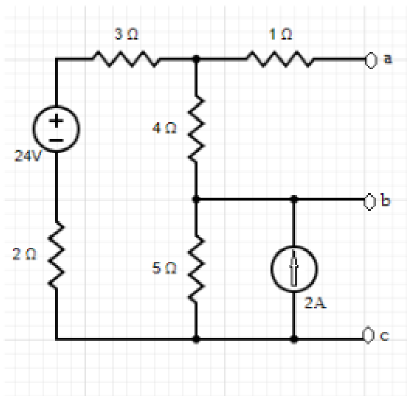
Step 1

Solving for a:



Step 2

To get R_{th}, we need to:

1. Turn off all the $\text{independent sources}$

So in our circuit:

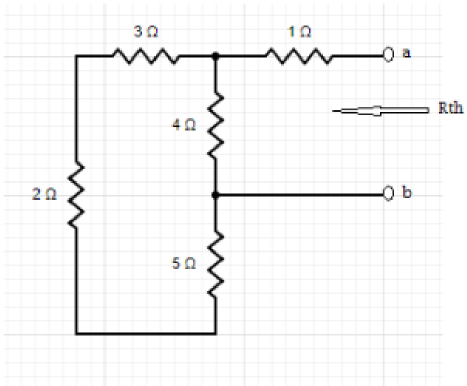
$\text{We put the 2A current source to zero.}$

$\text{We put the 24V voltage source to zero.}$

2. Determine the R_{th} at the terminals a-b of the open circuit.

The input resistance is equal to the thevenin equivalent resistance

Step 3



Step 4

From the last figure:

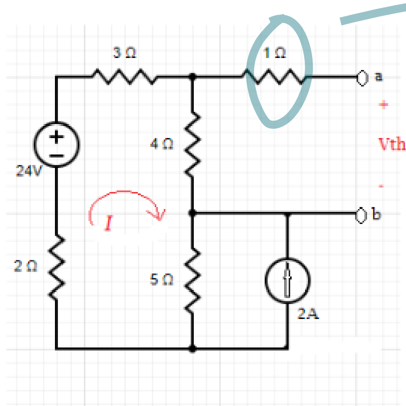
The resistors 5Ω and 3Ω and 2Ω are in series and both are in parallel with the resistor 4Ω:

So the equivalent resistance of the three resistor is:

$$R_{eq} = (5+3+2) \parallel 4 = 10 \parallel 4 = \frac{10 \times 4}{10+4} = \frac{40}{14}\Omega$$

$$R_{th} = \frac{40}{14} + 1 = \frac{54}{14} = 3.857\Omega$$

Step 5



what about considering voltage
across this 1 ohm resistance

Step 6

Apply mesh analysis:

Apply KVL to the last circuit :

$2I + 3I + 4I + 5(I + 2) - 24 = 0$

$14I + 10 - 24 = 0$

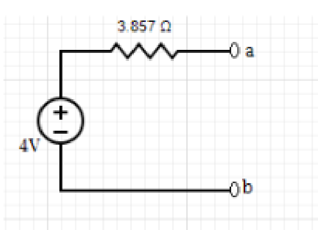
$14I = 14$

$I = 1A$

$Vth = 4I = 4 \times 1 = 4V$

Step 7

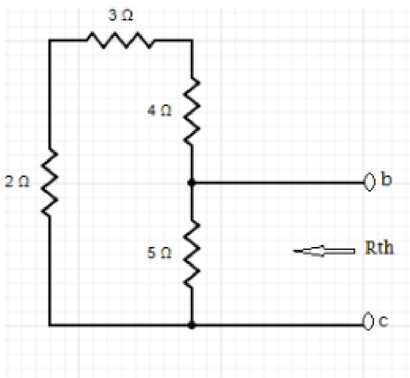
Thevenin equivalent circuit at a-b:



c - B / B - C ?

Step 8

Solving for b:



Step 9

From the last figure:

The resistors 4Ω and 3Ω and 2Ω are in series and both are in parallel with the resistor 5Ω:

So the equivalent resistance of the three resistor is:

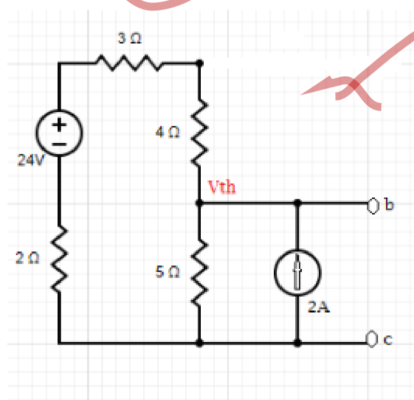
$$R_{eq} = (4+3+2) \parallel 5 = 9 \parallel 5 = \frac{9 \times 5}{9+5} = \frac{45}{14}\Omega$$

$$R_{th} = \frac{45}{14} = 3.214\Omega$$

Step 10

To get Vth at b-c:

??



Step 11

Apply nodal analysis to the previous circuit:

Apply KCL at the node Vth:

{$\text{\color{#4257b2}

$ \dfrac{Vth -24 }{4 + 3 + 2} +\dfrac{Vth}{5} - 2 = 0$\\

$ \dfrac{Vth - 24 }{9} +\dfrac{Vth}{5} = 2 0$ multiply by 45 \\

$ 5Vth - 120 + 9Vth =90 $ \\

$ 14Vth = 210$ \\

$Vth = 15V$}$

Step 12

Thevenin equivalent circuit at b-c: