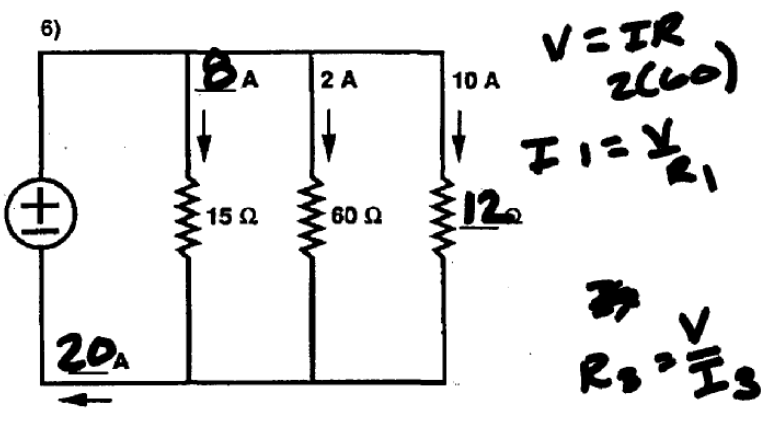
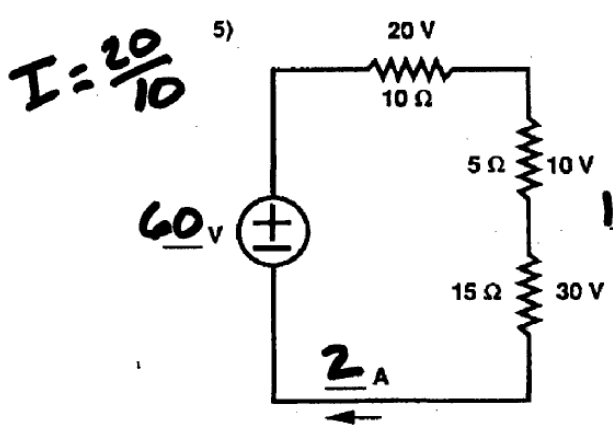
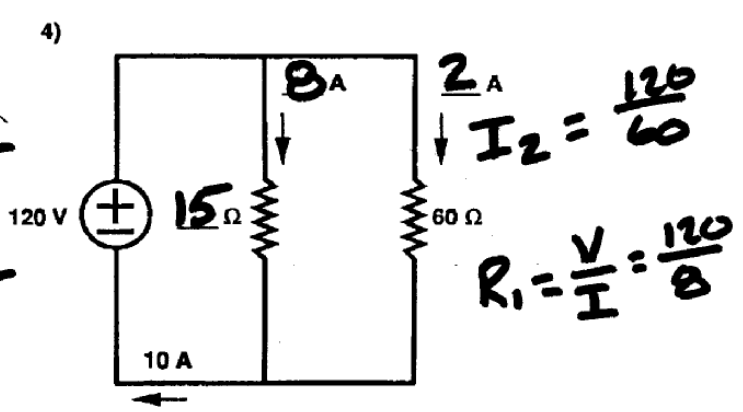
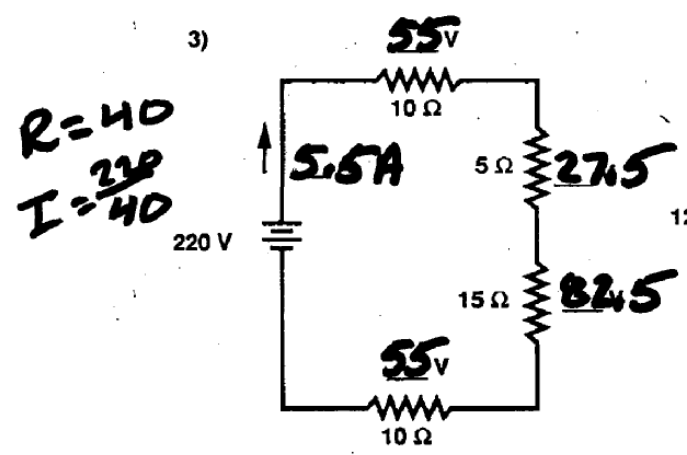
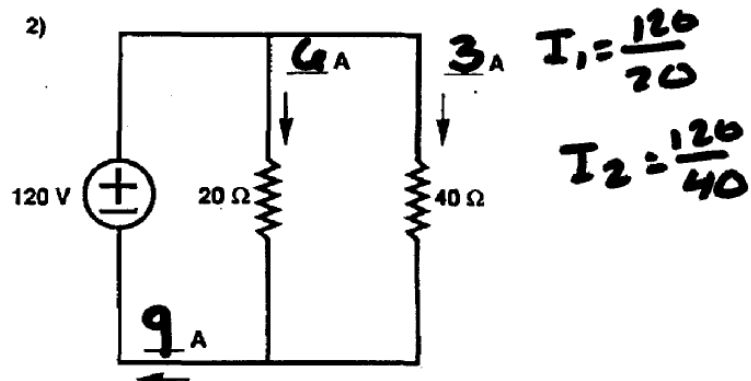
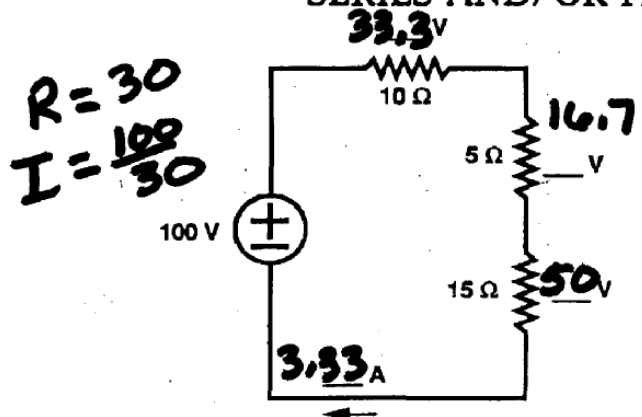


