Unit 1: DC Circuits

TUTORIAL : Week 3

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Recap: POLL

Nodal Analysis is applicable to_____ network.

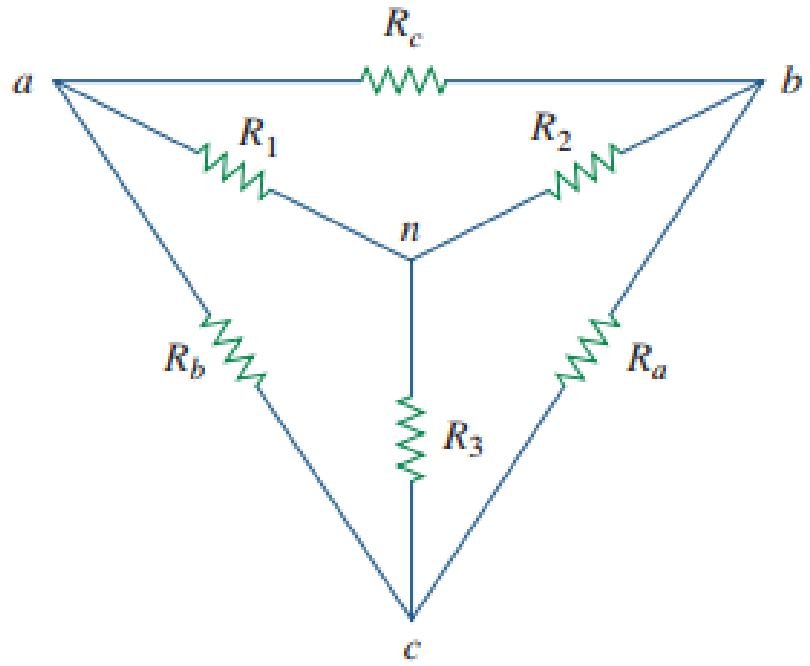
A. Planar only
B. Non Planar
C. Both planar and non planar
D. Only meshes

Delta to Star Conversion

$$R_1 = \frac{R_b R_c}{R_a + R_b + R_c}$$

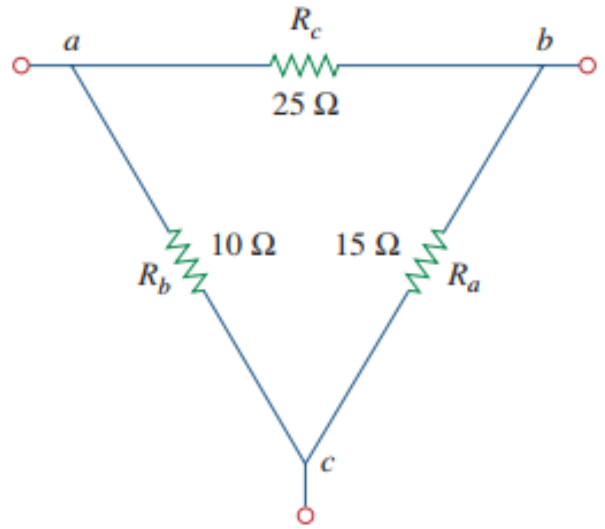
$$R_2 = \frac{R_c R_a}{R_a + R_b + R_c}$$

$$R_3 = \frac{R_a R_b}{R_a + R_b + R_c}$$



Problem 1

Q: Convert Δ network into a Y network?



POLL

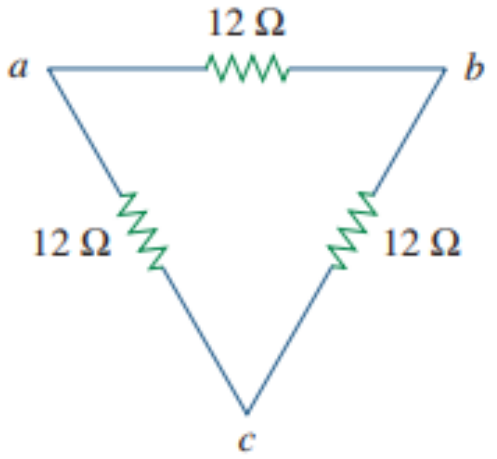
While converting Δ network into a Y , the equivalent values of the resistor would be?

