WORKSHEET 8A Q4 WORKED EXAMPLE

Work Sheet 8 A.
Series and Parallel problems - Words.

For each problem DRAW the circuit, put the information from the question onto the drawing and then solve using
- guess who's law.

1. Three resistors are connected in parallel and then this combination is connected in series with a 10 Ohm resistor. When 500 Volts is applied to the circuit, 25 Amps flows in the 10 Ohm series resistor. If 2 of the parallel resistors are 28 Ohms each then what is the value of the unknown resistor, and what is the current through it and the voltage drop across it ?

2. A heating element is in two sections, each of 45 Ohms. Find the current drawn from the supply (230V) when the sections are connected in a) series and b) parallel ?

3. Two cables having resistances of 0.5 Ohms and 0.8 Ohms carry between them a current of 30 Amps. What is the current in each cable and the Voltage Drop that occurs when the current is flowing ?

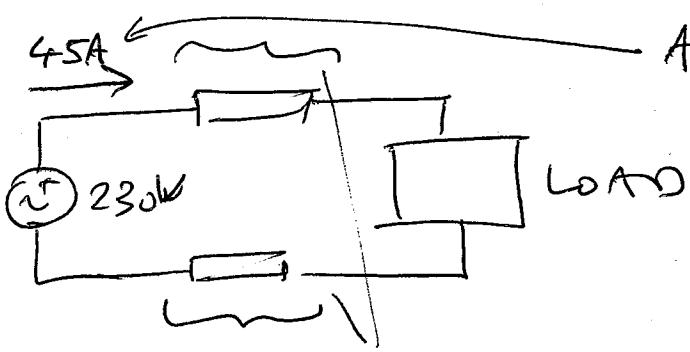
4. A cable carries a current of 45 Amps and when that happens a voltage drop of 21 Volts occurs. What would be the resistance value of a cable connected in parallel with the first to reduce the voltage drop to 5% of 230 Volts.

5. The specification for a wire to be used in a wire wound resistor says that its resistance is 0.6 Ohms per meter. How many meters would be required to give :
a) A resistance of 3.7 Ohms, and
b) 0.2 Ohms, given that the wire must be at least a meter long to reach from one end of the resistor to the other ?

6. A circuit consists of three resistors initially connected in series and then in parallel. What in general terms occurs to the following, given the changes listed.

	Series	Parallel
Supply current: if Voltage is doubled ?		
Total resistance: if one resistor is removed ?		
Supply voltage : if the current has halved ?		
Total current: if an extra resistor is added ?		
Voltage drop across each resistor: if an extra resistor is added ?		

Current situation:



Assume that load current is not affected by volt drop.

Total cable resistance (R_c) causes 21 volts drop at 45A.

We need to reduce this volt drop to 5%.

The target volt drop: $5\% \cdot 230 = 11.5V$

current volt drop: $= 21V$

Current cable resistance: $\frac{21}{45} = 0.4667\,\Omega$

Target cable resistance: $\frac{11.5}{45} = 0.2556\,\Omega$

We need to find a resistance to place in parallel with $0.4667\,\Omega$ to make it look like $0.2556\,\Omega$.

Use parallel resistance formula:

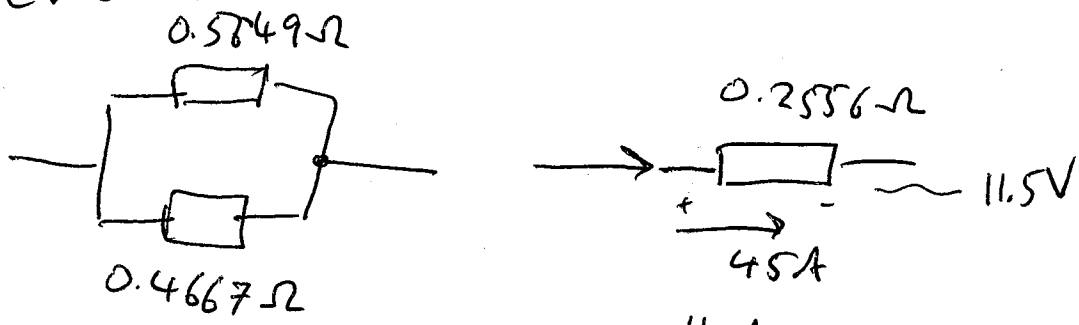
$$\frac{1}{0.2556} = \frac{1}{0.4667} + \frac{1}{R_c}$$

$$3.913 = 2.143 + \frac{1}{R_c}$$

$$\frac{1}{R_c} = 1.770$$

$$\boxed{R_c = 0.5649\ \Omega}$$

Cross-check.



volt drop:

$0.2556 \cdot 45 = 11.5V$

which is 5% of 230V.

The parallel cable must have a resistance of $0.5649\ \Omega$ or below.