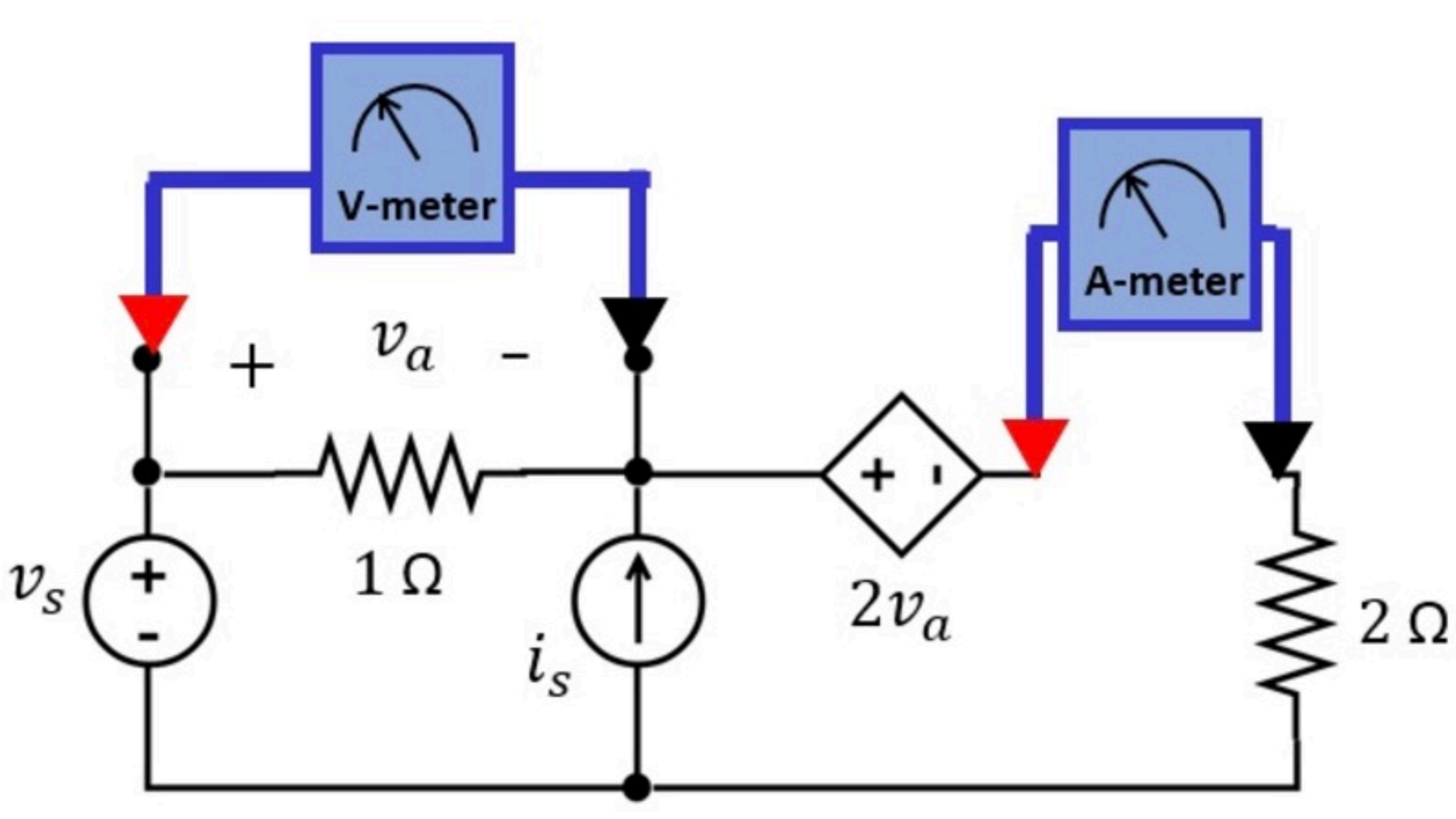
Basic concepts 009

Problem has been graded.

The reading of the voltmeter is x and that of the ammeter is y.

What is the power *P* supplied by the VCVS?
What is the value of the current source i_s?
What is the value of the voltage source v_s?



Given Variables:

x : 3 V

y : 5 A

Calculate the following:

P (W) :

---

i_s (A) :

---

v_s (V) :

The reading of the voltmeter is x and that of the ammeter is y.

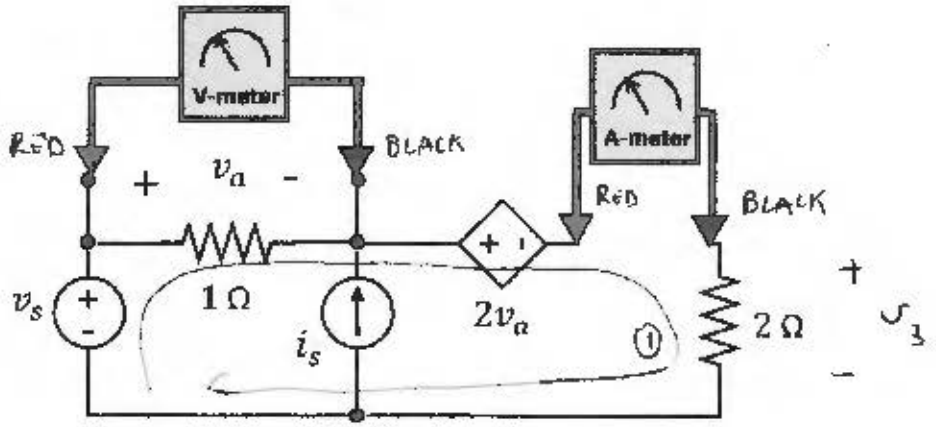
What is the power P supplied by the VCVS?

What is the value of the current source i_s?

What is the value of the voltage source v_s?

