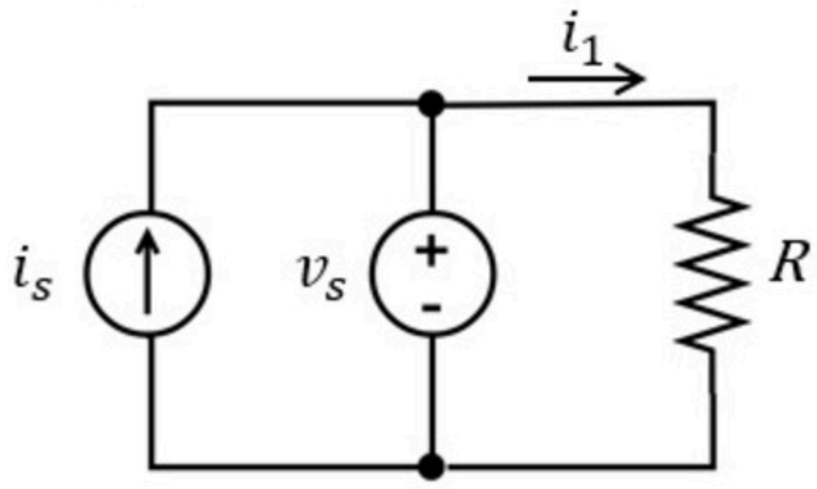
Basic concepts 006

Problem has been graded.

Find the current i_1 and the power P_1 received by the resistor.

Then change the current source to 5A. Recalculate the current i_1 (renaming it to i_2) and the power P_2 received by the resistor.



Given Variables:

v_s : 16 V

i_s : 4 A

R : 8 ohm

Calculate the following:

i_1 (A) :

P_1 (W) :

i_2 (A) :

P_2 (W) :

Hint: The voltage across a current source can be non-zero

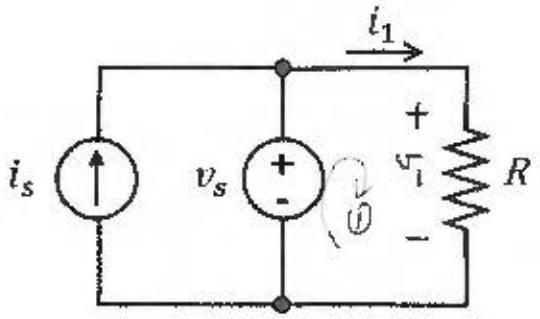
Find the current i_1 and the power P_1 received by the resistor.

Then change the current source to 5A. Recalculate the current i_1 (renaming it to i_2) and the power P_2 received by the resistor.

Vs = 16 V

Is = 4 A

R = 16 Ω



KVL①: $v_s = v_1 \Rightarrow v_1 = 16\,V$

$$i_1 = \frac{v_1}{R} = \frac{16}{16} \Rightarrow \boxed{i_1 = 1A}$$

$$P_1 = i_1^2 \cdot R = 1^2 \cdot 16 \Rightarrow \boxed{P_1 = 16\,W}$$

received

When $i_s = 5A$

v_1 still the same. $v_1 = 16\,V \Rightarrow i_2 = \frac{v_1}{R}$

$$\boxed{i_2 = 1A}$$

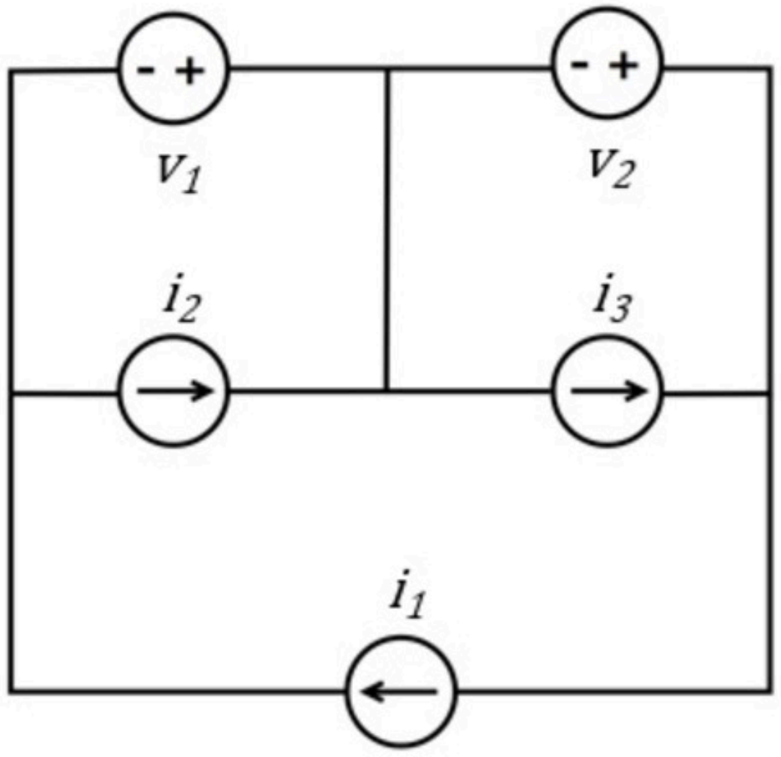
$$P_2 = i_2^2 R \qquad \boxed{P_2 = 16\,W}$$

received

Basic analysis 002

Problem has been graded.

Determine the power P_1 supplied by voltage source v_1 and the power P_2 supplied by voltage source v_2.



Given Variables:

i1 : 4 A

i2 : 2 A

i3 : 3 A

v1 : 3 V

v2 : 4 V

Calculate the following:

P1 (W) :

P2 (W) :

Determine the power P_1 supplied by voltage source v_1 and the power P_2 supplied by voltage source v_2.

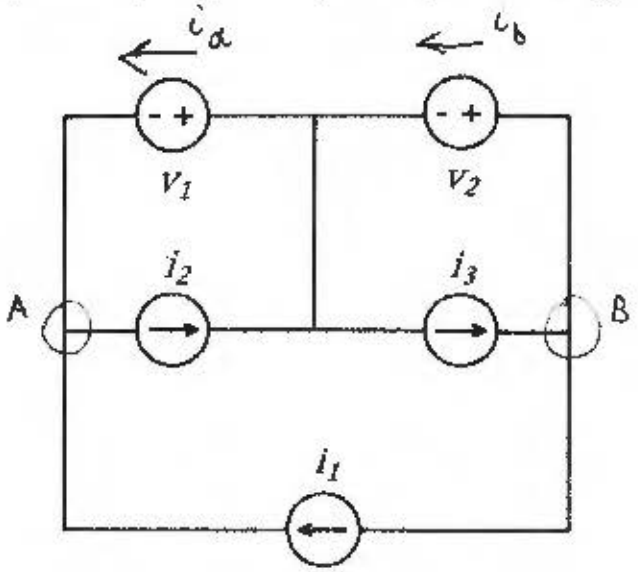
i1 = 4 A

i2 = 2 A

i3 = 3 A

v1 = 3 V

v2 = 4 V



KCL @ A : $i_1 + i_a = i_2 \Rightarrow i_a = 2 - 4 = -2\,A$

$P_1 = v_1 \cdot i_a = -6\,W$ RECEIVED (PASSIVE SIGN CONVENTION)

