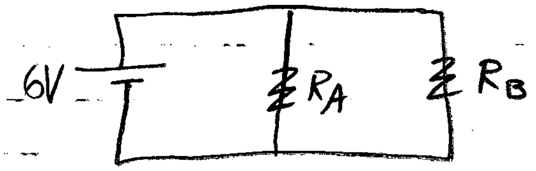
Thus, $I_{20} = \Delta V / R_{Branch} = 5.7V / 25\,\Omega = \boxed{.23\,A = I_{20}}$

(b) Find $\boxed{V_{AB} = 5.7V}$ (from above)

(The total resistance of the branch containing the 20-Ω resistor is actually 25-Ω.)

Med

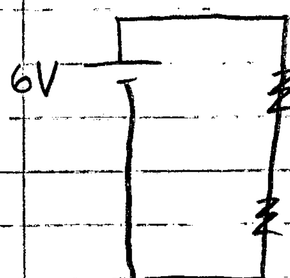
10 R_A, R_B parallel 6V Battery:



$I_B = 2A$ ↳ This tells us

$R_B = V/I_B = 6V/2A = \boxed{R_B = 3\Omega}$

R_A, R_B in series 6 V_{Batt} we measure $V_A = 4V$



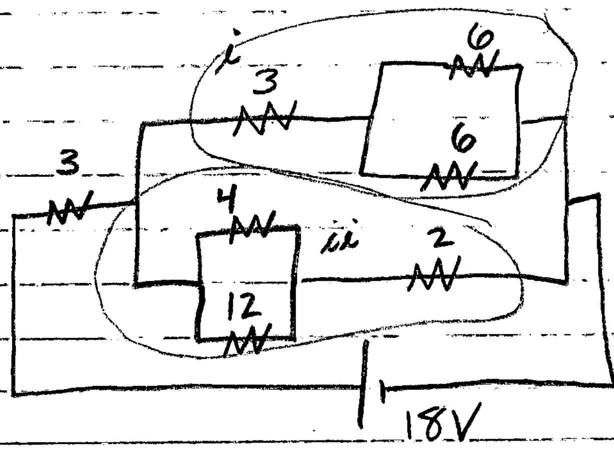
R_A; $V_A = I R_A = 4V$ Because $V_A + V_B = V_{Total}$

R_B; $V_B = I R_B = 6V - 4V = 2V$

↳ $I = \frac{V_B}{R_B} = \frac{2V}{3\Omega} = \frac{2}{3}A$

Thus $R_A = \frac{V_A}{I} = \frac{4V}{(2/3)A} = \boxed{6\Omega = R_A}$

13



All resistances in Ohm's

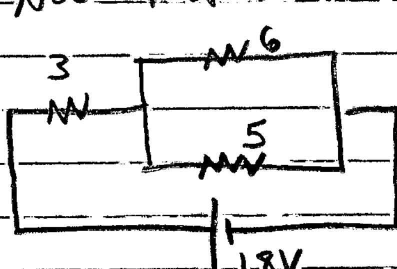
ⓐ Find I in 12Ω resistor:

First simplify i & ii

i) $3 + \left(\frac{1}{6} + \frac{1}{6}\right)^{-1} = 6$

ii) $\left(\frac{1}{4} + \frac{1}{12}\right)^{-1} + 2 = 5$

Now redraw



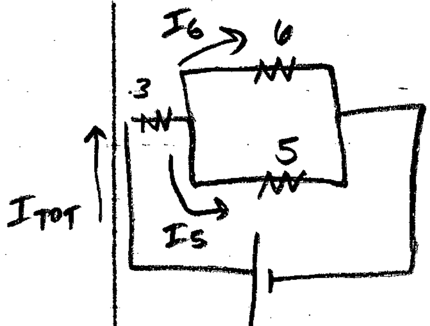
Find Req:

$Req = 3 + \left(1/6 + 1/5\right)^{-1} = \boxed{5.73\Omega = Req}$

$I_{TOT} = V/Req = \boxed{3.14 A = I_{TOT}}$ →

Med

$\boxed{13\text{-continued}}$ $I_{TOT} = 3.14$ A will split up among the branches of the circuit. Since parallel, $\Delta V_6 = \Delta V_5$