A. 12

B. 4

C. 36

D. 40

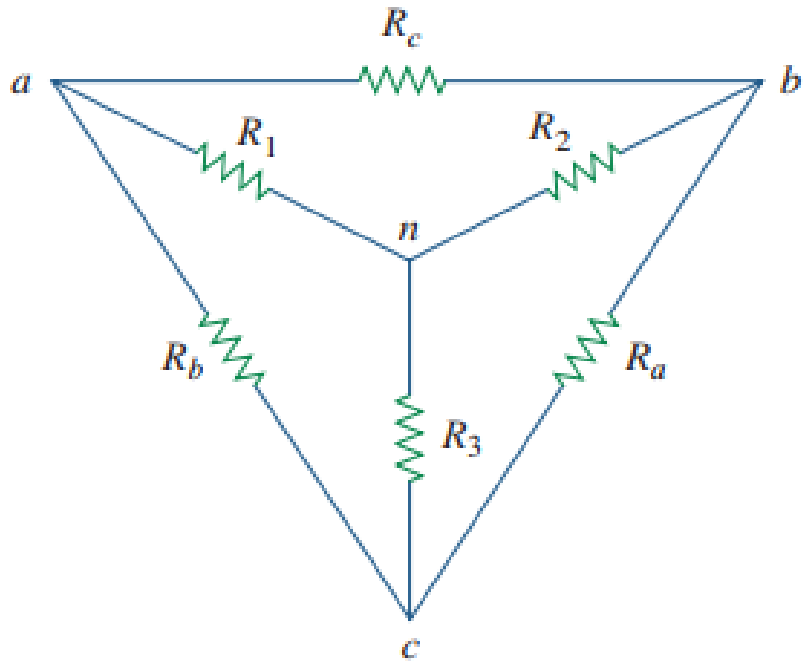


Star to Delta Conversion

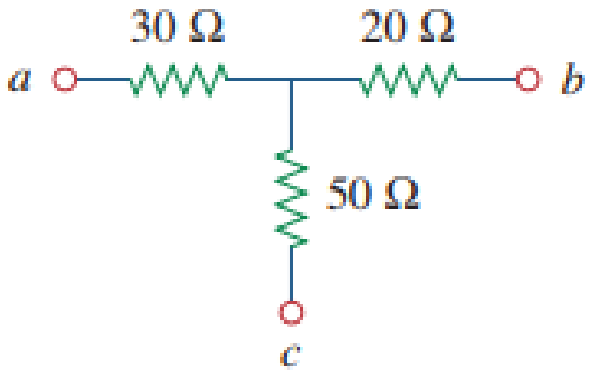
$$R_a = \frac{R_1R_2 + R_2R_3 + R_3R_1}{R_1}$$

$$R_b = \frac{R_1R_2 + R_2R_3 + R_3R_1}{R_2}$$

$$R_c = \frac{R_1R_2 + R_2R_3 + R_3R_1}{R_3}$$



Example



QUICK QUIZ (Poll)

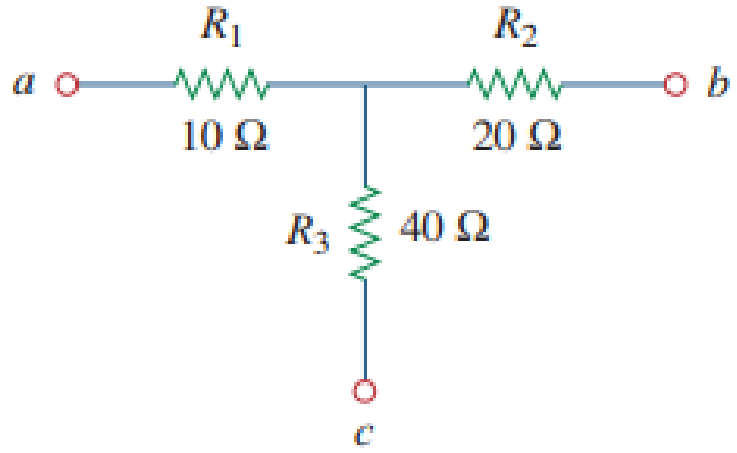
Resistance R_{bc} for the Δ network of the corresponding Figure is:

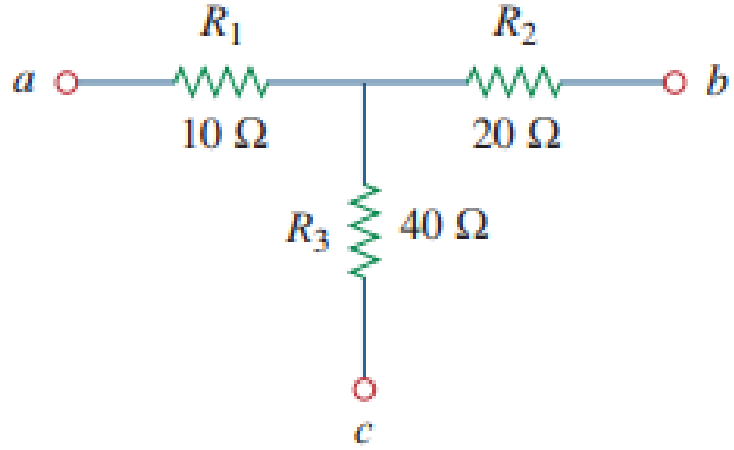
A. 140

B. 70

C. 35

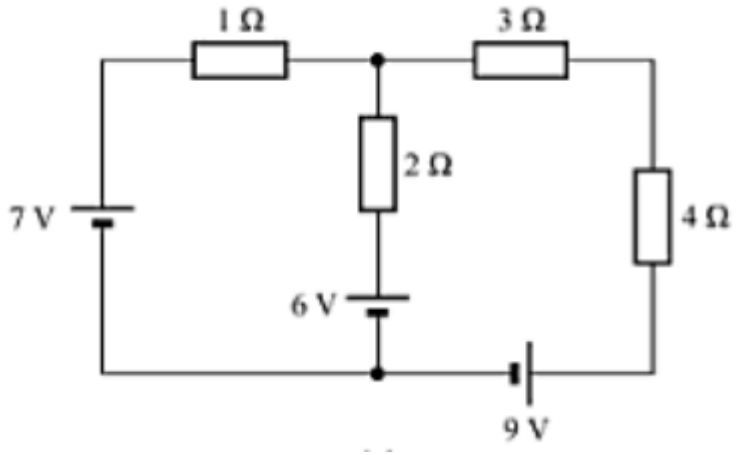
D. 100




R_1
R_2
a
b
10 Ω
20 Ω
R_3
40 Ω
c

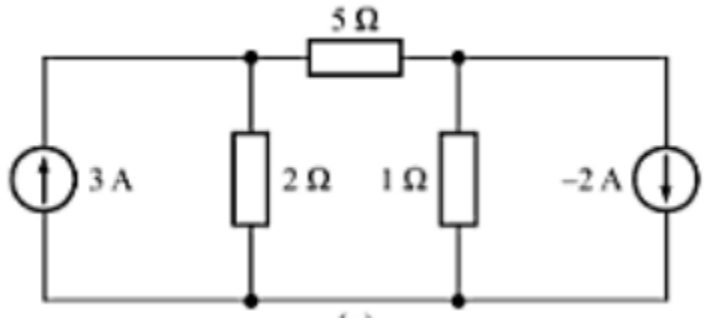
Problem 2

Find Mesh Currents?



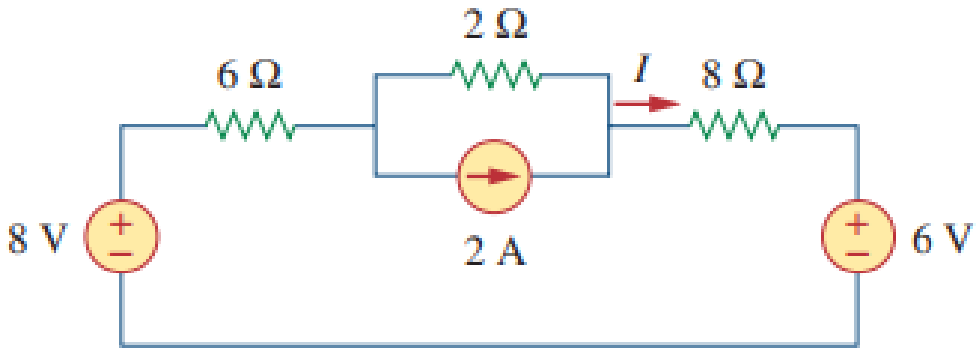
Problem 3

Find current through 5ohm using Nodal Analysis?



Problem 4

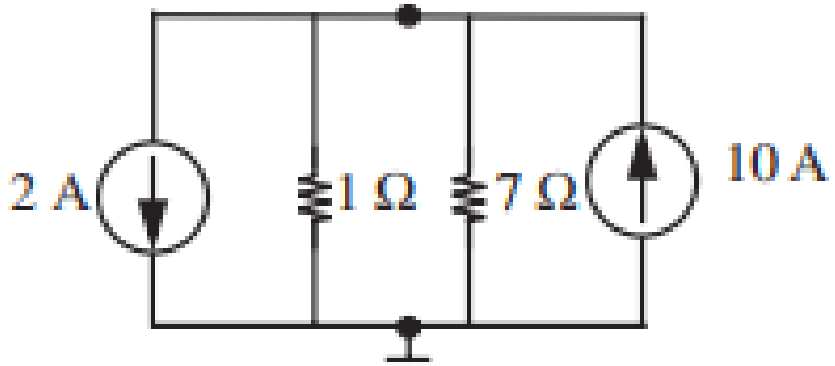
Find I using Superposition?



QUICK QUIZ (POLL)

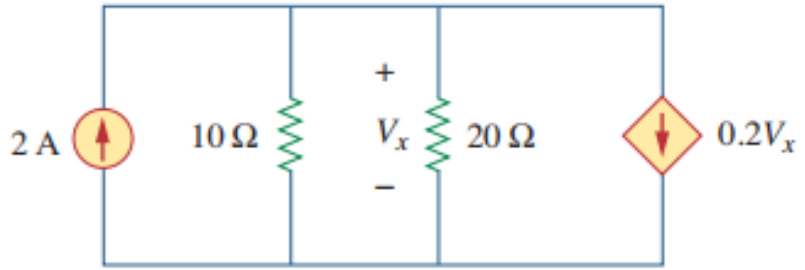
Find node voltages?

A. 6V
B. 7V
C. 8V
D. 9V



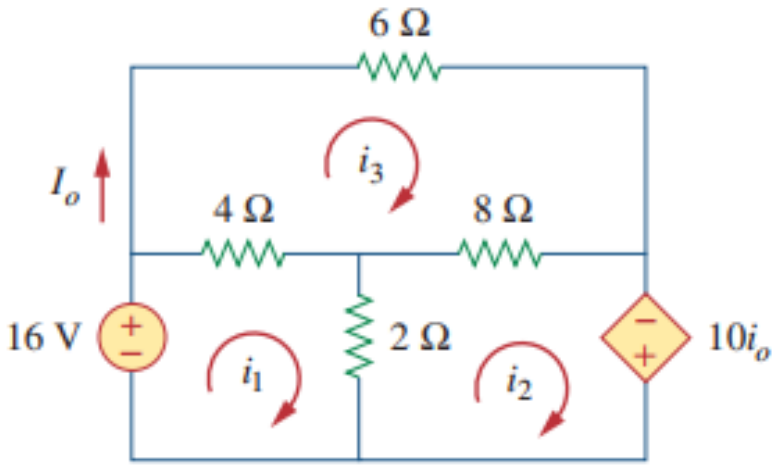
Dependent Sources:
Problem 5

Find Vx in the circuit using Nodal Analysis?



