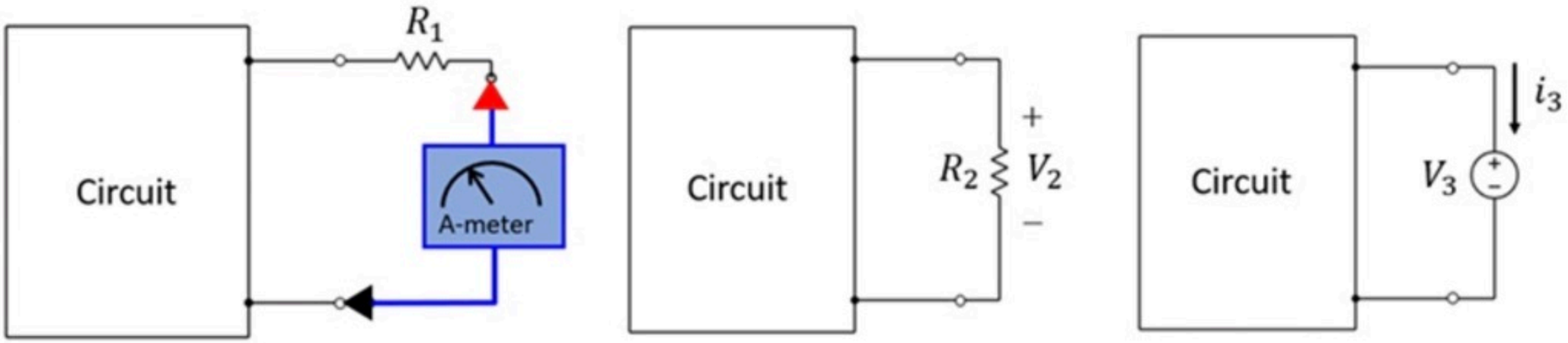
Circuit theorems 017

No more attempts left.

The box contains a linear circuit. This same circuit is placed into the three configurations shown below.

The reading of the ammeter in configuration 1 is given as X.

Find the current i_3 in configuration 3.



Configuration 1 **Configuration 2** **Configuration 3**

Given Variables:

X : 8 A

R1 : 1 ohm

V2 : 20 V

R2 : 10 ohm

V3 : 2 V

Calculate the following:

i3 (A) :

Hint: Replace the circuit in the box as its Thevenin equivalent model

The box contains a linear circuit. This same circuit is placed into the three configurations shown below.

The reading of the ammeter in configuration 1 is given as X.

Find the current i_3 in configuration 3.

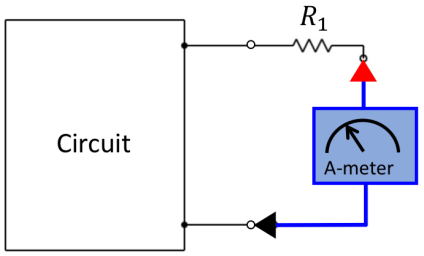
$X = 8A$

$R_1 = 1\Omega$

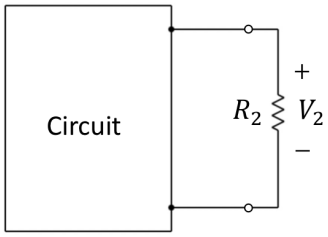
$V_2 = 16V$

$R_2 = 4\Omega$

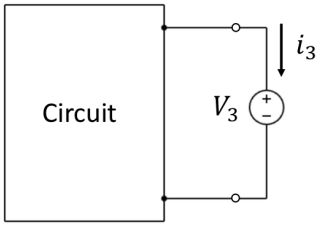
$V_3 = 8V$



Configuration 1

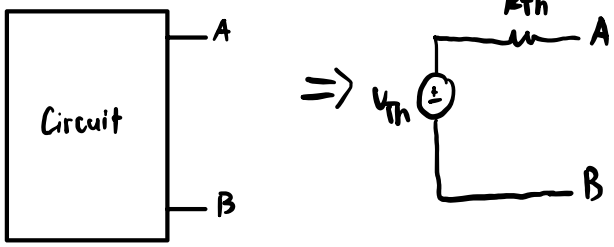


Configuration 2

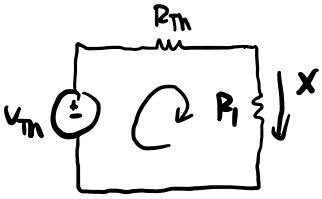


Configuration 3

Replace the box by its Thevenin equivalent model



Configuration 1

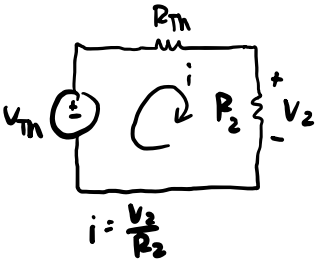


KVL 1: $-V_{Th} + XR_{Th} + XR_1 = 0$

$-V_{Th} + 8R_{Th} + 8 \cdot 1 = 0$

$-V_{Th} + 8R_{Th} = -8$ ①

Configuration 2



$i = \frac{V_2}{R_2}$

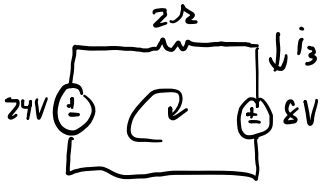
KVL 2: $-V_{Th} + iR_{Th} + V_2 = 0$

$-V_{Th} + \frac{V_2}{R_2} R_{Th} = -V_2$

$-V_{Th} + \frac{16}{4} R_{Th} = -16$

$-V_{Th} + 4R_{Th} = -16$ ②

Configuration 3



KVL 3: $-24 + 2i_3 + 8 = 0$

$2i_3 = 16$

$\boxed{i_3 = 8A}$

Solve system of equations

① : $-V_{Th} = -8 - 8R_{Th}$

$V_{Th} = 8 + 8R_{Th}$

①→②: $-(8 + 8R_{Th}) + 4R_{Th} = -16$

$-8 - 8R_{Th} + 4R_{Th} = -16$

$-4R_{Th} = -8$

$R_{Th} = 2\Omega$

$R_{Th} \rightarrow$ ① : $V_{Th} = 8 + 8(2)$

$V_{Th} = 24V$