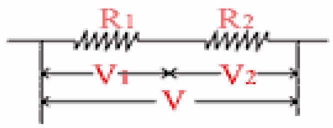
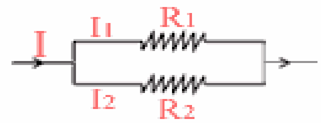
Series and parallel connection of a group of resistors

منتدي روضة العلوم الطبيعية

Grouping of resistors

I- In series	II- In parallel
	
(1) I constant	V constant
(2) V divides: $\frac{V_1}{V_2} = \frac{R_1}{R_2}$	I divides: $\frac{I_1}{I_2} = \frac{R_1}{R_2}$
(3) Total R (R_{eq}) The prove: - $V_T = V_1 + V_2 + ...$	$I_T = I_1 + I_2 + ...$ $\frac{V}{R_{eq}} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$

NOTCS:-

1- in case of two resistors in parallel

$$\frac{1}{R} . \frac{1}{R_1} \quad \frac{1}{R_2} \quad ---> \quad \therefore \frac{1}{R_{eq}} = \frac{R_2 + R_1}{R_1 x R_2}$$

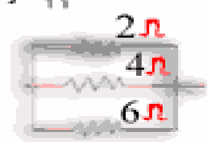
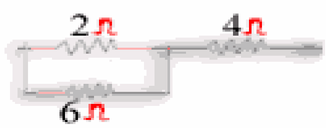
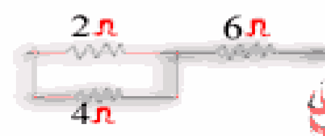
$$R_{eq} = \frac{R_1 x R_2}{R_1 + R_2} \longrightarrow \frac{product}{sum}$$

2- Distribution of in two branches in parallel

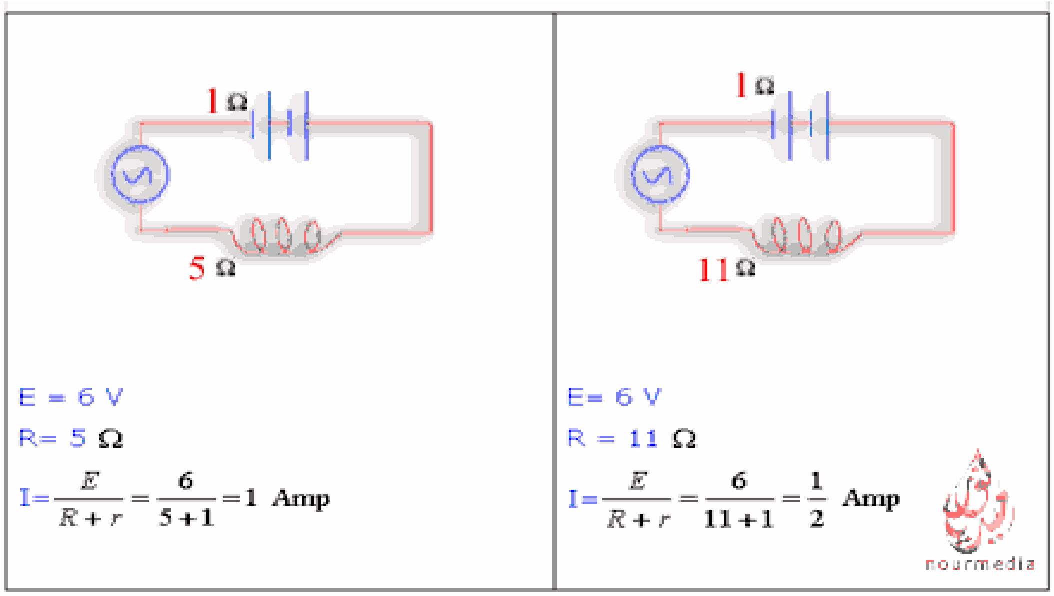
$$\therefore V_1 = V_2 \qquad \therefore I_1R_1 = I_2R_2$$