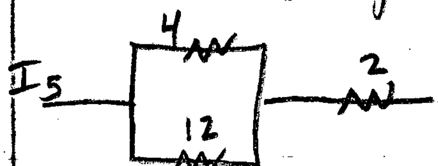
$I_{TOT} = I_6 + I_5$

$\Delta V_6 = \Delta V_5 \rightarrow I_6(6) = I_5(5)$

$\boxed{I_6 = \frac{5}{6} I_5}$ sub into top

$I_{TOT} = 3.14 = \left(\frac{5}{6} I_5\right) + I_5 \rightarrow \boxed{I_5 = 1.71\,A}$

Recall how we got (5)



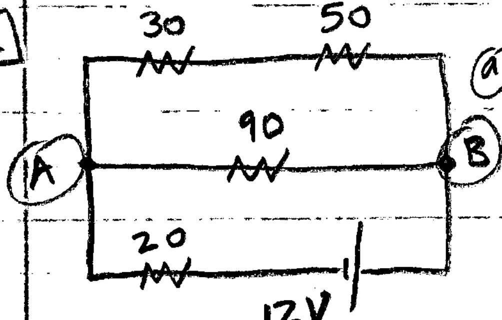
so I_5 will split again into I_4 and I_{12} where $V_4 = V_{12}$ because they are in parallel.

$I_5 = I_4 + I_{12}$ & $V_4 = V_{12} \rightarrow 4I_4 = 12 I_{12}$

sub in here $\boxed{I_4 = 3I_{12}}$

$I_5 = 1.71\,A = 3I_{12} + I_{12} \longrightarrow \boxed{I_{12} = .43\,A}$ (FINAL ANSWER)

$\boxed{22}$



(a) Find power delivered to 50 Ω:

First find R_{eq} to get I_{TOT}

R_{eq} = (30 + 50) in parallel with 90 Then in series with 20 Ω

$R_{eq} = \left(\frac{1}{80} + \frac{1}{90}\right)^{-1} + 20 \rightarrow \underline{R_{eq} = 62.4\,\Omega} \rightarrow \underline{I_{TOT} = .1925\,A}$

Med

$\boxed{22 \text{ cont}}$ → Now find current through 50 Ω branch

I_{TOT} will split, but since the branches are in parallel, the voltage across each will be a constant.

$I_{TOT} = I_{80} + I_{90}$ $V_{80} = V_{90}$

$(80) I_{80} = (90) I_{90}$

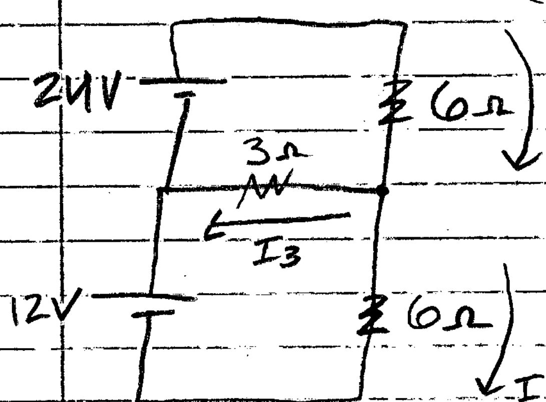
$I_{TOT} = I_{80} + \frac{8}{9} I_{80}$ $\boxed{I_{90} = \frac{8}{9} I_{80}}$

$\boxed{I_{80} = .102\,A}$ → Notice this is the current through the 50 Ω resistor.

Finally,

power $= P = I^2 R = (I_{80})^2 (50\,\Omega) = \boxed{.52 \text{ Watts} = P_{50}}$

$\boxed{25}$ Find all currents: (draw it with series resistors combined).



Junction rule: ① $I_1 = I_2 + I_3$

loop rules:

top loop clockwise:

② $24V - 6 I_1 - 3 I_3 = 0$

bottom loop clockwise

③ $12V + 3 I_3 - 6 I_2 = 0$

Now we have 3 eq. & 3 unk:

$I_1 = I_2 + I_3$ sub into 2nd eq.

