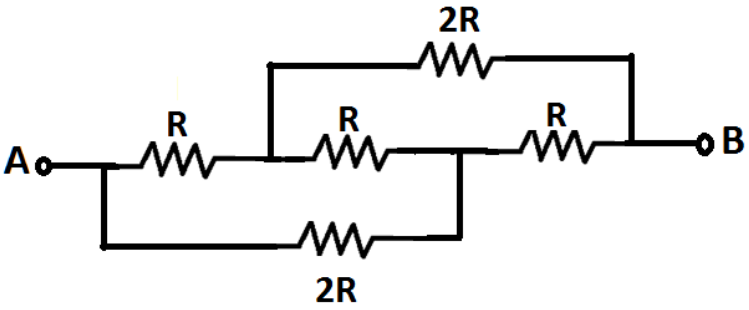
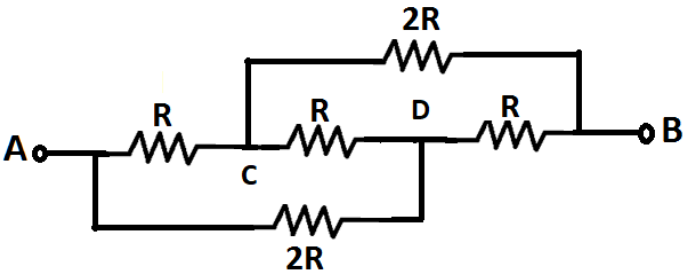
NOTES – CLASS 8

Numerical Examples on Star Delta Transformations:

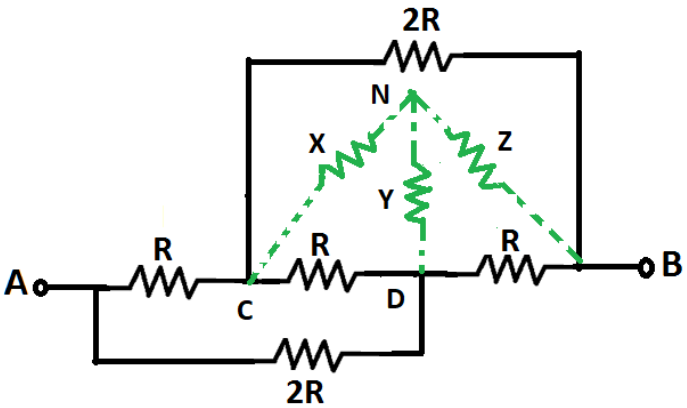
Numerical Example 1:
Find the equivalent resistance between the terminals A & B in the given network.



Solution:



Transform Delta existing between the terminals C-D-B into its equivalent star



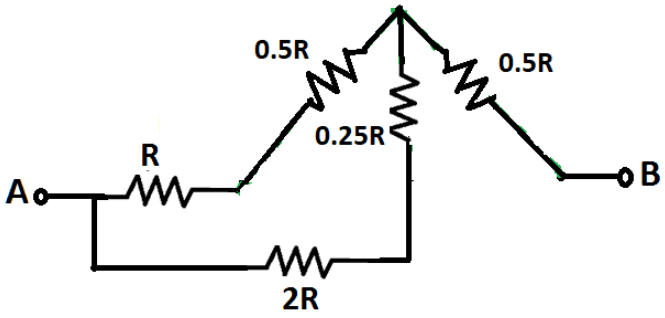
The equivalent star resistors can be obtained as

$$X = \frac{R*2R}{(R+2R+R)} = \frac{R}{2}\,\Omega$$

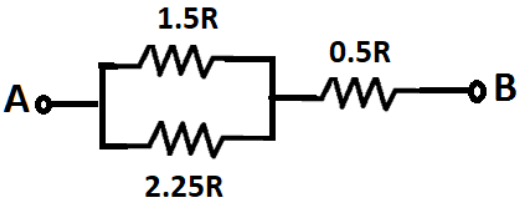
$$Y = \frac{R*R}{(R+2R+R)} = \frac{R}{4}\,\Omega$$

$$Z = \frac{R*2R}{(R+2R+R)} = \frac{R}{2}\,\Omega$$

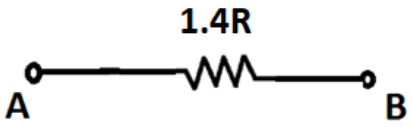
Hence, the network reduces as follows:



Now, combine (R & 0.5R) in series and (2R & 0.25R) in series. It gives

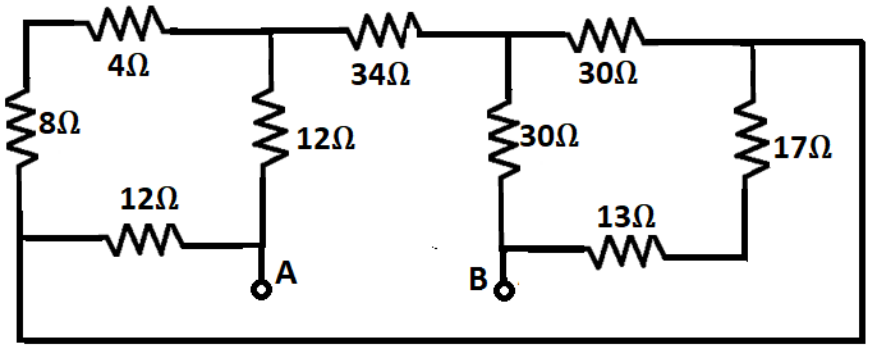


Now, combine (1.5R & 2.25R) in parallel & then, combine its equivalent in series with 0.5R.

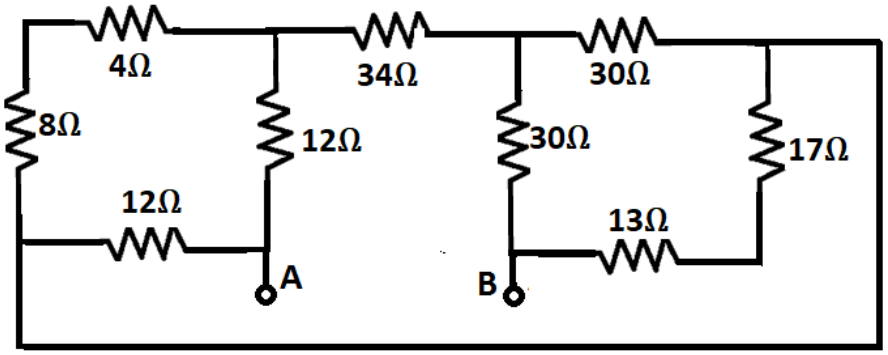


Hence, the equivalent resistance is 1.4R

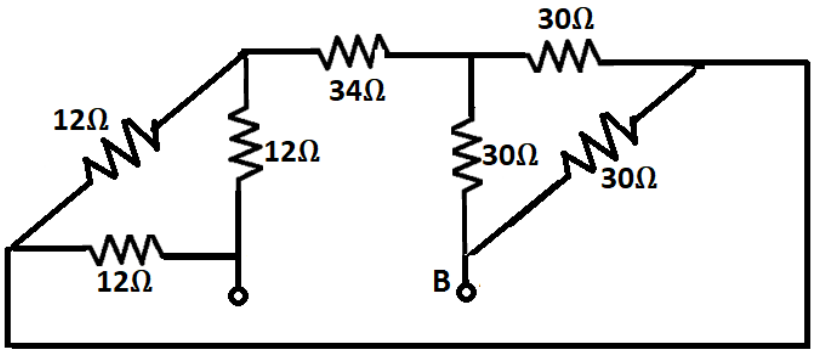
Numerical Example 2:
Find the equivalent resistance between the terminals A & B in the network shown.



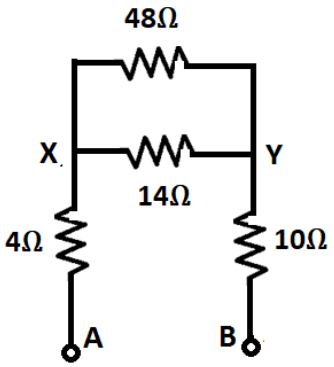
Solution:



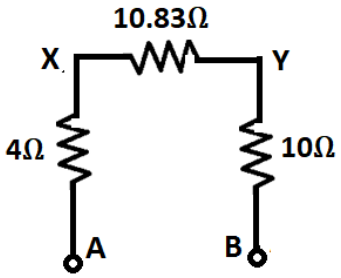
Combining (8Ω & 4Ω) in series and also (13Ω & 17Ω) in series,



Now, transform 12Ω - 12Ω - 12Ω delta into its equivalent star and also 30Ω - 30Ω - 30Ω delta into its equivalent star,