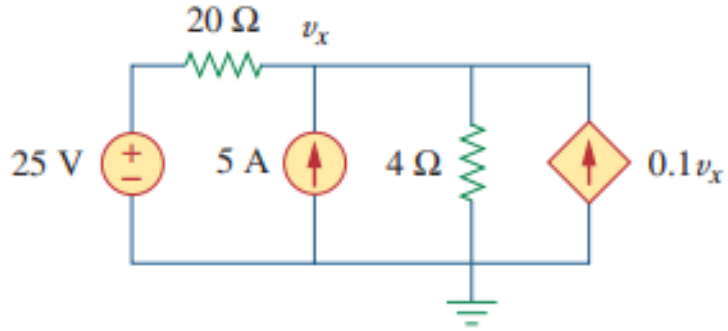
Problem 6

Use Mesh Analysis to find Io?



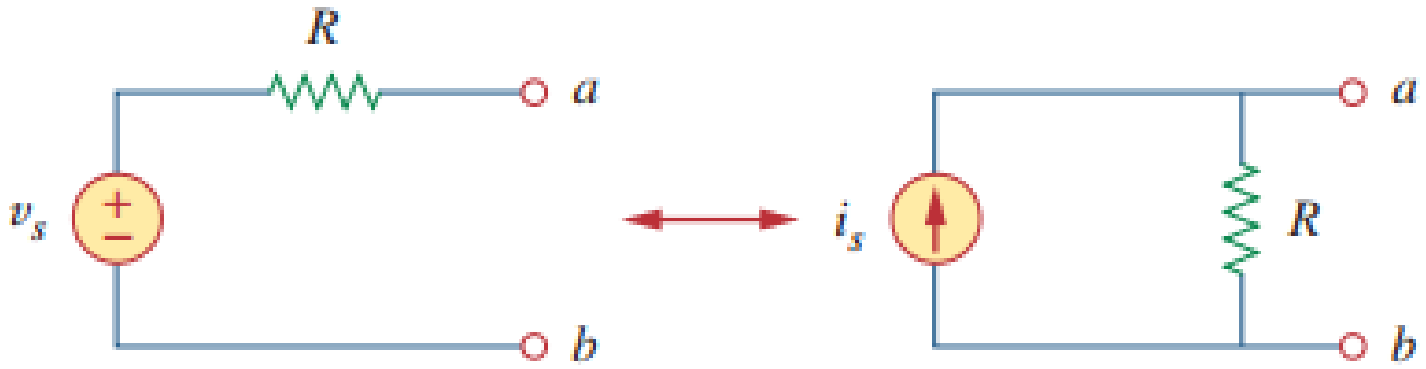
Problem 7

Find Vx using Superposition?



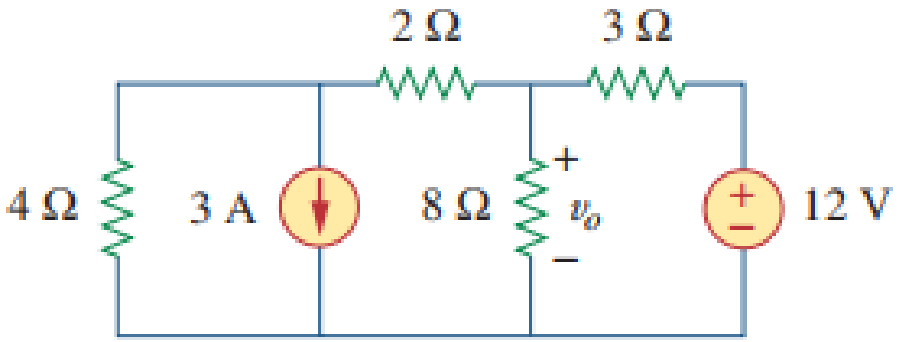
Source Transformation

- We have noticed that series-parallel combination and wye-delta transformation help simplify circuits.
- *Source transformation* is another tool for simplifying circuits. Basic to these tools is the concept of *equivalence*.



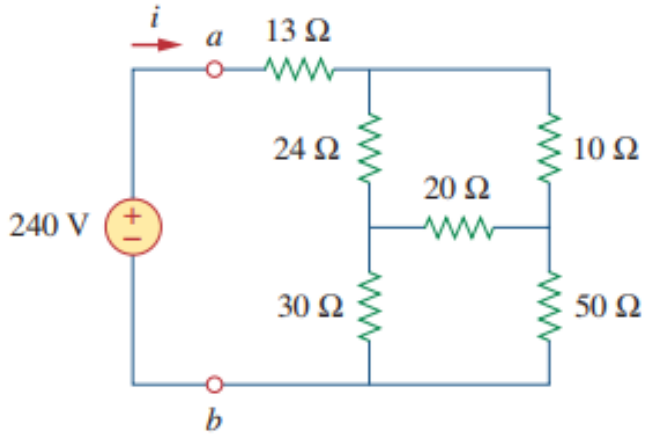
PRACTICE PROBLEM

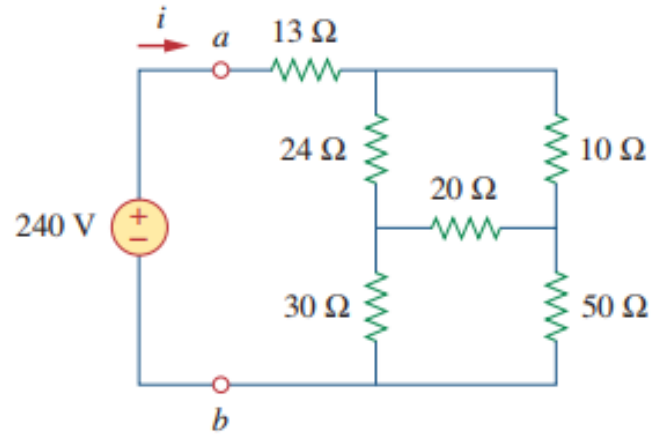
Using Source Transformation, find Vo?

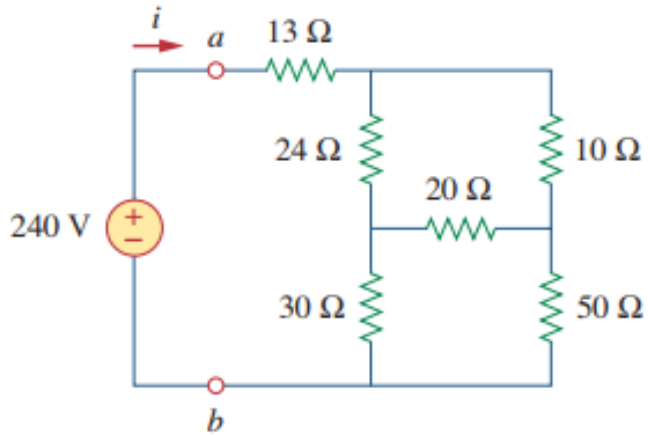


Problem 8

- Find $R_{ab}\ and\ i$ in the given circuit:




i
a
13 Ω
24 Ω
10 Ω
20 Ω
240 V
+
−
30 Ω
50 Ω
b


i
a
13 Ω
24 Ω
10 Ω
20 Ω
240 V
30 Ω
50 Ω
b

Problem 9

Find io in the circuit?