$\boxed{P_1 = 6\,W}$ SUPPLIED

KCL @ B : $i_3 = i_b + i_1 \Rightarrow i_b = 3 - 4 = -1\,A$

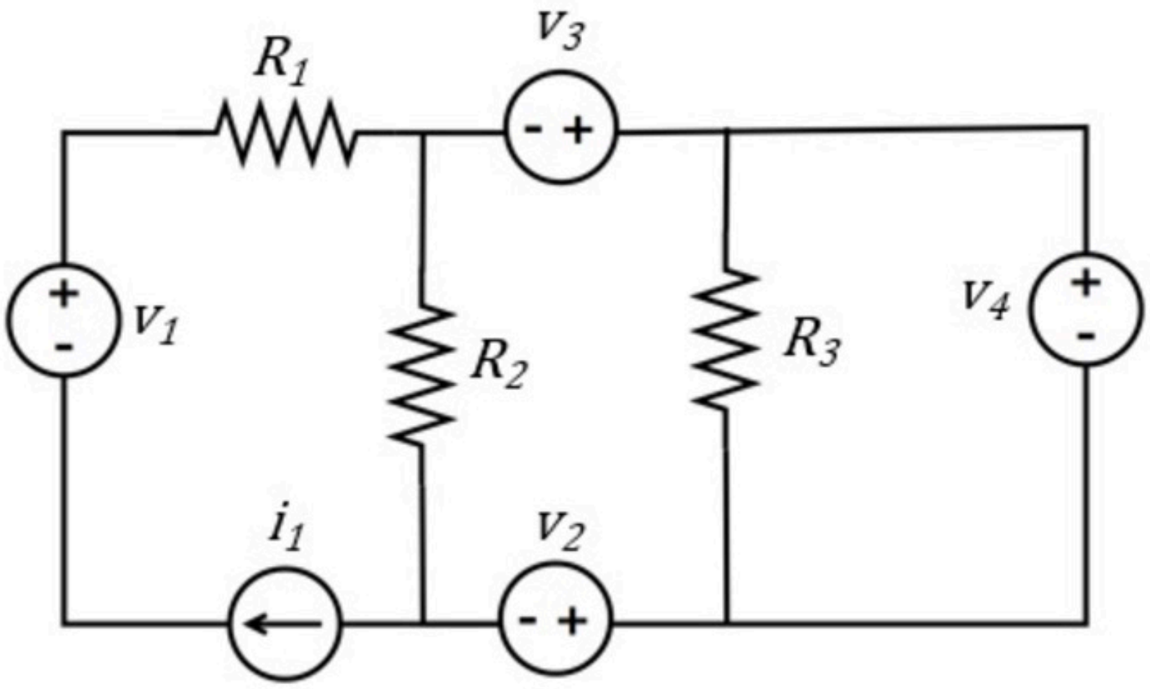
$P_2 = v_2 \cdot i_b = -4\,W$ RECEIVED

$\boxed{P_2 = 4\,W}$ SUPPLIED

Basic analysis 003

Problem has been graded.

Determine the power received by each of the three resistors.



Given Variables:

v1 : 3 V

v2 : 5 V

v3 : 1 V

v4 : 2 V

i1 : 1 A

R1 : 2 ohm

R2 : 3 ohm

R3 : 4 ohm

Calculate the following:

P1 (W) :

P2 (W) :

P3 (W) :

> Hint: Find currents using KCL and KVL

Determine the power received by each of the three resistors.

v1 = 2 V

v2 = 3 V

v3 = 4 V

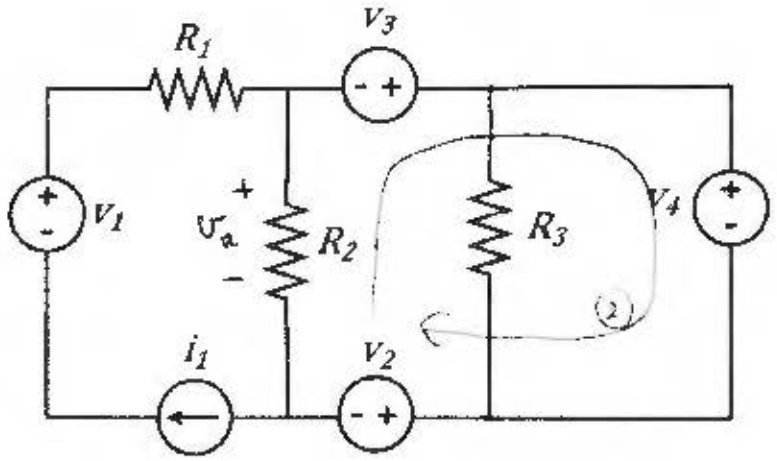
v4 = 2 V

i1 = 4 A

R1 = 2 Ω

R2 = 1 Ω

R3 = 4 Ω



(a) R_1 : $P = R_1 \cdot i_1^2 = 2 \cdot 4^2$ $\boxed{P_{R_1} = 32\ W}$

(b) R_3 : $P = \frac{v_4^2}{R_3} = \frac{4}{4}$ $\boxed{P_{R_3} = 1\ W}$

(c) KVL in (2) : $v_a + v_3 - v_4 - v_2 = 0$

$v_a = -4 + 2 + 3 = 1\ V$

$P = \frac{v_a^2}{R_2} = \frac{1}{1}$ $\boxed{P_{R_2} = 1\ W}$

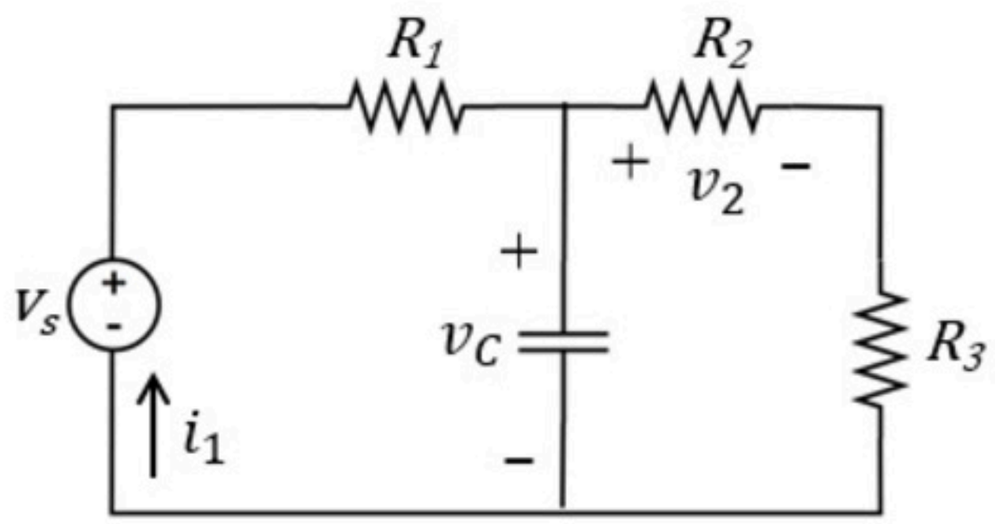
Basic analysis 011

Problem has been graded.

This circuit contains a capacitor (which we will cover in detail later in this course) with a voltage v_C across it. Voltage v_2 and current i_1 will satisfy the equations shown below (as we will also see later).
Find the coefficients *A*, *D* and *E*.

$v_C = 10 - 10 \cdot e^{-20t}$ V

$v_2 = A + B \cdot e^{-20t}$ V $\qquad$ $i_1 = D + E \cdot e^{-20t}$ A



Given Variables:

vs : 20 V

R1 : 20 ohm

R2 : 7 ohm

R3 : 13 ohm

Calculate the following:

A (.) :

B (.) :

D (.) :

E (.) :

This circuit contains a capacitor (which we will cover in detail later in this course) with a voltage v_C across it. Voltage v_2 and current i_1 will satisfy the equations shown below (as we will also see later).
Find the coefficients *A*, *D* and *E*.