$24V - 6(I_2 + I_3) - 3 I_3 = 0 \rightarrow 24V - 6I_2 - 9I_3 = 0$

rewrite eq. 3 → $12V - 6I_2 + 3I_3$ subtract

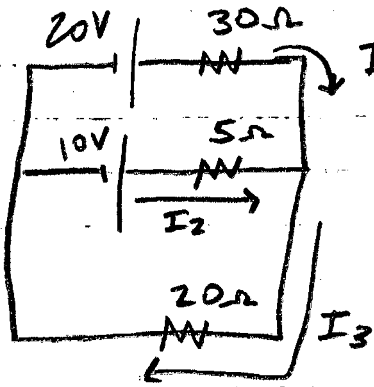
$12V + 0\cancel{I_2} - 12 I_3 = 0$

$I_2 = (12 + 3I_3)/6 = \boxed{2.5A = I_2}$ $\boxed{I_3 = 1A}$

$\boxed{I_1 = 3.5A}$

Med

[27] Find all currents:



① $I_1 + I_2 = I_3$

top loop ② $20V - 30I_1 + 5I_2 - 10V = 0$
bot loop ③ $10V - 5I_2 - 20I_3 = 0$

sub ① into ③ & reduce

$10V - 5I_2 - 20(I_1 + I_2) = 0$

$10V - 20I_1 - 25I_2 = 0$
rewrite ② $(10V - 30I_1 + 5I_2 = 0) \times 5$ & add

$60V - 170I_1 = 0$ $\boxed{I_1 = 6/17\ A}$ (.353A)

$I_2 = (10 - 20I_1)/25 = \boxed{2/17\ A = I_2}$ (.118A)

$I_3 = I_1 + I_2 \rightarrow \boxed{I_3 = 8/17\ A}$ (.471A)

[33] Series RC
$R = 1\,M\Omega$ Find $Q(10s)$ on the capacitors
$C = 5\mu F$
$\mathcal{E} = 30V$ We have $Q(t) = Q_{max}(1 - e^{-t/RC})$

So we find $Q_{max} = C\mathcal{E} = 150\mu C = Q_{max}$
and we find $(1 - e^{-10/RC}) = (1 - e^{-10/5}) = .865$

Thus $Q(10) = (150\mu C)(.865)$ $\boxed{Q(10) = 130\mu C}$

Med

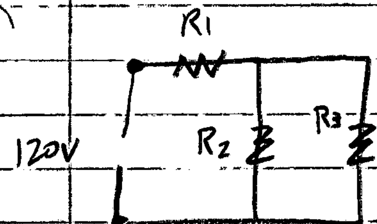
35 Capacitor in RC has $Q = 0.6\, Q_{max}$ at $t = .9s$
Find $RC = \tau$

$Q = Q_{max}\left(1 - e^{-t/RC}\right)$ is the equation to use and solve for RC

$\frac{Q}{Q_{max}} = .6 = 1 - e^{-.9/RC}$

$\ln(1-.6) = -.9/RC \rightarrow RC = \frac{-.9}{\ln(1-.6)} = \boxed{.98s = \tau}$

48 60 W, 120 V $\Big\}$ $P = \Delta V^2/R \rightarrow R = \frac{\Delta V^2}{P} = 240\,\Omega$ per bulb



(a) To get total power we need R_{eq}

$R_{eq} = R_1 + \left(\frac{1}{R_2} + \frac{1}{R_3}\right)^{-1} = 360\,\Omega$

The power dissipated is $P_{TOT} = V^2/R_{eq}$

$P_{TOT} = (120V)^2/360\,\Omega = \boxed{40W}$

(b) ΔV for each bulb?
$\Delta V = IR$ so we need current through R_1; This is I_{TOT}

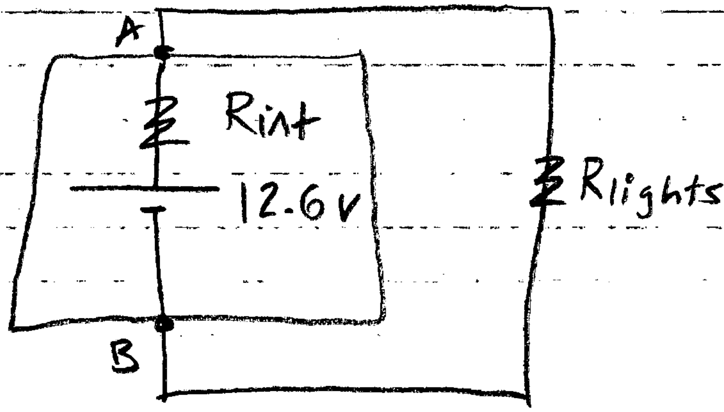
$I_{TOT} = V/R_{eq} = 1/3\,A$; $\Delta V_1 = IR_1 = \boxed{\Delta V_1 = 80V}$

$\Delta V_2 = \Delta V_3$ (b/c parallel) $= 120V - \Delta V_1$ (b/c Kirchoff loop rule)

$\boxed{\Delta V_2 = \Delta V_3 = 40V}$

Med

49



$R_{int} = .08\ \Omega$

$R_{lights} = 5\ \Omega$

(a) Find ΔV_{lights} : $\Delta V_{light} = I R_{light}$ → find I

$I = V/R_{eq} = 12.6V / 5.08\ \Omega = 2.48\ A$

$\boxed{\Delta V_{light} = 12.4\ V}$

(b) Now starter motor draws an additional 35 A from battery.