SERIES AND/OR PARALLEL CIRCUITS



7. Household wires can only carry a maximum current of 15A from a 120V line. What is the most power someone can use before blowing a fuse in their home?

$P = I V$ $P = 15(120)$
 $I = 15 A$ $P = 1800 W$
 $V = 120 V$

8. Before going to work each morning, Gene runs his 18Ω toaster, his 11Ω electric frying pan and 14Ω electric coffee maker, all at the same time. The three are connected in parallel across a 120V line.
- a. What is the current through each appliance?

$$I = \frac{V}{R} \quad \text{TOASTER} \quad I = \frac{120}{18} = 6.67 \text{ Amps}$$

$$\text{frying Pan} \quad I = \frac{120}{11} = 10.91 \text{ Amps}$$

$$\text{Coffee Pot} \quad I = \frac{120}{14} = 8.57 \text{ Amps}$$

- b. If a household circuit could carry a maximum current of 15A, would Gene be able to run all of these appliances at the same time?

No The total demand is 26.1 A

$$I_{\text{TOTAL}} = 6.67 + 10.91 + 8.57 = 26.1 \text{ A}$$

9. Timmy is playing with a new electronics kit he has received for his birthday. He takes out four resistors with resistances of 15Ω , 20Ω , 20Ω and 30Ω .

- a. How would Timmy have to wire the resistors so that he would allow the maximum current to be drawn? Calculate the total resistance and current in this circuit.

The maximum current is when they are WIRED in Parallel

$$\frac{1}{R} = \frac{1}{15} + \frac{1}{20} + \frac{1}{20} + \frac{1}{30} = 0.20$$

$$R = \frac{1}{0.20} = 5.0 \Omega$$

$$I = \frac{V}{R} = \frac{120}{5} = 24.0 \text{ Amps}$$

- b. How must he wire the resistors so that they draw a minimum amount of current? Calculate the total resistance and current in this circuit.

THE MINIMUM current is when RESISTANCE IS Largest (Series)

$$R = 15 + 20 + 20 + 30 = 85 \Omega$$

$$I = \frac{V}{R} = \frac{120}{85} = 1.41 \text{ Amps}$$

10. Old fashioned holiday lights were connected in series across a 120V household line.

- a. If a string of these lights consists of 12 bulbs, what is the potential difference across each bulb?

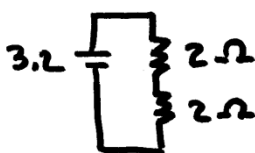
$$\Delta V = \frac{120 \text{ V}}{12} = 10 \text{ Volts EACH}$$

- b. If the bulbs were connected in parallel, what would be the potential difference across each bulb?

In Parallel ΔV is the same
for EACH Bulb = 120 Volts

11. Horace has invented a unique pair of reading glasses that have two small light bulbs at the bottom wired in series, so that he can see the newspaper when he is reading at night. Each of the bulbs has a resistance of 2.00Ω , and the system runs off a 3.20V battery.

- a. How much current is drawn by Horace's reading glasses?



$$R = 2 + 2 = 4 \Omega$$

$$I = V/R = 3.2/4 = 0.80 \text{ Amps}$$

- b. The light bulbs are rated for 5h of use before they burn out. If the battery can supply 5184J to the circuit, which occurs first, energy depletion in the battery or failure of a bulb?

Power for 2 Bulbs = 2 IV

$$P = 2(.8)(3.2) = 5.12 \text{ W} = 5.12 \text{ J/s}$$

Total Energy used for the life of

The Bulb = $P \times \text{time}$

$$E = (5.12)(5)(3600) = 92,160 \text{ J} > 5184 \text{ J}$$