Vs = 15 V

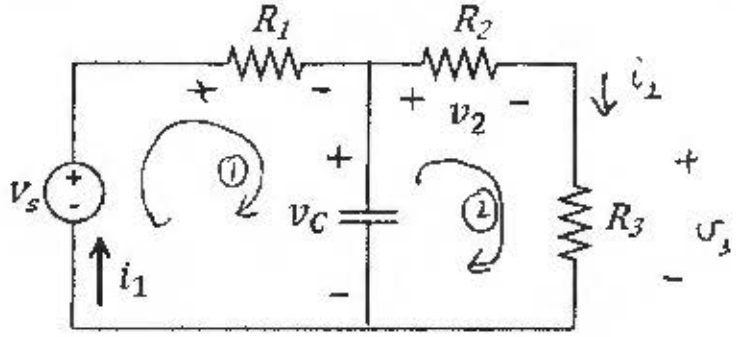
R1 = 10 Ω

R2 = 15 Ω

R3 = 5 Ω

$$v_C = 10 - 10 \cdot e^{-20t} \text{ V}$$

$$v_2 = A + B \cdot e^{-20t} \text{ V} \qquad i_1 = D + E \cdot e^{-20t} \text{ A}$$



KVL IN ① : $v_S - v_{R_1} - v_C = 0$ $\qquad v_{R_1} = i_1 R_1$

$$\Rightarrow \quad i_1 = \frac{1}{R_1}\cdot\left(v_S - v_C\right) = \frac{1}{10}\left(15 - 10 + 10\,e^{-20t}\right)$$

$$= \frac{1}{10}\left(5 + 10\,e^{-20t}\right)$$

D = 0.5 **E = 1**

KVL in ② : $v_C - v_2 - v_3 = 0$ $\qquad v_2 = i_2 \cdot R_2$

$v_3 = i_2 \cdot R_3$

$$\Rightarrow \quad v_C = v_2 + v_3 = i_2\left(R_2 + R_3\right)$$

$$\Rightarrow \quad v_2 = R_2 \cdot i_2 = v_C \cdot \frac{R_2}{R_2 + R_3}$$

$$= v_C \cdot \frac{15}{20}$$

⇝ THIS COULD ALSO BE FOUND DIRECTLY WITH VOLTAGE DIVIDER

$$\Rightarrow \quad v_2 = 7.5 - 7.5\,e^{-20t}$$

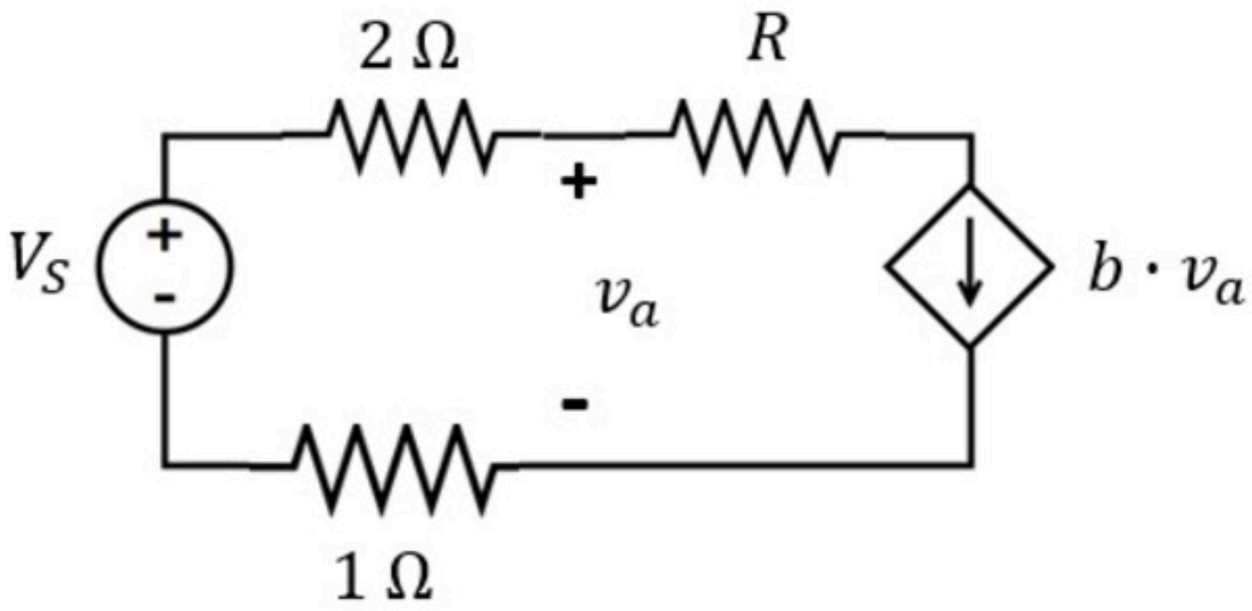
A = 7.5 **B = -7.5**

Basic analysis 013

No more attempts left.

Find v_a.

What is the power *P* received by the dependent source?



Given Variables:

Vs : 7 V

R : 2 ohm

b : 2 A/V

Calculate the following:

va (V) :

P (W) :

Hint: KVL also works when the voltage drop is not across an element.

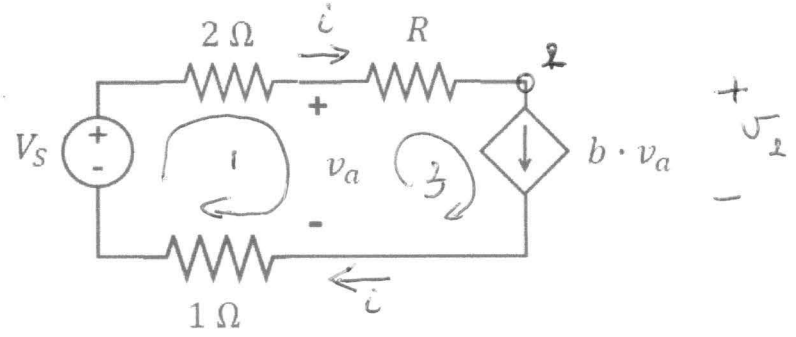
Find v_a.

What is the power *P* received by the dependent source?

Vs = 7 V

R = 2 Ω

b = 2 A/V



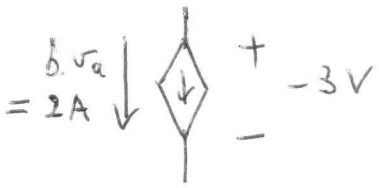
KVL 1 : $V_S = 2 \cdot i + v_a + 1 \cdot i \Rightarrow V_S = 3i + v_a$ (1)

KCL 2 : $i = b\, v_a$ (2)