965 This lowers V_{AB} because the extra current passes Rint.

$\Delta V_{light} = \boxed{12.6\ V - \Delta V_{int} = I_{light} R_{light}}$

$\boxed{\Delta V_{int} = I_{TOT} R_{int} = (35 + I_{light}\ A)(.08\ \Omega)}$

Combine 2 boxed equations by eliminating V_{int}. (add)

$12.6V = I_{light} R_{light} + (35A + I_{light})(.08\ \Omega)$

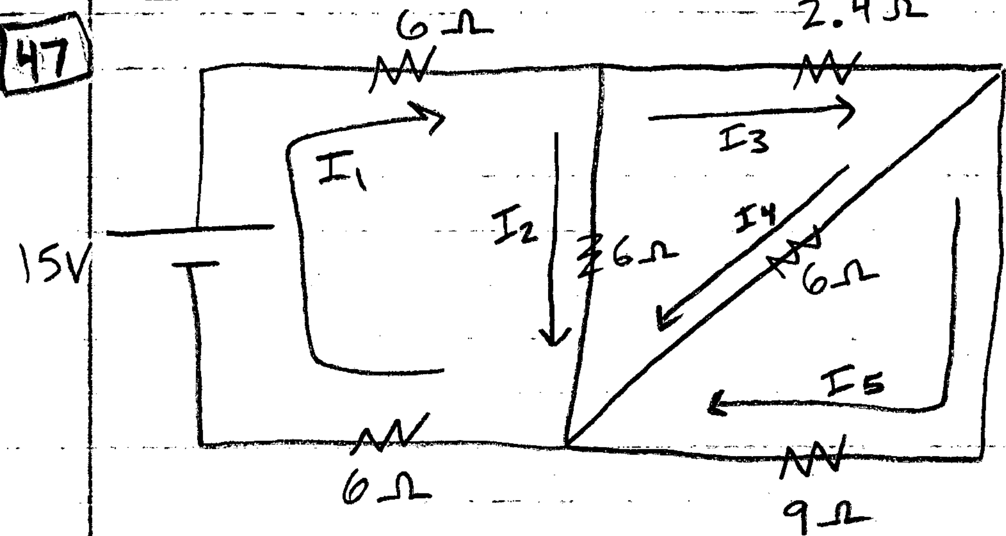
Solve for $I_{light} = \dfrac{12.6V - (35A)(.08\ \Omega)}{5\ \Omega + .08\ \Omega} = 1.93\ A$

$\Delta V_{light} = I_{light} R_{light} = (1.93A)(5\ \Omega)$

$\boxed{\Delta V_{light} = 9.65\ V}$

47

Hard



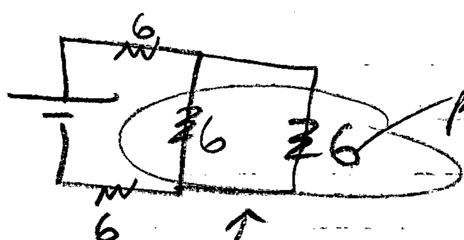
ⓐ Find R_{eq}

Right hand side 6 Ω & 9 Ω are in parallel

$(1/6 + 1/9)^{-1} = 3.6\,\Omega \rightarrow$ This is series w/ 2.4

Right side $R = 2.4 + 3.6 = 6\,\Omega$

Redraw :



parallel $R_{\parallel} = 3\,\Omega$

The rest are in series

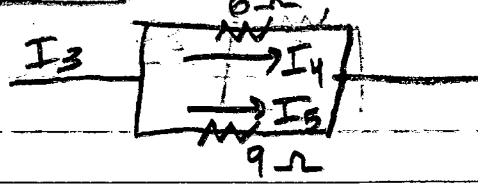
$$\boxed{R_{eq} = 6 + 3 + 6 = 15\,\Omega}$$

ⓑ Find all currents.

$I_1 = I_{TOT} = V/R_{eq} = \boxed{I_1 = 1A}$

splits into I_2 & I_3 evenly b/c the parallel branches have equal resistance.

$\boxed{I_2 = I_3 = .5A}$ I_3 splits into I_4 & I_5 unevenly



$\Delta V_{TOP} = \Delta V_{Bottom}$ (parallel)

$6I_4 = 9I_5$

Hard

47-cont $\quad .5 = I_4 + I_5 \qquad I_4 = \frac{3}{2} I_5$

$$.5 = \left(1 + 3/2\right) I_5 \qquad \boxed{I_5 = .2A}$$

$$I_4 = .5 - .2 \rightarrow \boxed{I_4 = .3A}$$

(c) ΔV on each resistor

$\Delta V = IR$ for each one

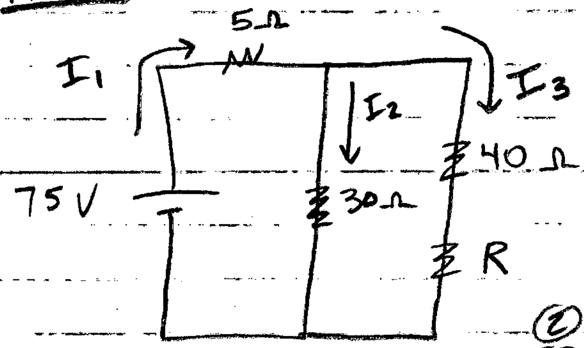
	ΔV	Power out
top left :	$\Delta V = (1A)\,6\Omega = 6V$	6W
bot left :	$\Delta V = (1A)\,6\Omega = 6V$	6W
center mid :	$\Delta V = (.5A)\,6\Omega = 3V$	1.5W
top right :	$\Delta V = (.5A)(2.4\Omega) = 1.2V$	.6W
center right	$\Delta V = (.3A)(6\Omega) = 1.8V$	.54W
bot right	$\Delta V = (.2A)(9\Omega) = 1.8V$	.36W

(d) power dissipated in each resistor $= I^2R$

→ see above right for answers.

Hard

5.6



Find R

Given
$P_R = 20W = I_3^2 R = I_3 V_R$

① $I_1 = I_2 + I_3$

② right loop: $30 I_2 = (40+R) I_3$

③ left loop: $75v - 5I_1 - 30 I_2 = 0$

sub ① into ③ : $75V - 35 I_2 - 5 I_3 = 0$

solve ② & the new eq ⟶ for I_2

② $\frac{(40+R) I_3}{30} = I_2$ New $\frac{75V - 5I_3}{35} = I_2$ ⟹ Next page

---

set equal to each other & sub $I_3 = \sqrt{\frac{20}{R}}$ (from top given)

$$\frac{(40+R)}{30}\sqrt{\frac{20}{R}} = \frac{\overset{15}{\cancel{75}} - \overset{1}{\cancel{5}}\sqrt{20/R}}{\underset{7}{\cancel{35}}} \longrightarrow \text{solve for } R$$

This is a tough equation, but since you have a square root, you should try values for R that give a whole number for $\sqrt{20/R}$ term. Possible values for this would be $R = 5, 20, 80$

Work out each side for these values & you find $R = 20\,\Omega$ is the solution.

$$\frac{(40+20)}{30}\sqrt{\frac{20}{20}} = 2 = \frac{15 - 1\sqrt{20/20}}{7} = 2$$

$\boxed{\text{Thus } R = 20\,\Omega}$ → see next page for better solution!!

61 Same as #9.

Hard

56 - cont.

We can set the two equations for I_2 equal to each other and we get

$$\frac{40 I_3 + R I_3}{30} = \frac{\cancel{75}^{15} V - \cancel{5}^{1} I_3}{\cancel{35}_{7}}$$

reduce it and using $P = I_3^2 R = 20$ we can plug $\boxed{I_3 R = \frac{20}{I_3}}$

$$7(40 I_3 + 20/I_3) = 30(15V - I_3)$$

Now multiply by I_3 & combine terms

$$280 I_3^2 + 140 - 450 I_3 + 30 I_3^2 = 0$$

$$310 I_3^2 - 450 I_3 + 140 = 0$$ apply quadratic formula

$$I_3 = 1A \text{ or } 0.452 A$$

Back to $P = I_3^2 R = 20W$ we have $R = \frac{20W}{I_3^2}$

$$R = \frac{20W}{(1A)^2} = 20\,\Omega$$

2 possible values

OR $$R = \frac{20W}{(.452A)^2} = 98\,\Omega$$

Prob 61 This is the same as prob #9.