X = 6 V

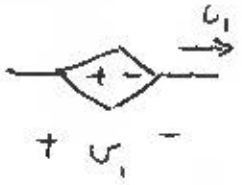
Y = 3 A



(a) $v_a = X = 6$

$i_1 = Y = 3$

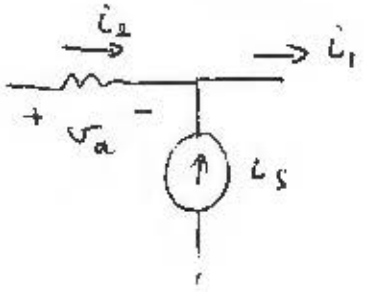
$v_1 = 2v_a = 12$



$P = v_1 \cdot i_1 = 36$ W RECEIVED

$P = -36$ W SUPPLIED

(b)



$i_1 = \frac{v_a}{1} = 6A$

KCL: $i_2 + i_s = i_1 \Rightarrow i_s = 3 - 6 = -3$

$i_s = -3A$

(c) KVL on ①:

$v_s = v_a + 2v_a + v_3$

$= 3 \cdot 6 + 6$

$= 24$

$v_3 = i_1 \cdot 2 = 6$ V

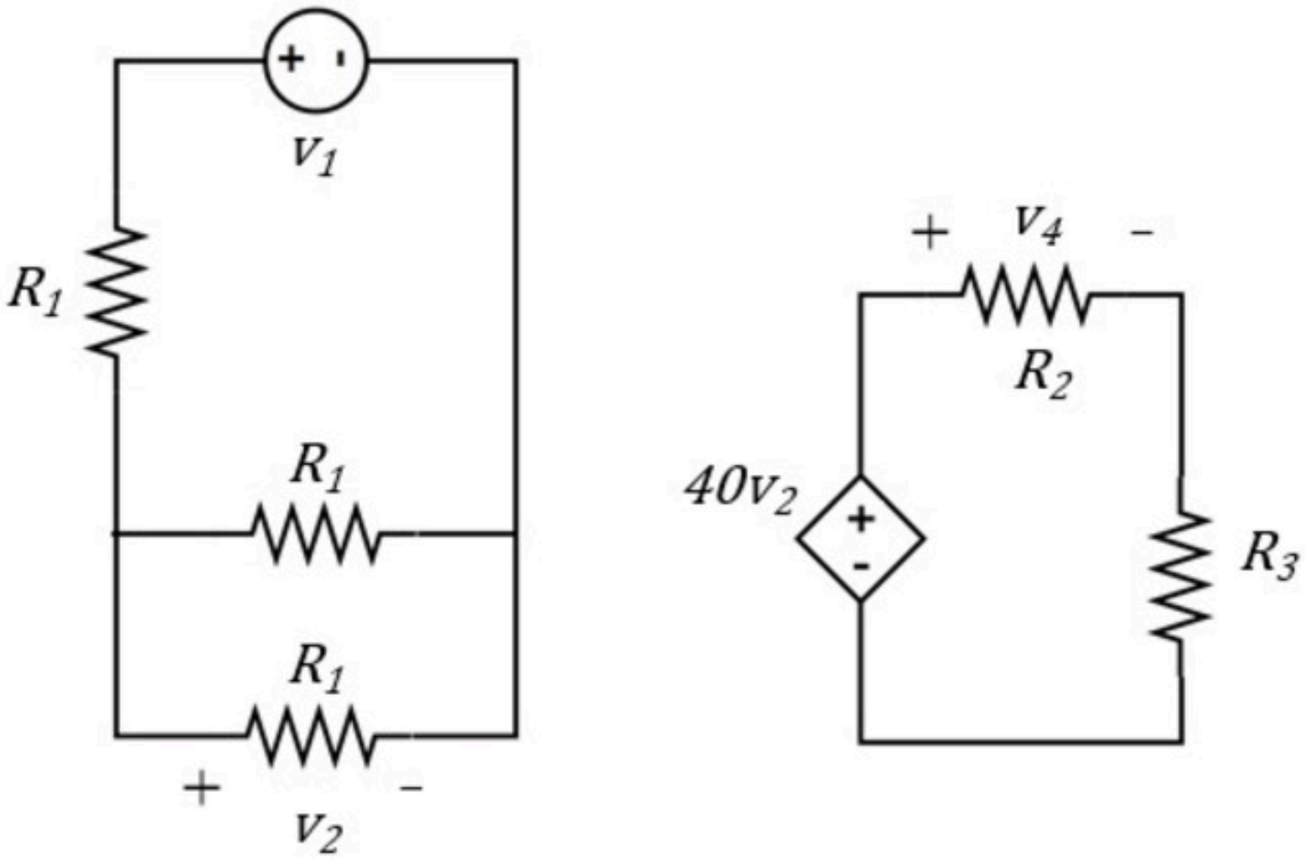
$v_s = 24$ V

Basic analysis 007

Problem has been graded.

In this circuit, v_1 is an input, but you don't know what its value is. Find v_4 as a function of v_1.

More specifically, find X = $\frac{V_4}{V_1}$.



Given Variables:

R1 : 10 ohm

R2 : 3 ohm

R3 : 5 ohm

Calculate the following:

X (V/V) :

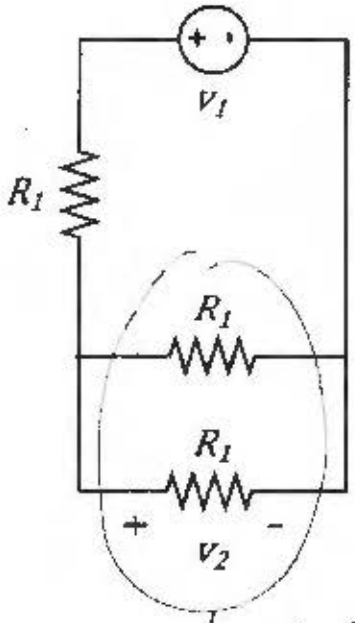
In this circuit, v_1 is an input, but you don't know what its value is. Find v_4 as a function of v_1.

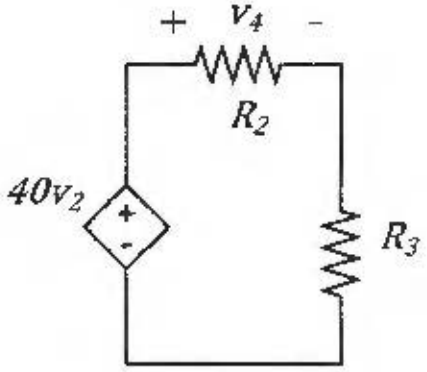
More specifically, find $X = \frac{v_4}{v_1}$.

R1 = 20 Ω

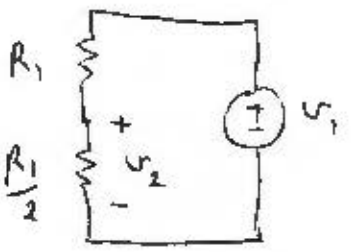
R2 = 12 Ω

R3 = 20 Ω



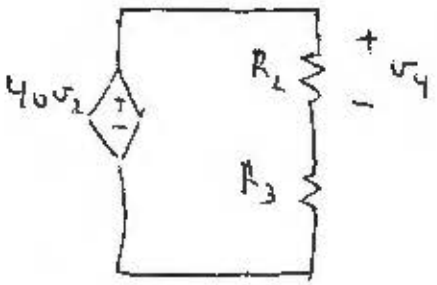


$\hookrightarrow R_1 // R_1 = \left(\frac{1}{R_1} + \frac{1}{R_1}\right)^{-1} = \left(\frac{2}{R_1}\right)^{-1} = \frac{R_1}{2}$



VOLTAGE DIVIDER

$$v_2 = v_1 \cdot \frac{\frac{R_1}{2}}{R_1 + \frac{R_1}{2}} = v_1 \frac{\frac{1}{2}}{1 + \frac{1}{2}} = \frac{v_1}{3}$$



VOLTAGE DIVIDER

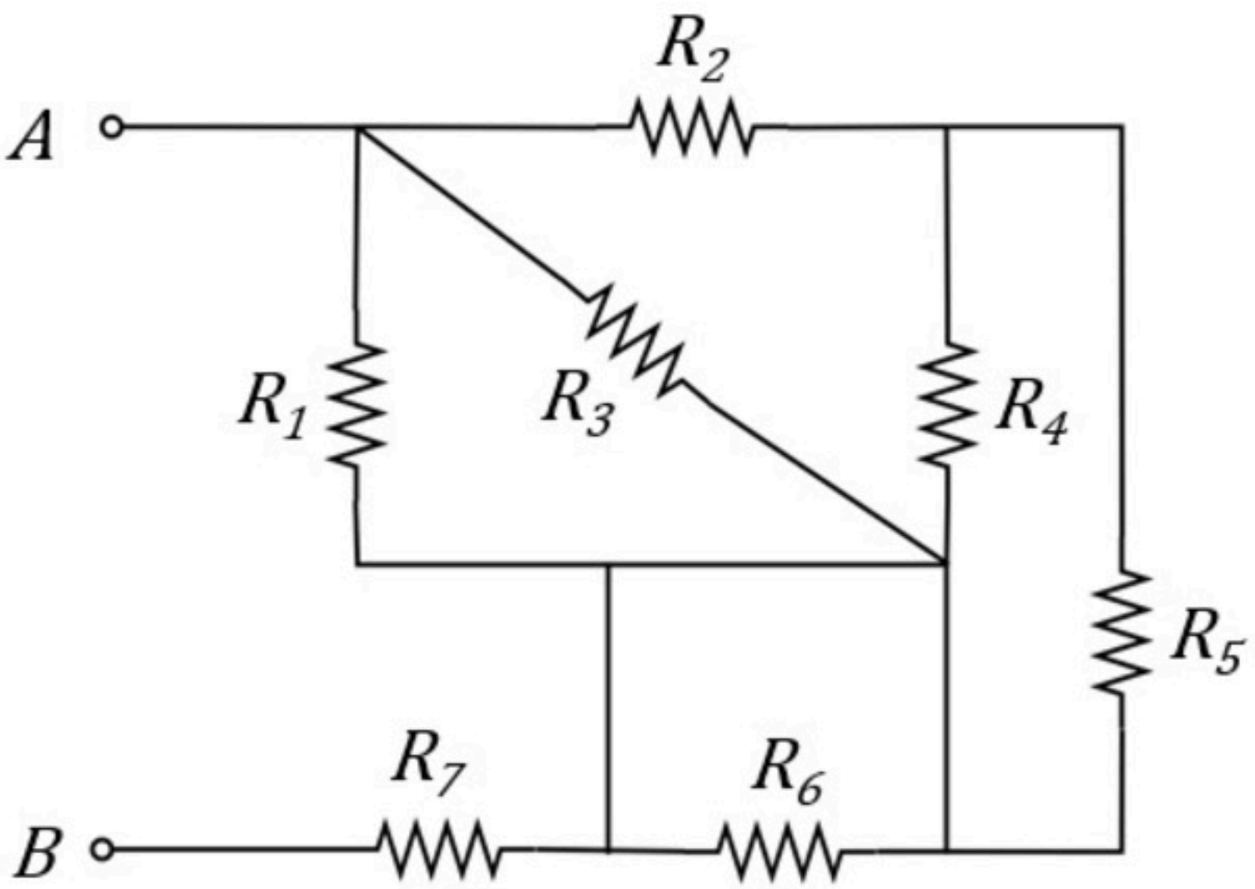
$$v_4 = 40\, v_2 \cdot \frac{R_2}{R_2 + R_3} = \frac{40}{3} \cdot \frac{v_1}{3} \cdot \frac{12}{32} = 5\, v_1$$

$$\boxed{X = \frac{v_4}{v_1} = 5}$$

Basic analysis 009

Problem has been graded.

You are given that the equivalent resistance between *A* and *B* is R_{eq}.
Find the value of R_3.



Given Variables:

Req : 8 ohm

R1 : 3 ohm

R2 : 4 ohm

R4 : 24 ohm

R5 : 12 ohm

R6 : 12 ohm

R7 : 6 ohm

Calculate the following:

R3 (ohm) :

You are given that the equivalent resistance between A and B is R_{eq}. Find the value of R_3.

Req = 8 Ω

R1 = 6 Ω

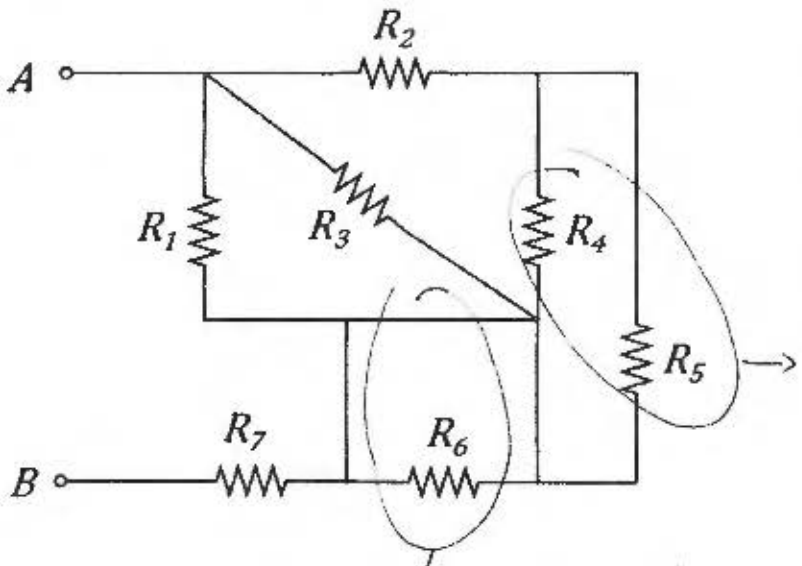
R2 = 4 Ω

R4 = 40 Ω

R5 = 10 Ω

R6 = 12 Ω

$R_7 = 5\,\Omega$



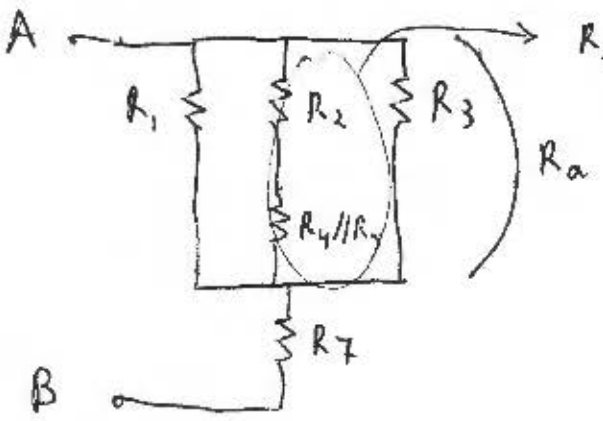
$R_4 // R_5$

$= \left(\frac{1}{40} + \frac{1}{10}\right)^{-1}$

$= \left(\frac{1+4}{40}\right)^{-1} = 8\,\Omega$

$R_6 // 0 = \left(\frac{1}{R_6} + \frac{1}{0}\right)^{-1}$

$= (\infty)^{-1} = 0\,\Omega$



$R_2 + R_4 // R_5 = 4 + 8 = 12\,\Omega$

$R_{eq} = R_a + R_7 \Rightarrow R_a = -R_7 + R_{eq}$

$= 3\,\Omega$

$$\frac{1}{R_a} = \frac{1}{R_1} + \frac{1}{12} + \frac{1}{R_3}$$

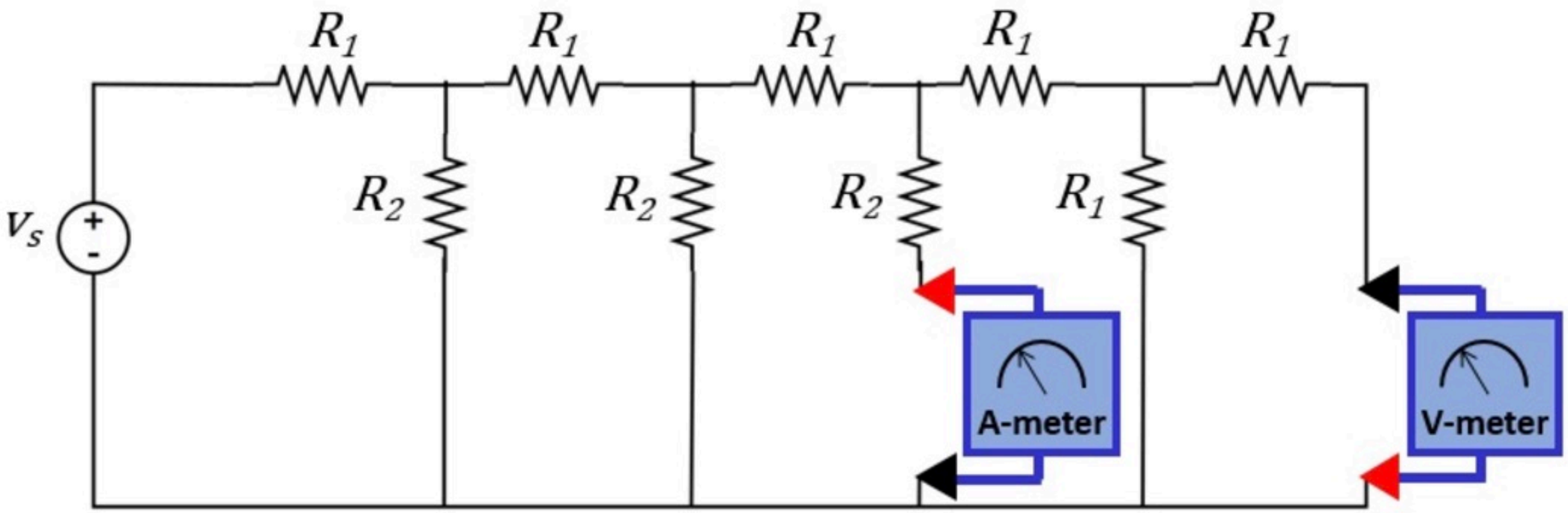
$$\frac{1}{R_3} = \frac{1}{R_a} - \frac{1}{R_1} - \frac{1}{12} = \frac{1}{3} - \frac{1}{6} - \frac{1}{12} = \frac{4-2-1}{12}$$

$$\boxed{R_3 = 12\,\Omega}$$

Basic Analysis 010b

No more attempts left.

Find the ammeter reading *X* and the volt-meter reading *Y*.



Given Variables:

vs : 32 V

R1 : 2 ohm

R2 : 4 ohm

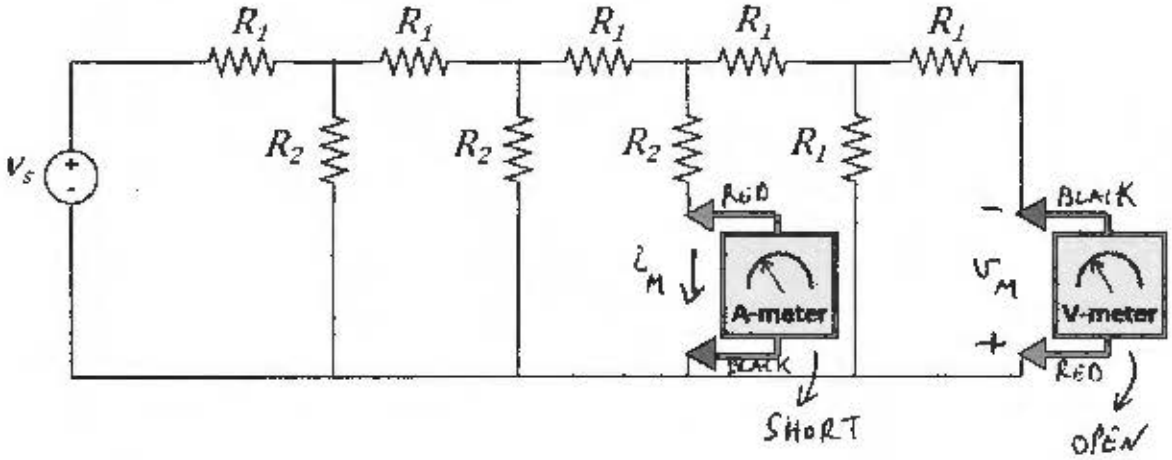
Calculate the following:

X (A) :

Y (V) :

Hint: First find the current through Vs. Use series/parallel. Then find X with current divider.

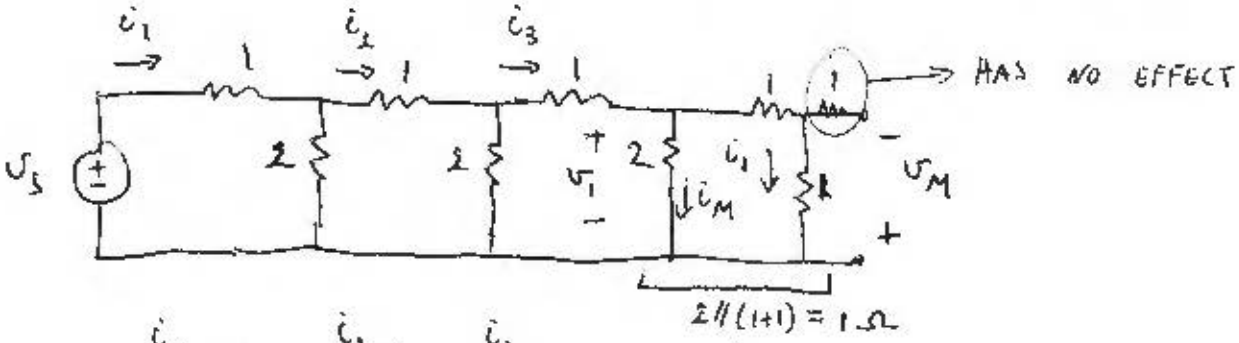
Find the ammeter reading *X* and the volt-meter reading *Y*.

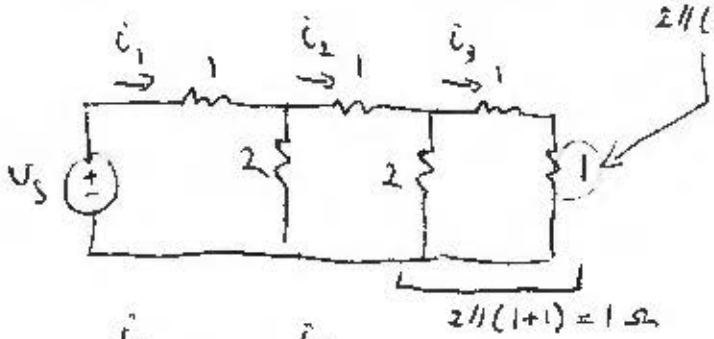


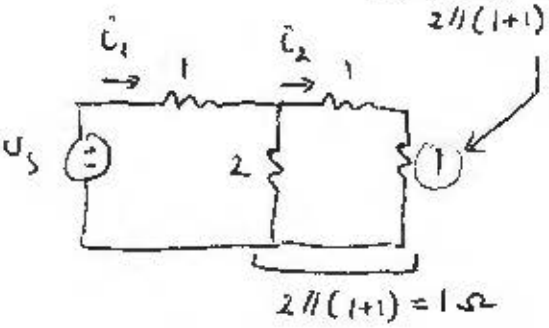
vs = 80 V

R1 = 1 Ω

R2 = 2 Ω







$$i_1 = \frac{v_s}{1+1} = 40$$

$$i_2 = i_1 \frac{2}{2+2} = 20 \quad \text{(CURRENT DIVIDER)}$$

$$i_3 = i_2 \frac{2}{2+2} = 10 \quad \text{(CURRENT DIVIDER)}$$

$$i_M = i_3 \cdot \frac{2}{2+2} = 5 \quad \text{(CURRENT DIVIDER)}$$

X = 5 A

$$v_1 = 2 \cdot i_M = 10$$

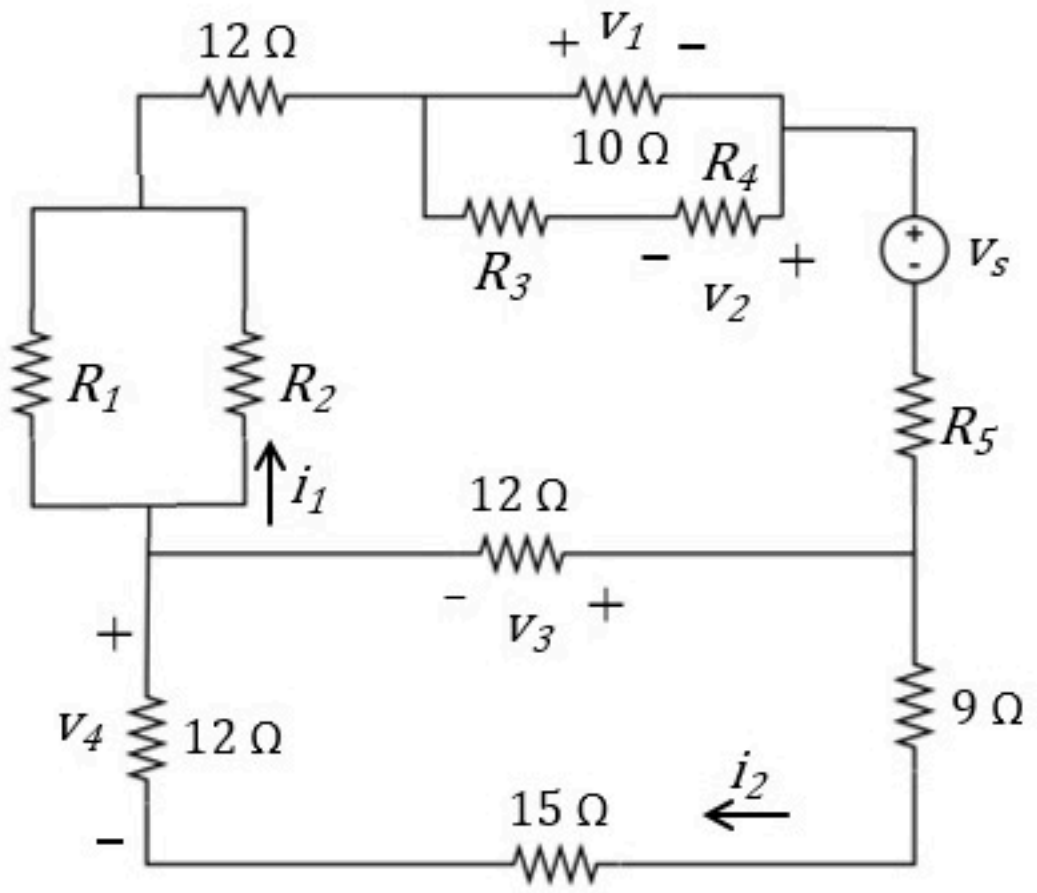
$$i_1 = i_M = 5 \Rightarrow -v_M = 1 \cdot i_1 = 5$$

Y = -5 V

Basic analysis 012

Problem has been graded.

Determine the voltages v_1, v_2, v_3 and v_4 and the currents i_1 and i_2.



Given Variables:

vs : 80 V

R1 : 24 ohm

R2 : 8 ohm

R3 : 6 ohm

R4 : 9 ohm

R5 : 7 ohm

Calculate the following:

v1 (V) :

---

v2 (V) :

---

v3 (V) :

---

v4 (V) :

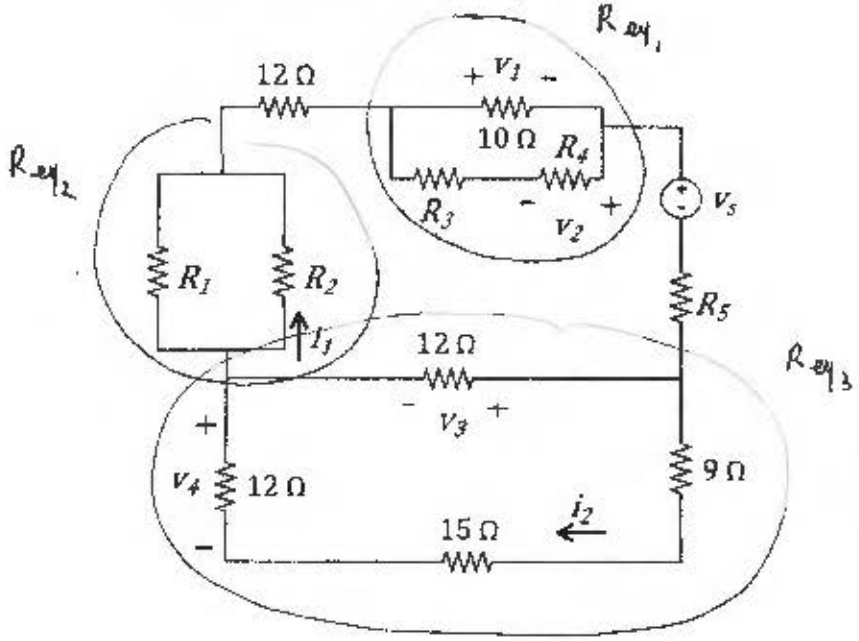
---

i1 (A) :

---

i2 (A) :

Determine the voltages v_1, v_2, v_3 and v_4 and the currents i_1 and i_2.



Vs = 80 V

R1 = 8 Ω

R2 = 24 Ω

R3 = 3 Ω

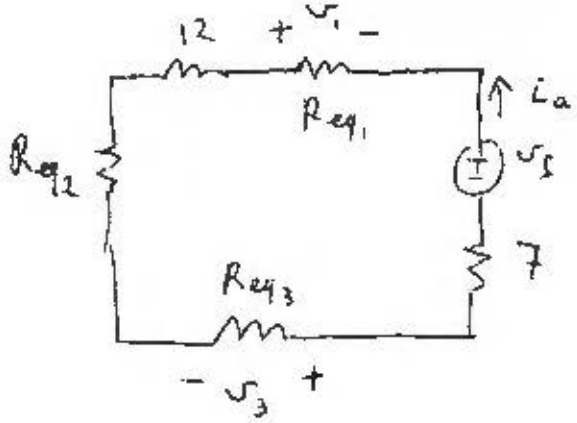
R4 = 12 Ω

R5 = 7 Ω

$$R_{eq_1} = \left(\frac{1}{10} + \frac{1}{3+12}\right)^{-1} = 6\,\Omega$$

$$R_{eq_2} = \left(\frac{1}{8} + \frac{1}{24}\right)^{-1} = 6\,\Omega$$

$$R_{eq_3} = \left(\frac{1}{12} + \frac{1}{12+15+9}\right)^{-1} = 9\,\Omega$$



$$i_a = \frac{v_s}{R_{eq_1} + 12 + R_{eq_2} + R_{eq_3} + 7}$$

$$= \frac{v_s}{40} \quad \Rightarrow \quad i_a = 2\,A$$

$$v_1 = (-i_a)\cdot R_{eq_1} = (-2)\cdot 6 = -12\,V$$

$$\boxed{v_1 = -12\,V}$$

$$v_2 = (-v_1)\cdot \frac{R_4}{R_3+R_4} = 12\cdot \frac{12}{15} = \frac{48}{5}\,V$$