$$\frac{I_1}{I_2} = \frac{R_2}{R_1} \qquad \therefore \frac{I_1}{(I_1 + I_2)} \qquad \frac{R_2}{(R_1 + R_2)}$$

$$\therefore I_1 = I_{total}\frac{R_2}{R_1 + R_2}$$

(3)Examples: find the R_{eq} R_{eq} = 2+4+6= 12  	of the following groups: $\frac{1}{R} = \frac{1}{2} + \frac{1}{4} + \frac{1}{6} = \frac{6+3+2}{12} = \frac{11}{12}$ $\therefore R_{eq} = \frac{12}{11}\Omega$ 
$\frac{1}{R_{eq}} = \frac{1}{2} + \frac{1}{6} = \frac{4}{6}$ $\therefore R = 1\frac{1}{2}$ $\therefore R_{eq} = 4 + 1\frac{1}{2} = 5\frac{1}{2}\Omega$  	$\frac{1}{R_{eq}} = \frac{1}{2} + \frac{1}{4} = \frac{3}{4}$ $\therefore R = 1\frac{1}{3}$ $\therefore R_{eq} = 1\frac{1}{3} + 6 = 7\frac{1}{3}\Omega$  nourmedia

The relation between external resistance and terminal voltage



When the resistance increases, the current decreases.

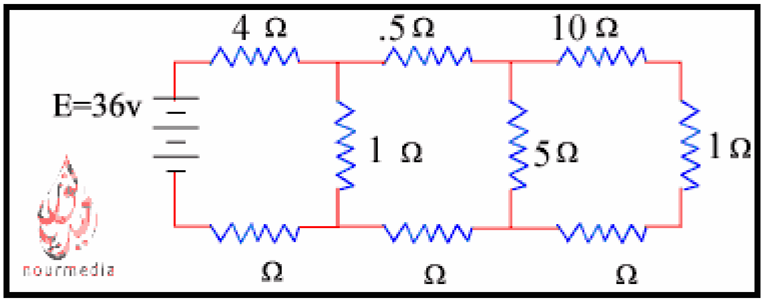
$V_R = IR$	$V = IR$
$1 \times 5 = 5$ volt	$V = ½ \times 11 = 5.5$ VOLT

When the resistance increases the terminal voltage increases but there is no direct prop. Between them because there is no prop .Constant.

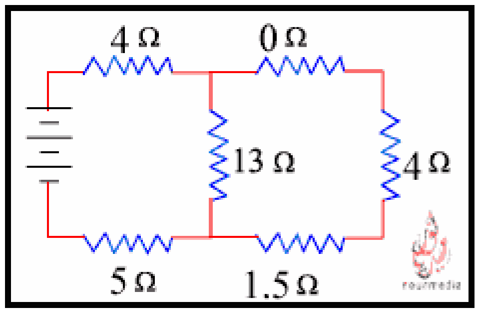
$V_r = IR$	$V = IR$
$= 1 \times 1 = 1$ volt	$V = ½ \times 1 = 0.5$ volt

*Internal voltage decreases when R increases

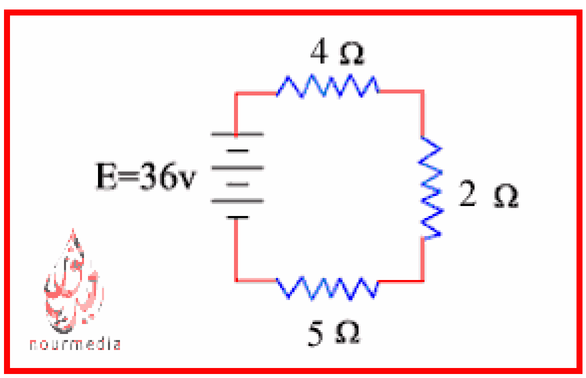
FIND I_b



$$R_{eq} = \frac{20x5}{25} = 4\Omega$$



$$R_{eq} = \frac{6x3}{9} = 2\Omega$$



$$R_{total} = 11\Omega$$

$$I_b = \frac{E}{R+r} = \frac{36}{11+1} = 3Amp$$

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