(2) in (1) : $V_S = 3b v_a + v_a = 7 \cdot v_a \Rightarrow \boxed{v_a = 1\,V}$

$\overset{(2)}{\Rightarrow} i = 2 \cdot v_a = 2\,A$

KVL 3 : $v_a = R \cdot i + v_2 \Rightarrow v_2 = 1 - 2 \cdot i = -3\,V$



PASSIVE SIGN CONVENTION

$P = (-3) \cdot 2 = -6$

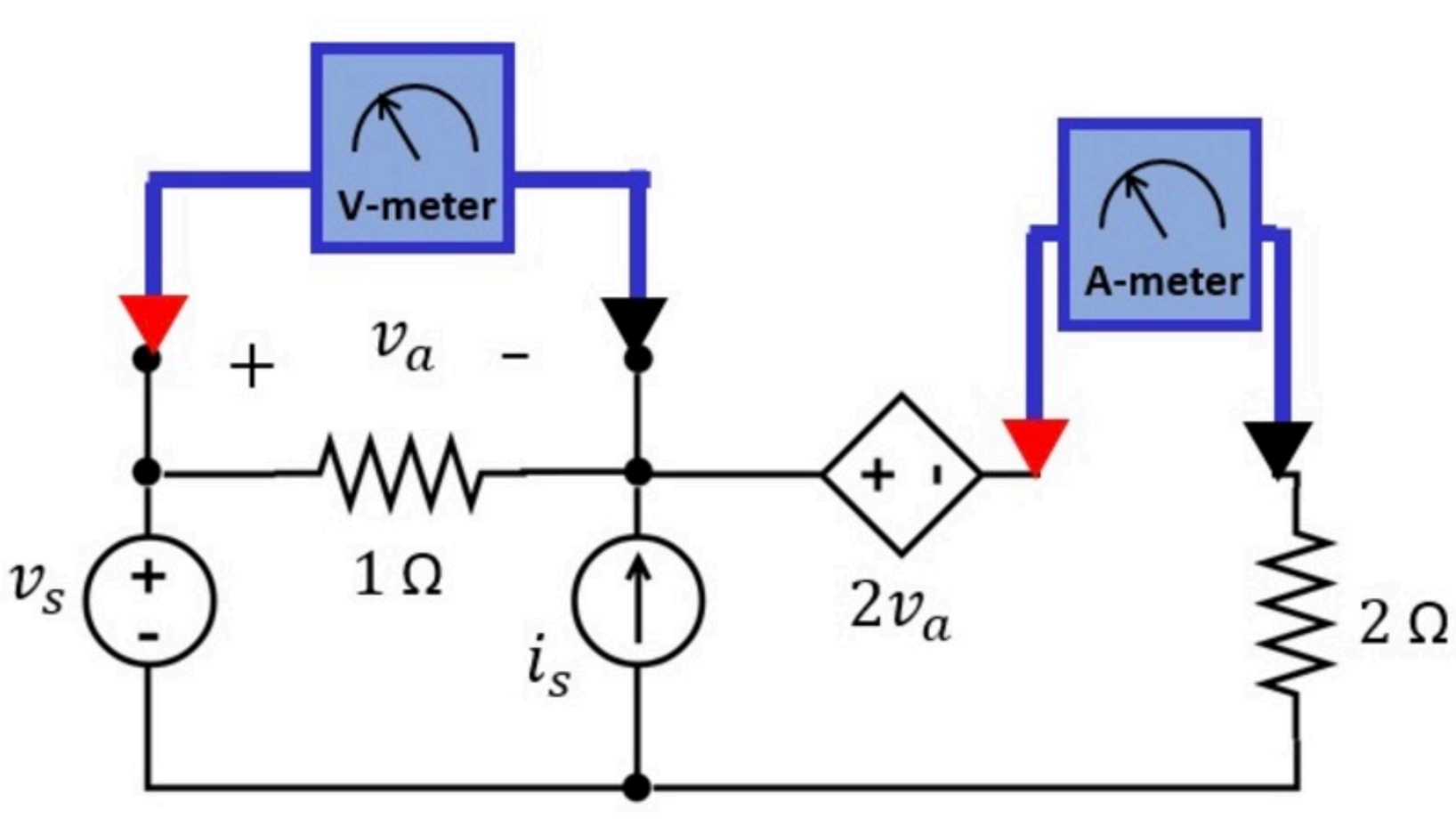
$\boxed{P = -6\,W \quad \text{RECEIVED}}$

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.

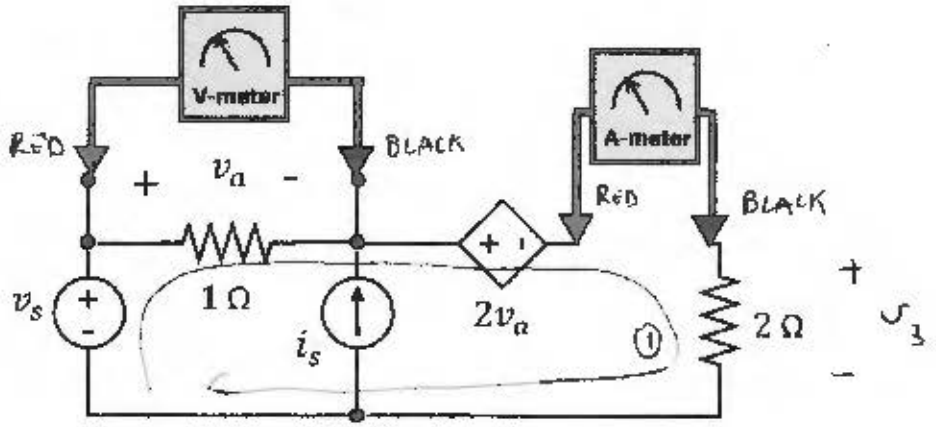
What is the power P supplied by the VCVS?

What is the value of the current source i_s?

What is the value of the voltage source v_s?

X = 6 V

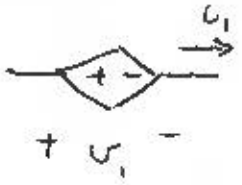
Y = 3 A



(a) $v_a = X = 6$

$i_1 = Y = 3$

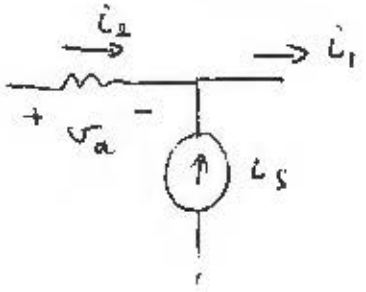
$v_1 = 2v_a = 12$



$P = v_1 \cdot i_1 = 36$ 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

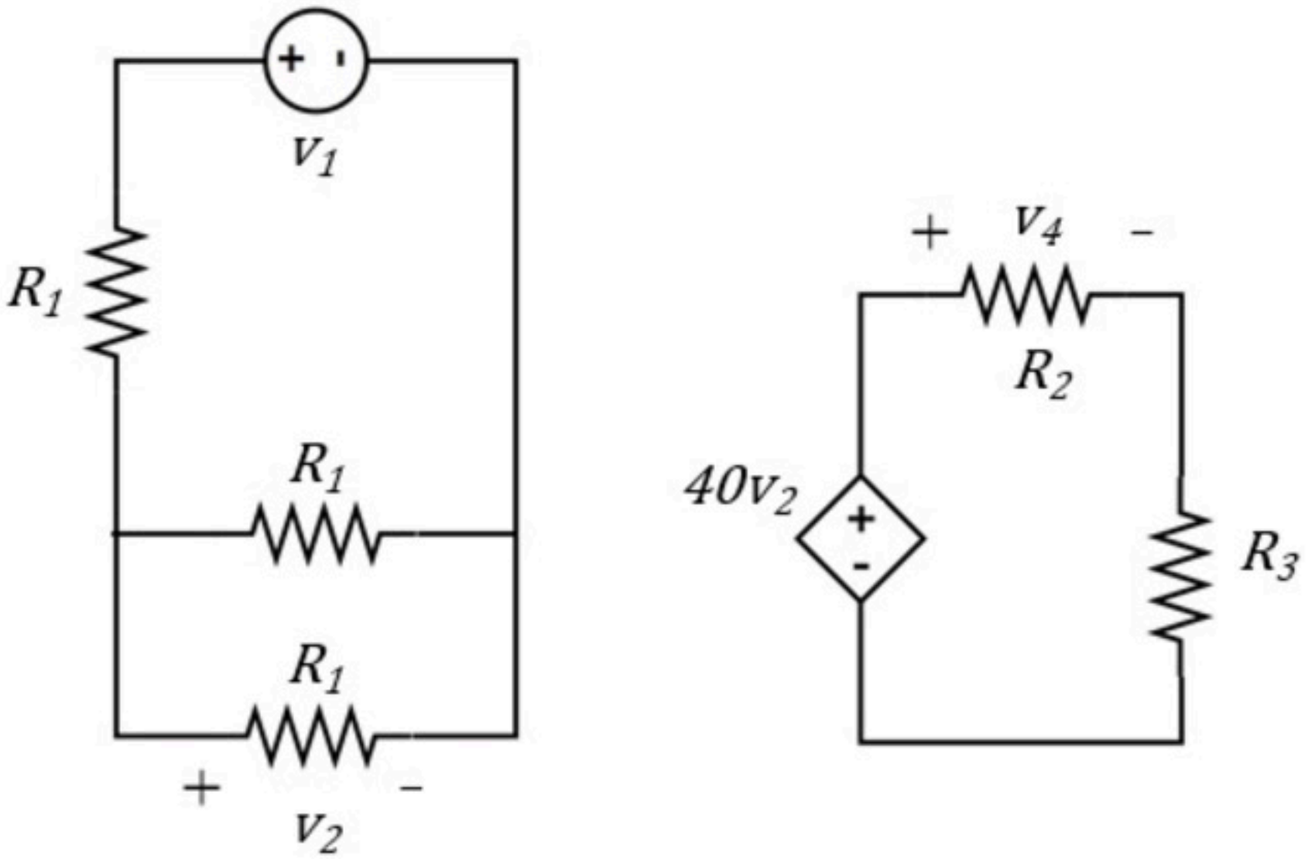
$v_s = 24$ V

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) :