$$\boxed{v_2 = 9.6\,V}$$

$$v_3 = (-i_a)\,R_{eq_3} = (-2)\,9 = -18\,V$$

$$\boxed{v_3 = -18\,V}$$

$$v_4 = (-v_3)\,\frac{12}{12+15+9} = 18\cdot \frac{12}{36} = 6\,V$$

$$\boxed{v_3 = 6\,V}$$

$$i_1 = (-i_a)\,\frac{R_1}{R_1+R_2} = (-2)\,\frac{8}{32} = -0.5\,A$$

$$\boxed{i_1 = -0.5\,A}$$

$$i_2 = (-i_a)\cdot \frac{12}{12+12+15+9} = (-2)\cdot \frac{12}{48} = -0.5\,A$$

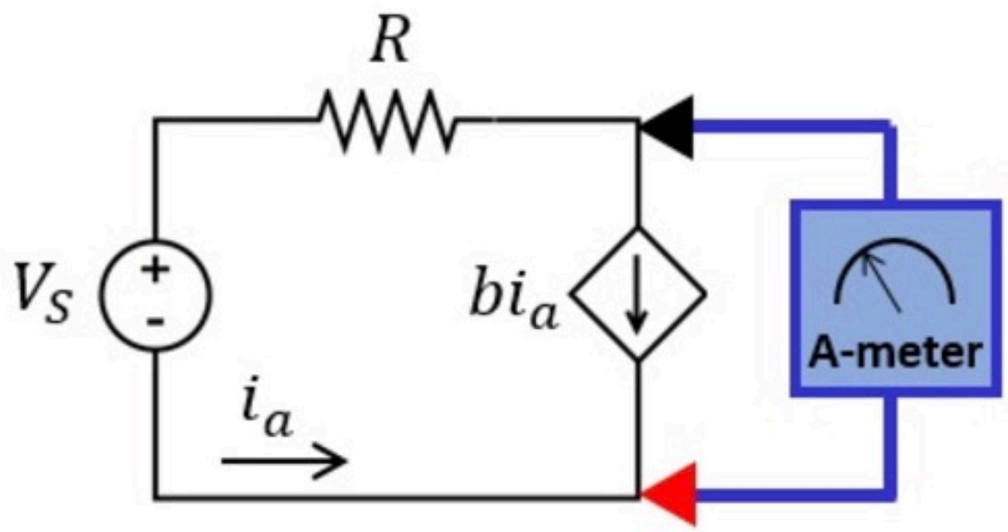
$$\boxed{i_2 = -0.5\,A}$$

Basic analysis 014

No more attempts left.

What is the reading *X* from the ammeter?

What would be the reading *Y* if we replaced the ammeter by a volt-meter?



Given Variables:

Vs : 8 V

R : 4 ohm

b : 2 A/A

Calculate the following:

X (A) :

Y (V) :

> Hint: Ammeters and volt meters behave as short and open circuits respectively. Trust the math.

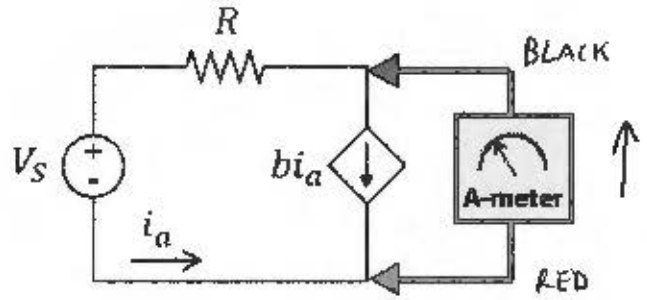
(a) What is the reading *X* from the ammeter?

(b) What would be the reading *Y* if we replaced the ammeter by a volt-meter?

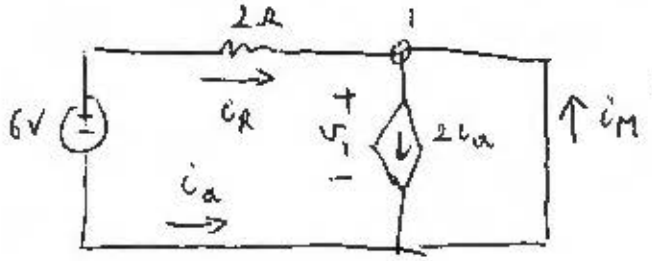
$V_S = 6\,V$

$R = 2\,\Omega$

$b = 2\,A/A$



(a)



AMMETER EQUIVALENT TO A SHORT

$\Rightarrow v_1 = 0V$

$\Rightarrow i_R = \frac{6 - v_1}{R} = \frac{6}{2} = 3A$

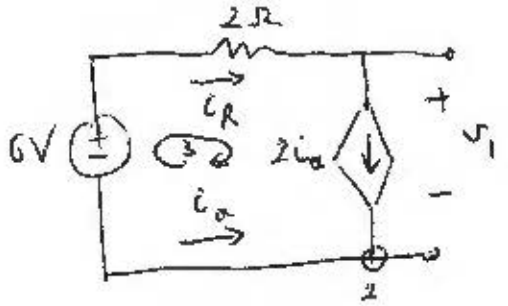
$\Rightarrow i_a = -i_R = -3A$

KCL @ 1 : $i_R + i_M = 2i_a$

$i_M = 2i_a - i_R = 3i_a = -9$

$\boxed{X = -9A}$

(b)



V-METER EQUIVALENT TO AN OPEN

KCL @ 2 : $i_a + 2i_a = 0 \Rightarrow 3i_a = 0 \Rightarrow i_a = 0$

$\Rightarrow i_R = 0$

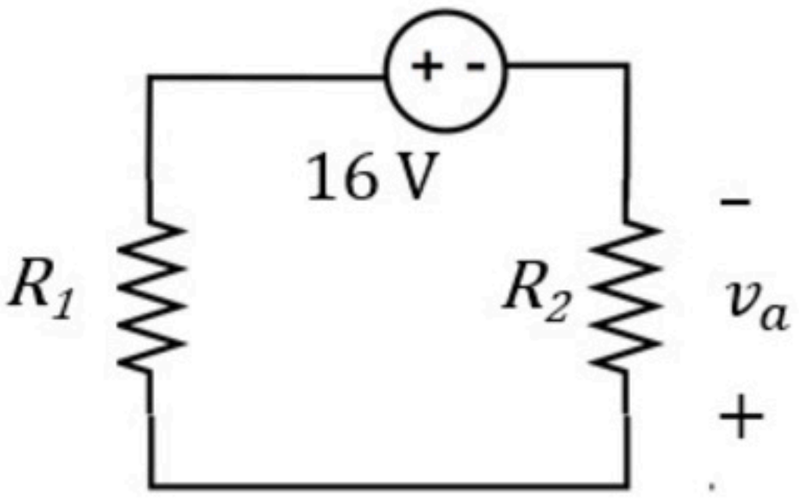
KVL 3 : $6V = i_R \cdot 2 + v_1 \Rightarrow v_1 = 6V$

