- In a linear system, with several causes acting to give a combined effect, the nett effect is determined by adding the individual effects.

- In electronic circuits, the individual effect of a voltage or current source is determined by removing all of the other voltage and current sources and

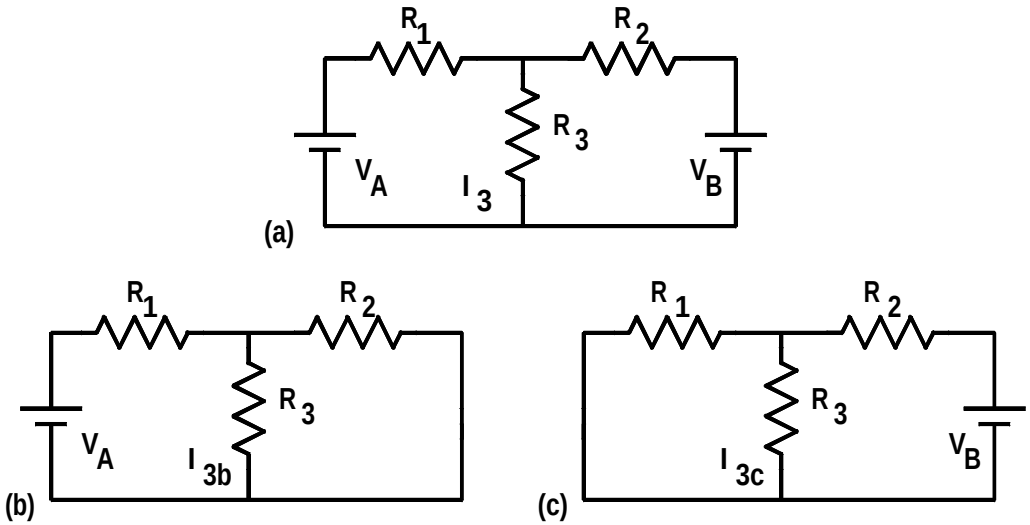
- replacing the voltage sources by short circuits and

- replacing the current sources by open circuits.

The use of the principle of superposition can lead to major simplifications in the analysis of electronic circuits

The same results would be obtained by using Kirchoff's Laws but with loss of clarity.

But there are limits to linearity.



$$I_3 = I_{3b} + I_{3c}$$

Split the x circuit before applying principle of superposition

Current in R_3 is required

Redraw the circuit twice with only one voltage source remaining in each version

The gaps where the voltage sources were located are shorted out

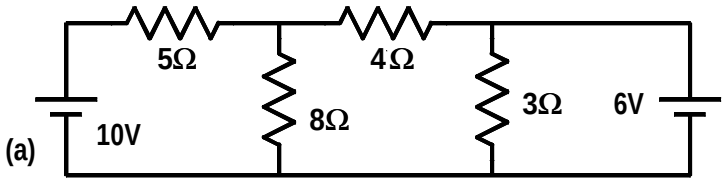
The current in R_3 due to each of the voltage sources is calculated

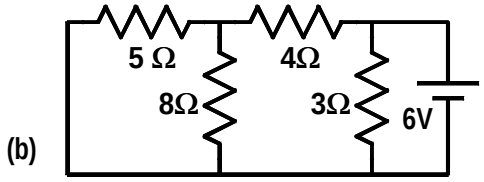
The current which flows when both of the voltage sources are present is the algebraic sum of the currents which flow when each of the voltage sources is present.

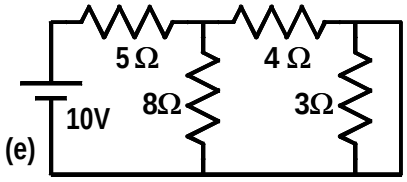
In using the Principle of Superposition draw the modified circuit at each stage.

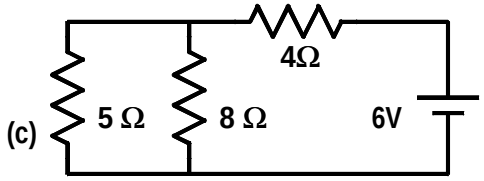
Indicate the defined direction of current flow on the diagram.

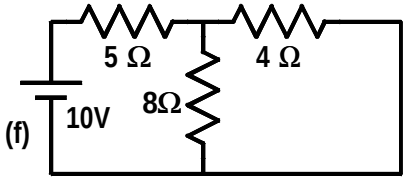
There is no problem if the initial assignment of the current direction is incorrect as all the will happen is that the sign of the flow will be reversed.

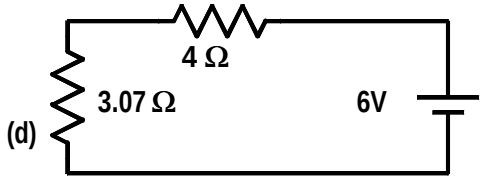


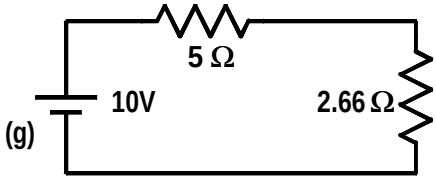












Calculate the current in the 8Ω resistor

There are two voltage sources present so there are two sets of calculations to be carried out.

The voltage across the 8Ω due to the 6V source is:—

$$V_{6,8} = \frac{3.07}{3.07 + 4} \times 6\ V = 2.60\ V$$

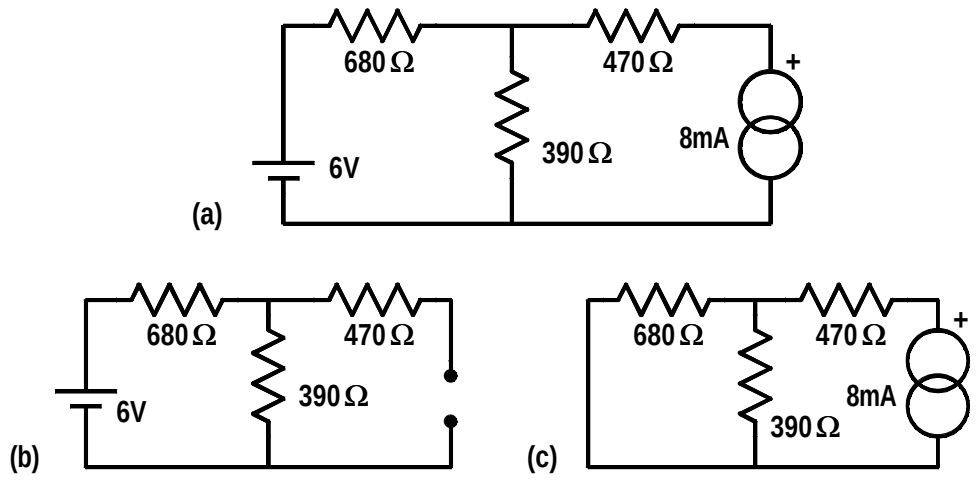
This gives the current in the 8Ω resistor due to the 6V source as:—

$$I_{6,8} = \frac{2.60}{8} = 0.325\ A$$

The current in the 8Ω due to the 10V source is then:—

$$I_{10,8} = \frac{3.47}{8} = 0.434\ A$$

The total current in the 8Ω is therefore 0.325+ 0.434 = 0.759 A.



Calculate the current in the 390Ω resistor

Redraw the circuit to eliminate the current source as shown in (b).The current source is replaced by an open circuit.

Redraw the circuit to eliminate the voltage source as shown in (c). The voltage source is replaced by a short circuit. The total current is $5.61 + 5.10 = 10.71mA$.