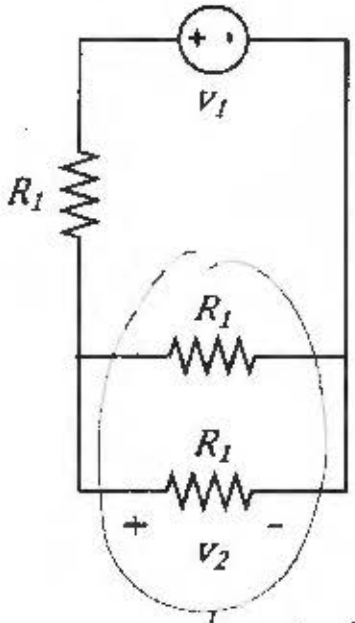
In this circuit, v_1 is an input, but you don't know what its value is. Find v_4 as a function of v_1.

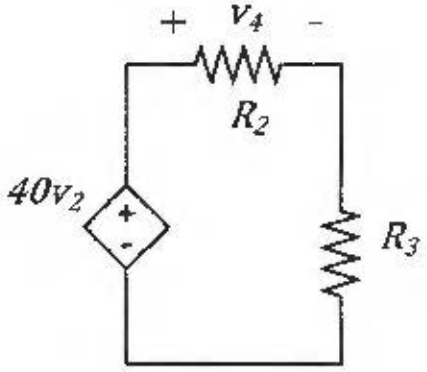
More specifically, find $X = \frac{v_4}{v_1}$.

R1 = 20 Ω

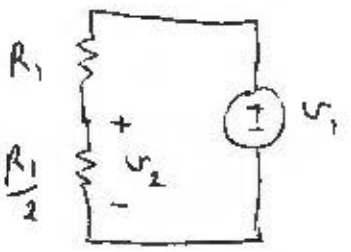
R2 = 12 Ω

R3 = 20 Ω



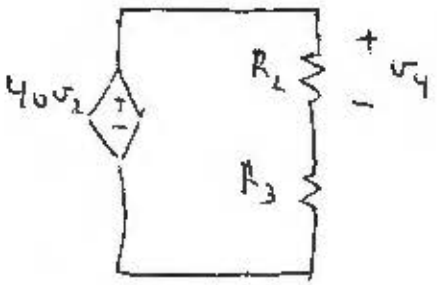


$\hookrightarrow R_1 // R_1 = \left(\frac{1}{R_1} + \frac{1}{R_1}\right)^{-1} = \left(\frac{2}{R_1}\right)^{-1} = \frac{R_1}{2}$



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

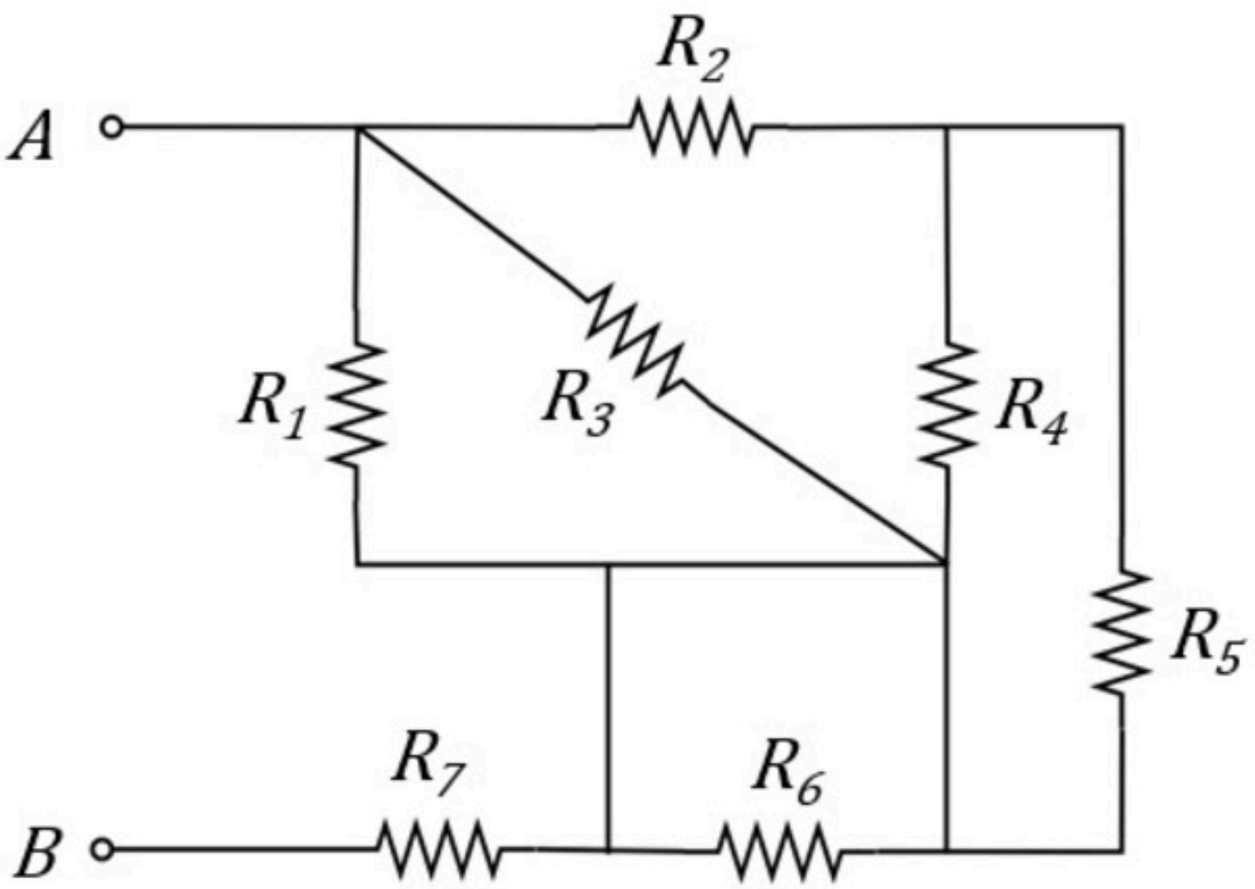
$$v_4 = 40\, v_2 \cdot \frac{R_2}{R_2 + R_3} = \frac{40}{3} \cdot \frac{v_1}{3} \cdot \frac{12}{32} = 5\, v_1$$

