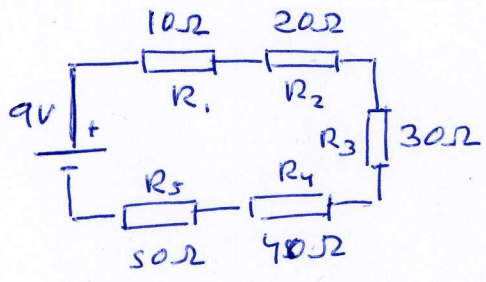


Associations of resistors and power sources. (pg 129) ①

28 a)

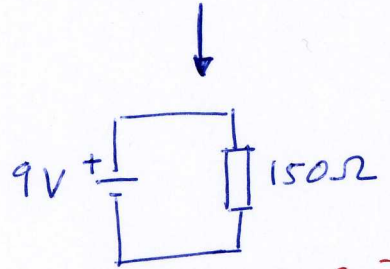


Series connection

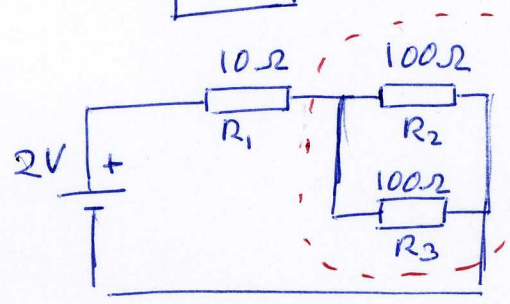
$$R_{eq} = R_1 + R_2 + R_3 + R_4 + R_5$$

$$R_{eq} = 10 + 20 + 30 + 40 + 50$$

$$R_{eq} = 150 \Omega$$



b)

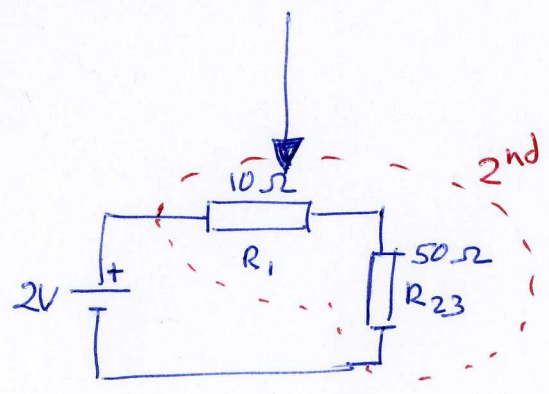


Series-parallel combination

1st we simplify the parallel connection

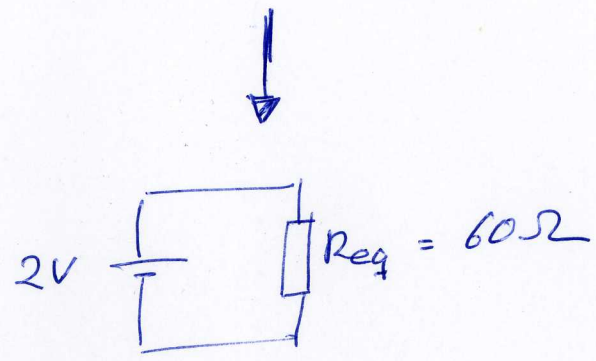
$$\frac{1}{R_{23}} = \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{100} + \frac{1}{100} = \frac{2}{100}$$

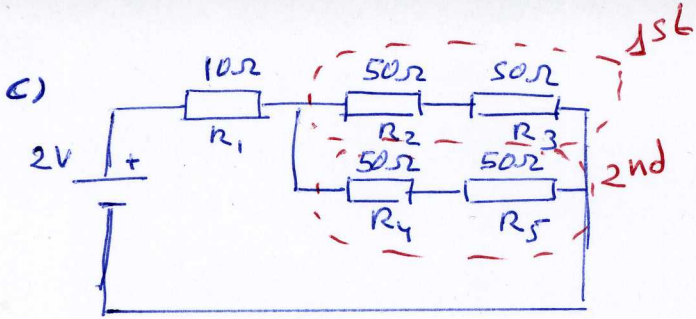
$$\Rightarrow \frac{R_{23}}{1} = \frac{100}{2} \rightarrow R_{23} = 50 \Omega$$