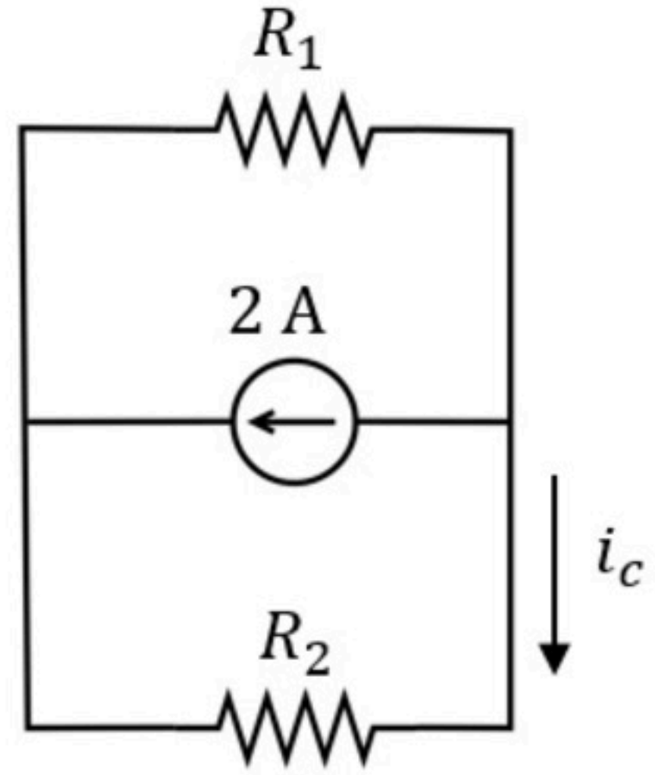
$\boxed{Y = 6V}$

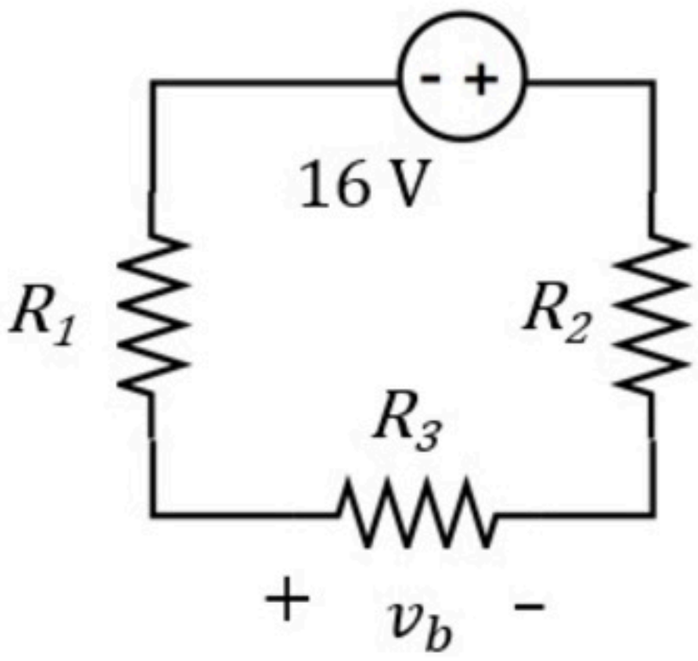
Basic Analysis 015

Problem has been graded.

Find v_a, v_b and i_c .







Given Variables:

R1 : 2 ohm

R2 : 6 ohm

R3 : 2 ohm

Calculate the following:

va (V) :

---

vb (V) :

---

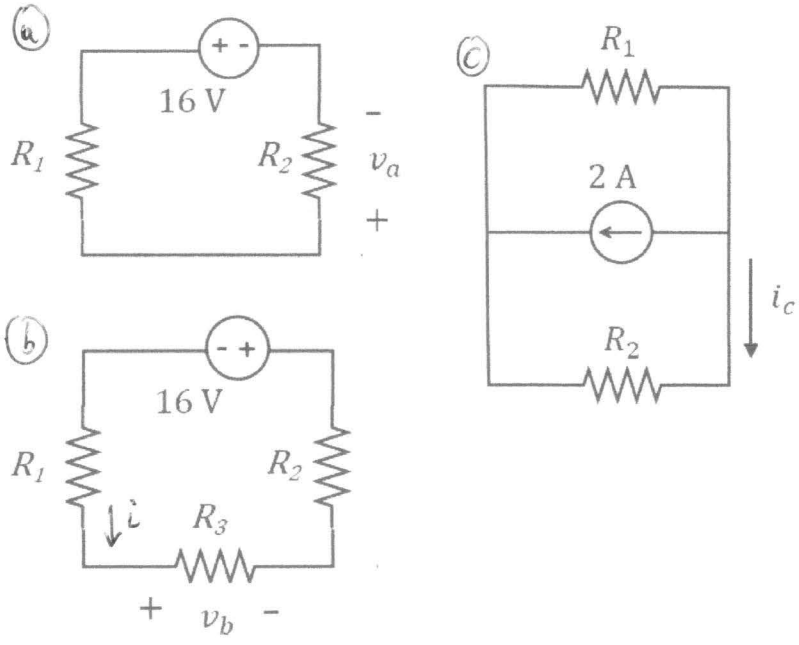
ic (A) :

Find v_a, v_b and i_c.

R1 = 2 Ω

R2 = 6 Ω

R3 = 2 Ω



(a) VOLTAGE DIVIDER: $v_a = 16 \cdot \frac{R_2}{R_1+R_2} = 16 \cdot \frac{6}{2+6} = 12$

$$\boxed{v_a = 12\,V}$$

(b) VOLTAGE DIVIDER: $v_b = (-16) \frac{R_3}{R_1+R_2+R_3} = (-16) \frac{2}{2+6+2} = -3.2$

$$\boxed{v_b = -3.2\,V}$$

BTW: WHERE THIS COMES FROM

$$i = \frac{(-16)}{R_1+R_2+R_3} \quad \text{AND} \quad v_b = R_3 \cdot i$$

$$\Rightarrow v_b = (-16) \frac{R_3}{R_1+R_2+R_3}$$

(c) CURRENT DIVIDER: $i_c = (-2) \frac{R_1}{R_1+R_2} = (-2) \cdot \frac{2}{2+6} = -0.5$

$$\boxed{i_c = -0.5\,A}$$