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

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

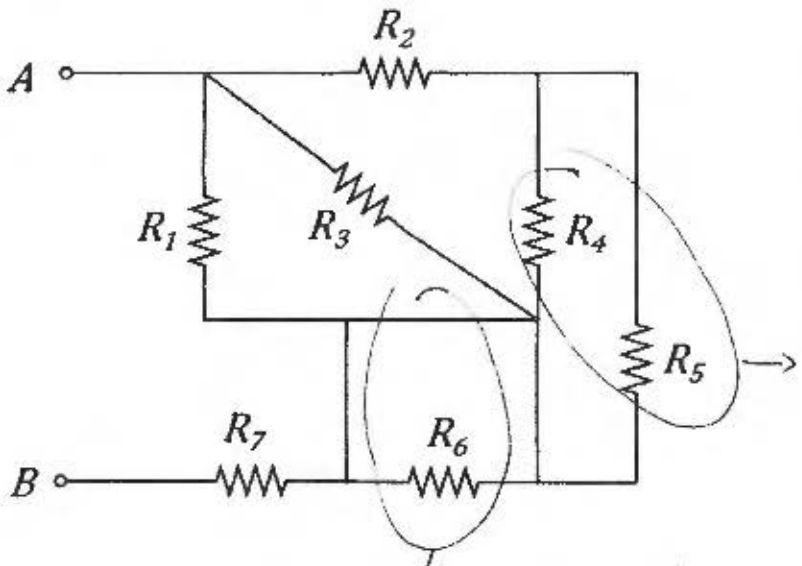
R2 = 4 Ω

R4 = 40 Ω

R5 = 10 Ω

R6 = 12 Ω

$R_7 = 5\,\Omega$



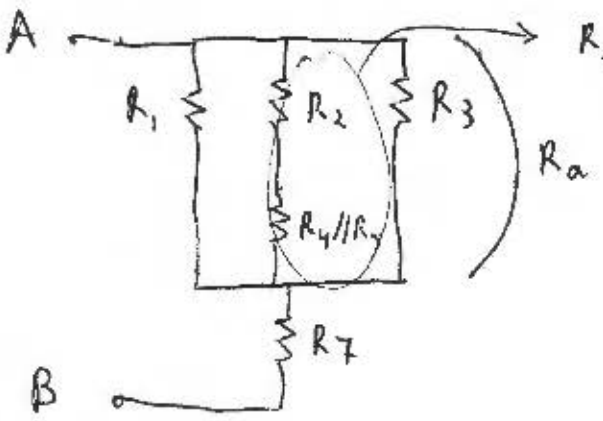
$R_4 // R_5$

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

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

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

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



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

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

$= 3\,\Omega$

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

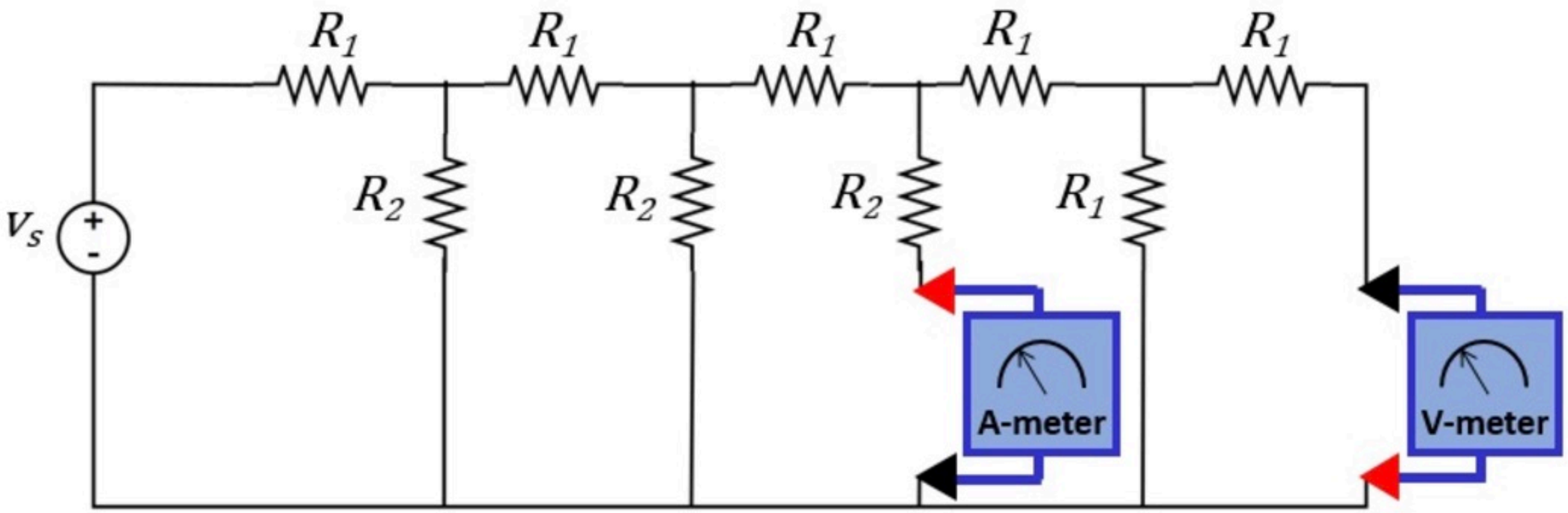
$$\frac{1}{R_3} = \frac{1}{R_a} - \frac{1}{R_1} - \frac{1}{12} = \frac{1}{3} - \frac{1}{6} - \frac{1}{12} = \frac{4-2-1}{12}$$

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

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

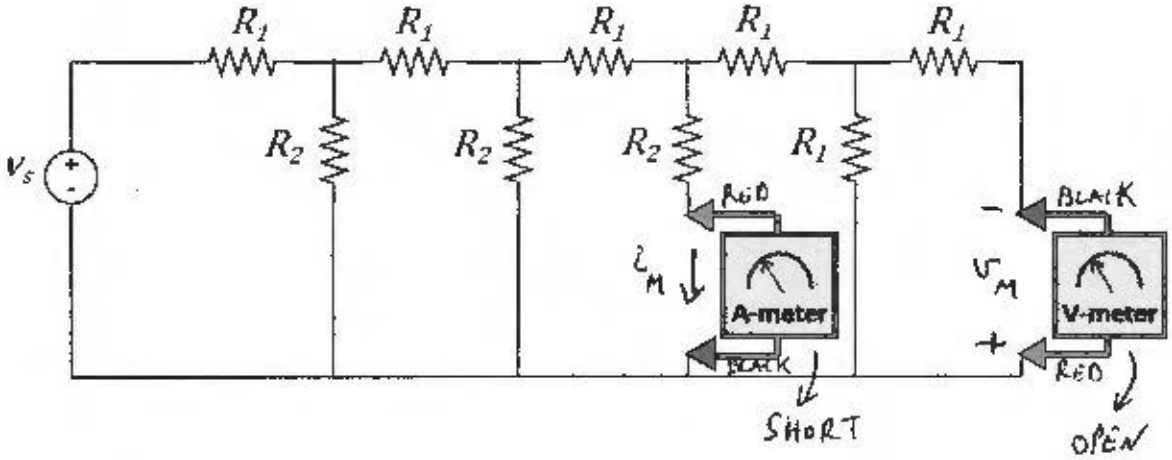
Calculate the following:

X (A) :

Y (V) :

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

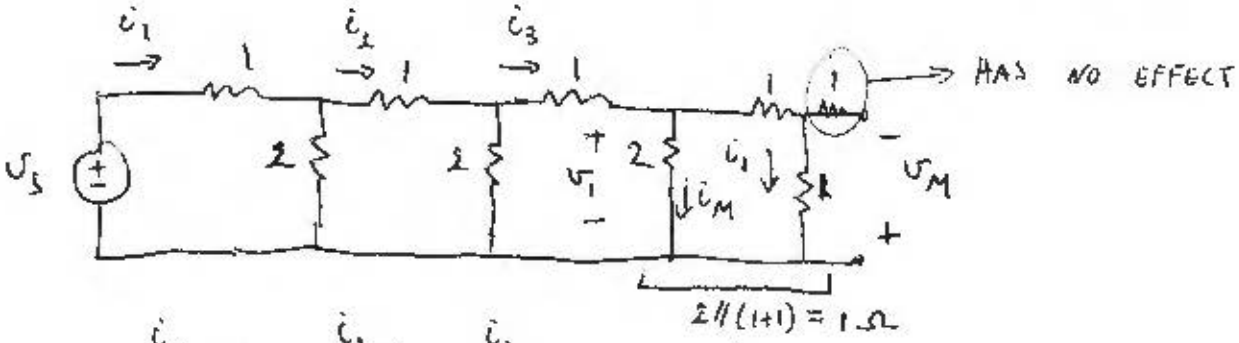
Find the ammeter reading *X* and the volt-meter reading *Y*.

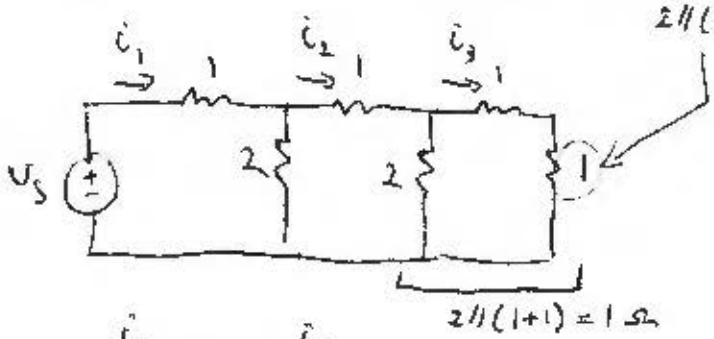


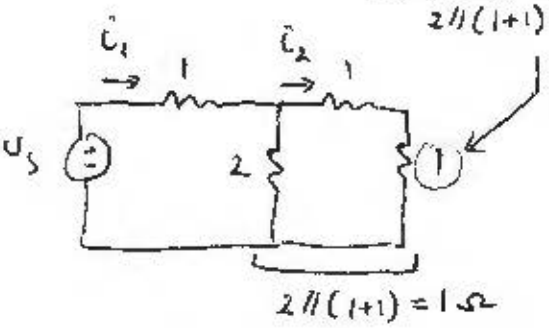
vs = 80 V

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

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

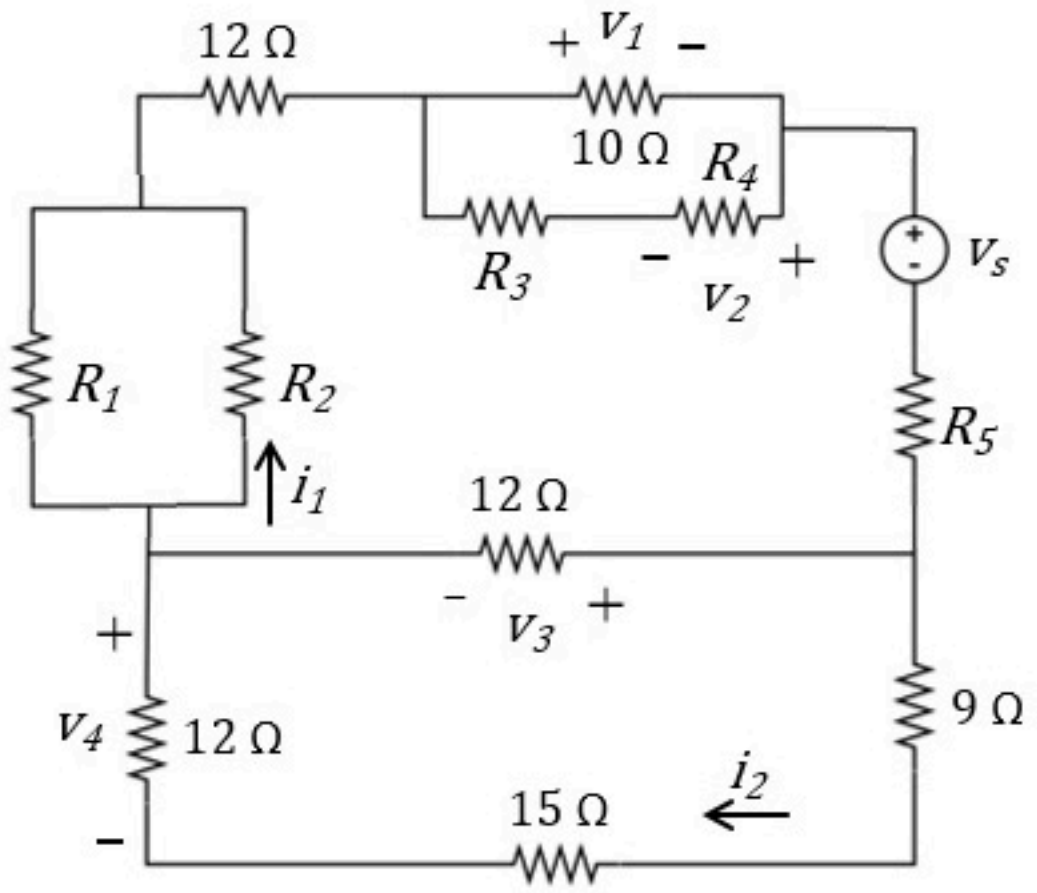
$$i_1 = i_M = 5 \Rightarrow -v_M = 1 \cdot i_1 = 5$$

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) :

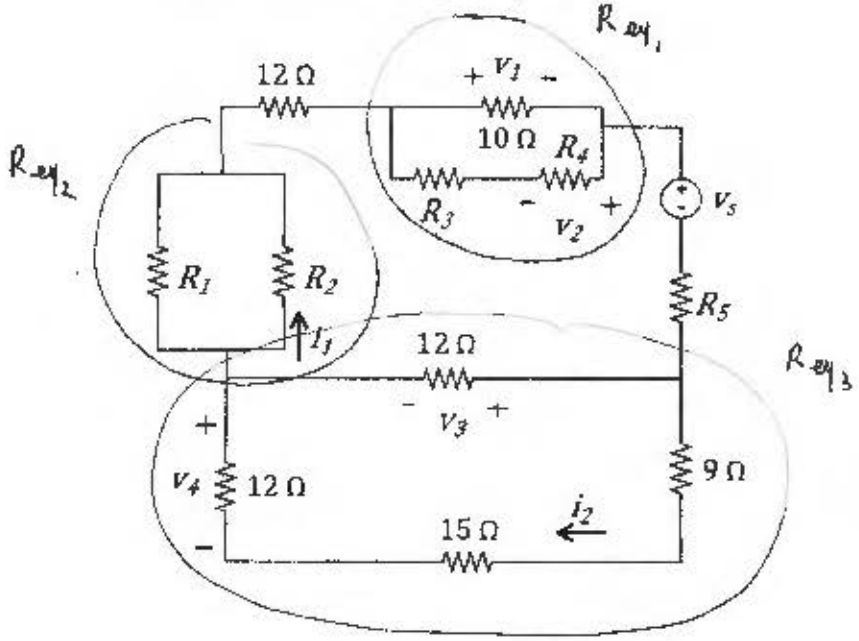
---

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

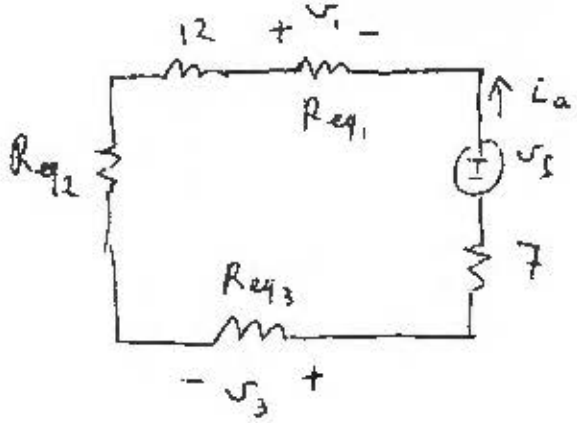
R4 = 12 Ω

R5 = 7 Ω

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

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

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



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

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

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

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

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

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

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

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

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

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

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

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

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

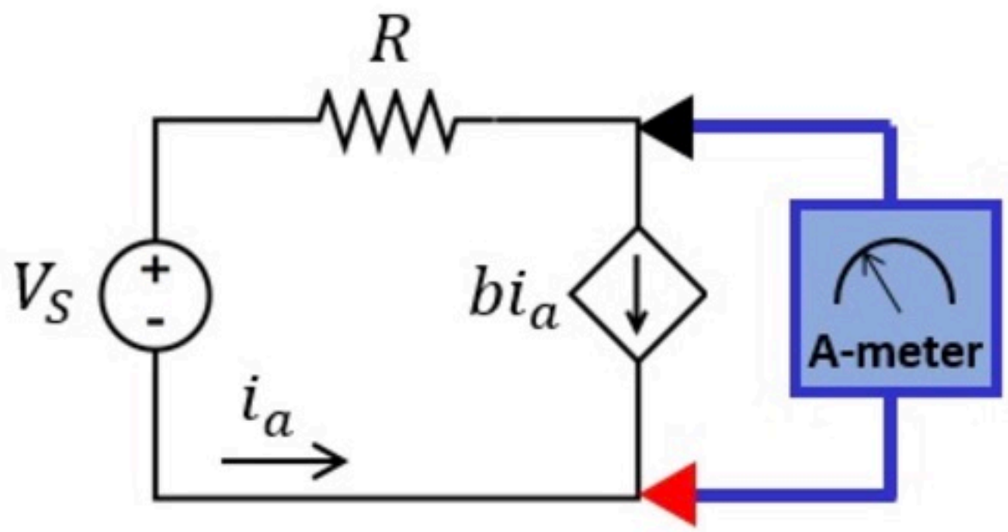
$$\boxed{i_2 = -0.5\,A}$$

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.