2nd this is a series connection

$$R_{eq} = R_1 + R_{23} = 10 + 50 = 60 \Omega$$





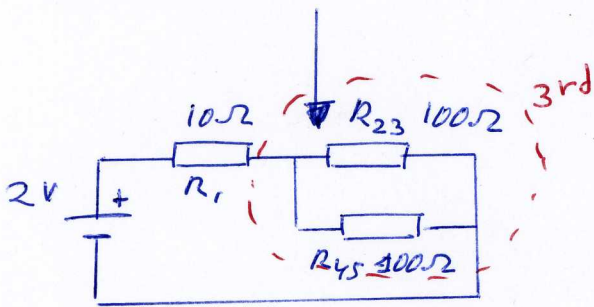
Series-parallel combination

1st series connection

$$R_{23} = R_2 + R_3 = 50 + 50 = 100\Omega$$

2nd It's exactly the same as 1st

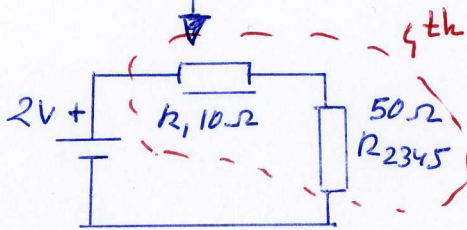
$$R_{45} = R_{23} = 100\Omega$$



3rd Parallel connection

$$\frac{1}{R_{2345}} = \frac{1}{R_{23}} + \frac{1}{R_{45}} = \frac{1}{100} + \frac{1}{100} = \frac{2}{100}$$

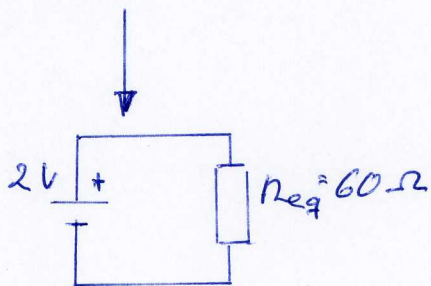
$$\Rightarrow \frac{R_{2345}}{1} = \frac{100}{2} = 50\Omega$$



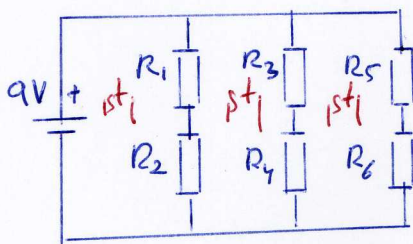
4th Series connection

$$R_{eq} = R_1 + R_{2345} = 10 + 50$$

$$R_{eq} = 60\Omega$$



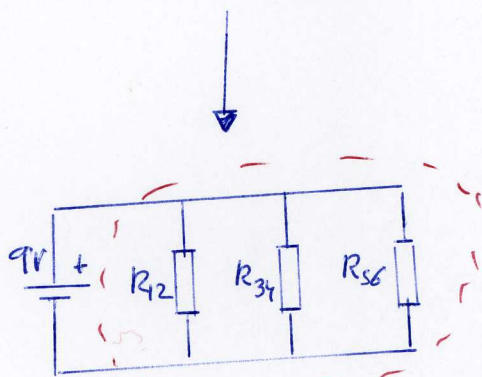
d)



• All six resistors are just the same  $R = 10k$

•  $R_{12}$   $R_{34}$   $R_{56}$  are equal series connections

$$R_{12} = R_{34} = R_{56} = 10k + 10k = 20k\Omega$$

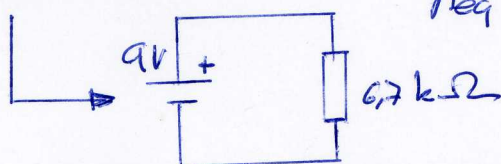


Parallel connection

$$\frac{1}{R_{eq}} = \frac{1}{R_{12}} + \frac{1}{R_{34}} + \frac{1}{R_{56}} = \frac{1}{20} + \frac{1}{20} + \frac{1}{20}$$

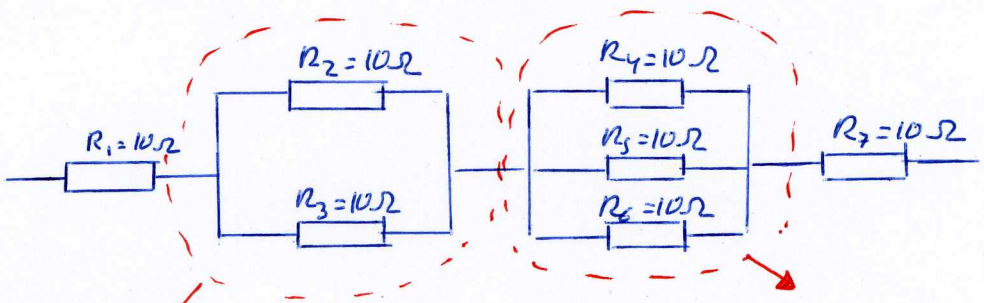
$$\frac{1}{R_{eq}} = \frac{3}{20} \Rightarrow$$

$$R_{eq} = \frac{20}{3} = 6.7k\Omega$$





e)



$R_2, R_3$  series connection

$$R_{23} = R_2 + R_3$$

$$R_{23} = 10 + 10 = \underline{20\Omega}$$

$R_4, R_5, R_6$  parallel connection

$$\frac{1}{R_{456}} = \frac{1}{R_4} + \frac{1}{R_5} + \frac{1}{R_6}$$

$$\frac{1}{R_{456}} = \frac{1}{10} + \frac{1}{10} + \frac{1}{10} = \frac{3}{10}$$

inversion

$$\frac{R_{456}}{1} = \frac{10}{3} = \underline{3,3\Omega}$$



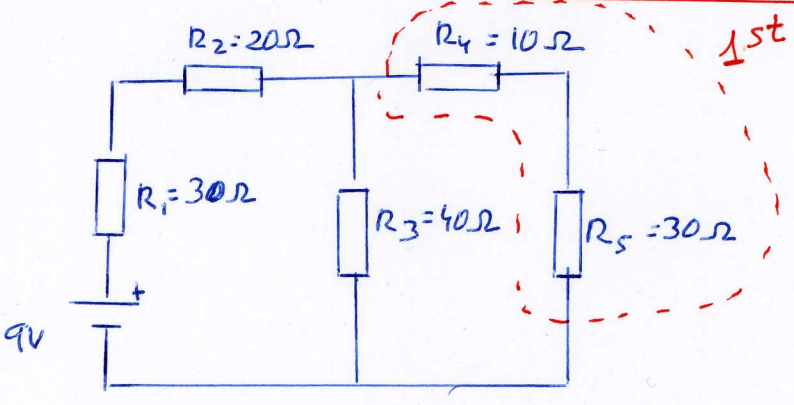
Series connection

$$R_{eq} = R_1 + R_{23} + R_{456} + R_7$$

$$R_{eq} = 10 + 20 + 3,3 + 10$$

$$R_{eq} = \underline{43,3\Omega}$$

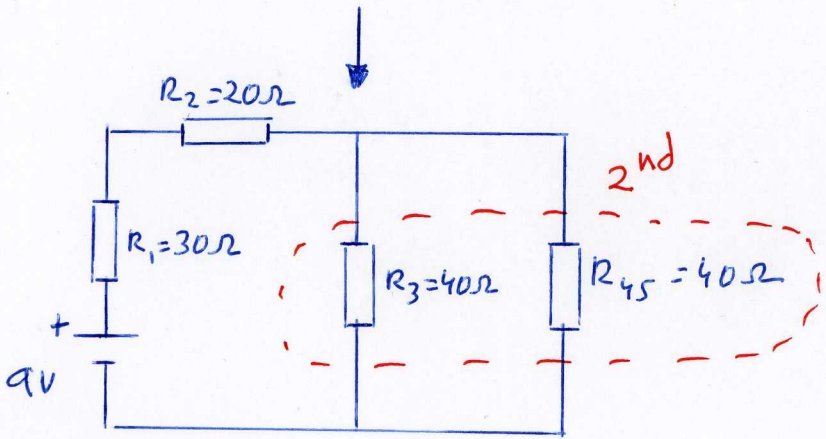
f)



1<sup>st</sup>: Series connection

$$R_{45} = R_4 + R_5$$

$$R_{45} = 10 + 30 = \underline{40\Omega}$$



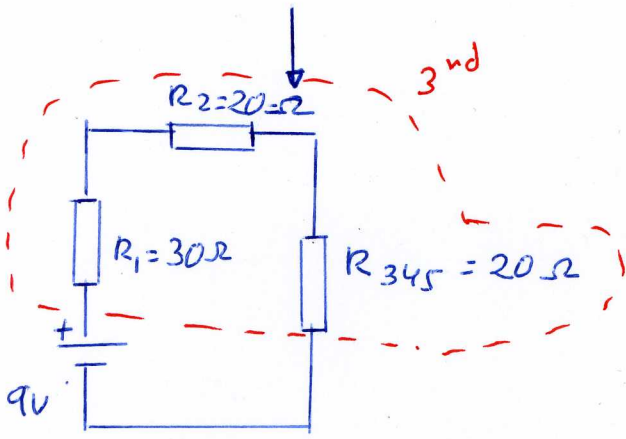
2<sup>nd</sup>: Parallel connection

$$\frac{1}{R_{345}} = \frac{1}{R_3} + \frac{1}{R_{45}}$$

$$\frac{1}{R_{345}} = \frac{1}{40} + \frac{1}{40} = \frac{2}{40}$$

inversion

$$\frac{R_{345}}{1} = \frac{40}{2} = \underline{20\Omega}$$



3<sup>rd</sup> Series connection

$$R_{eq} = R_1 + R_2 + R_{345}$$

$$R_{eq} = 30 + 20 + 20$$

$$R_{eq} = 70\Omega$$