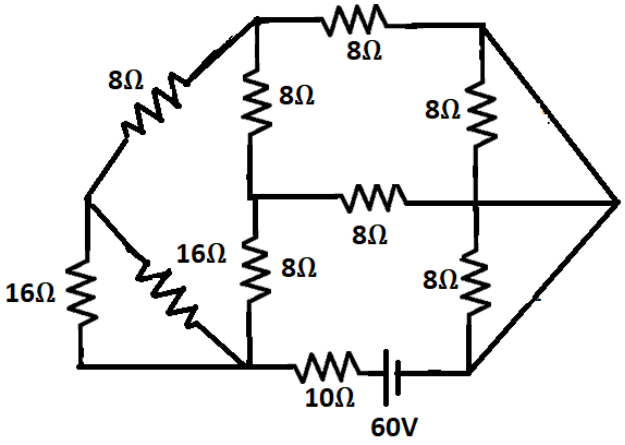
Now, combine 48Ω and 14Ω in parallel



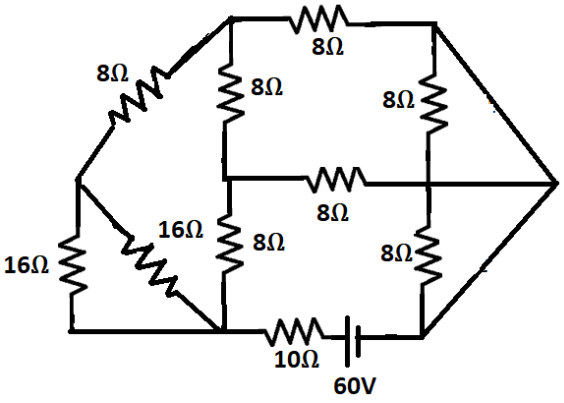
Now, combine all of them in series, which gives R_{AB} = 24.83Ω

Numerical Example 5:

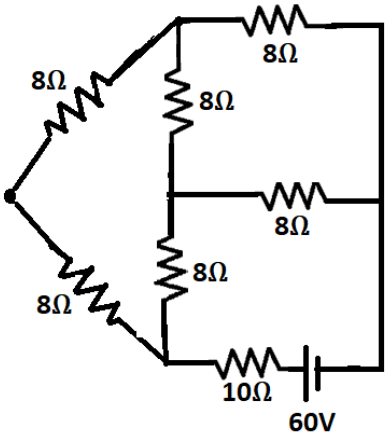
Find the voltage drop across 10Ω resistor in the network shown.



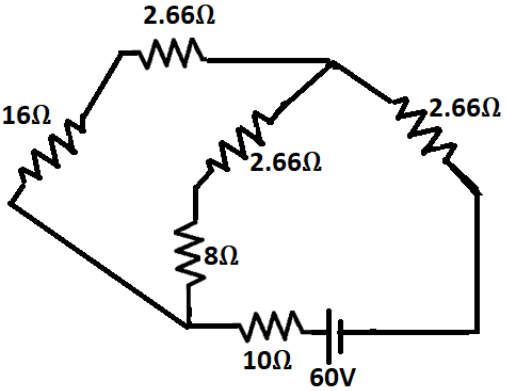
Solution:



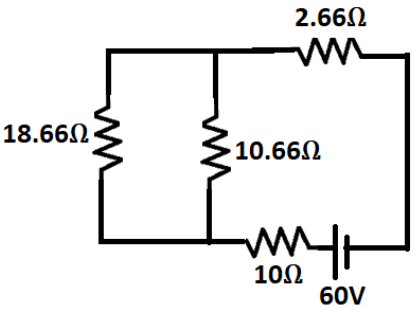
Combine 16Ω & 16Ω in parallel



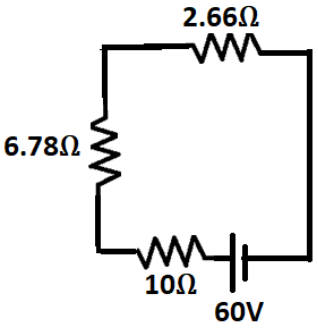
Combine left extreme 8Ω & 8Ω in series. Also, transform top delta (8Ω - 8Ω - 8Ω) into equivalent star



Now, 16Ω and 2.66Ω are in series. Also, 8Ω and 2.66Ω are in series.



Now combine 18.66Ω and 10.66Ω in parallel.



Now, remaining resistors are in series, which gives R_{eq} = 19.44Ω

Current delivered by 60V source, $I_S = \frac{60}{R_{eq}} = \frac{60}{19.44}$ = 3.086A

Voltage drop across 10Ω resistor = I_S*10 = 30.86V