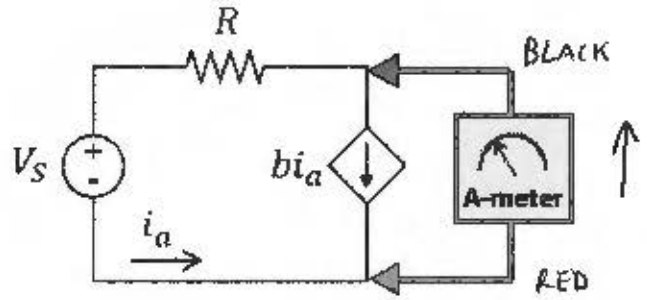
(a) What is the reading *X* from the ammeter?

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

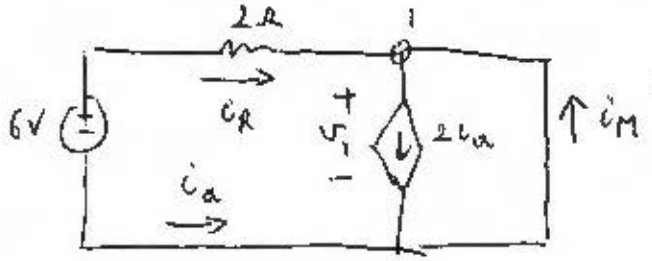
$V_S = 6\,V$

$R = 2\,\Omega$

$b = 2\,A/A$



(a)



AMMETER EQUIVALENT TO A SHORT

$\Rightarrow v_1 = 0V$

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

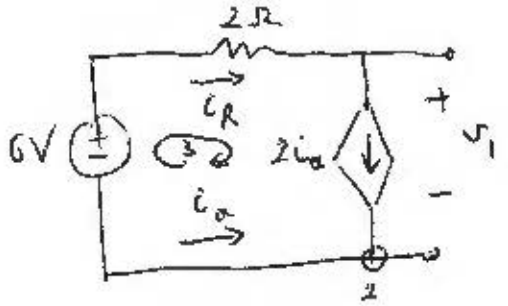
$\Rightarrow i_a = -i_R = -3A$

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

$\Rightarrow i_R = 0$

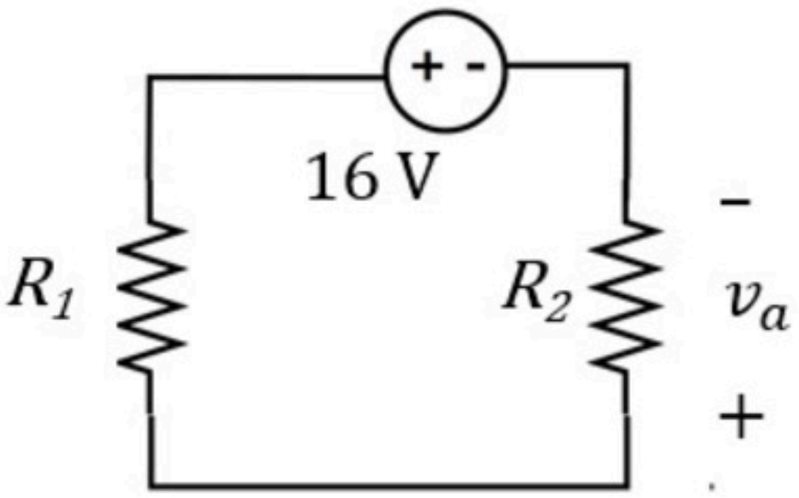
KVL 3 : $6V = i_R \cdot 2 + v_1 \Rightarrow v_1 = 6V$

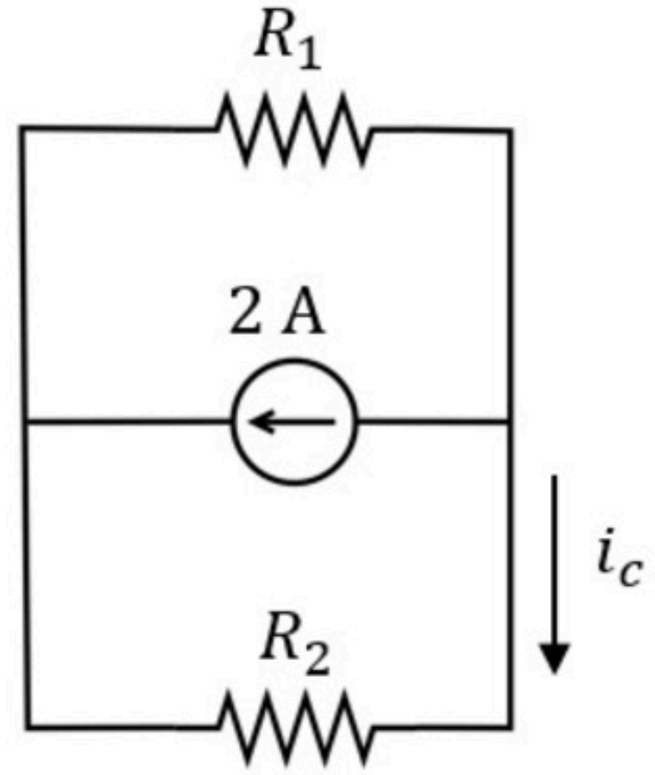
$\boxed{Y = 6V}$

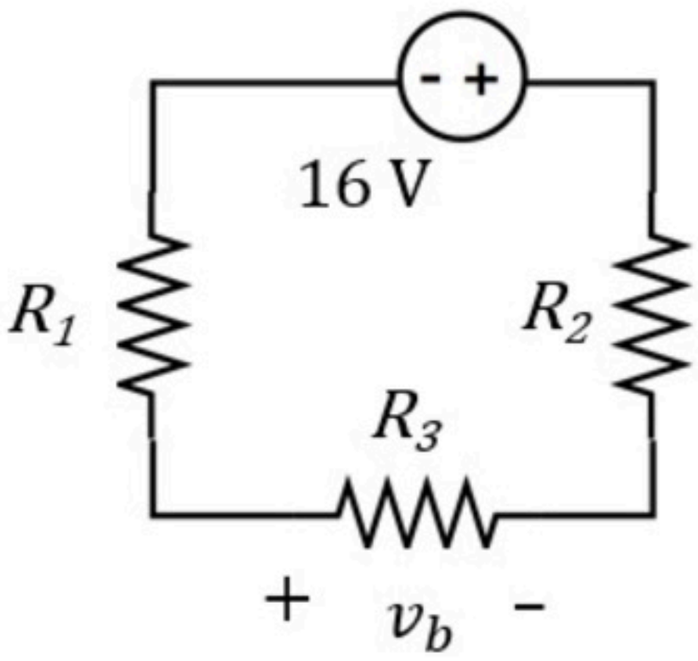
Basic Analysis 015

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) :

---

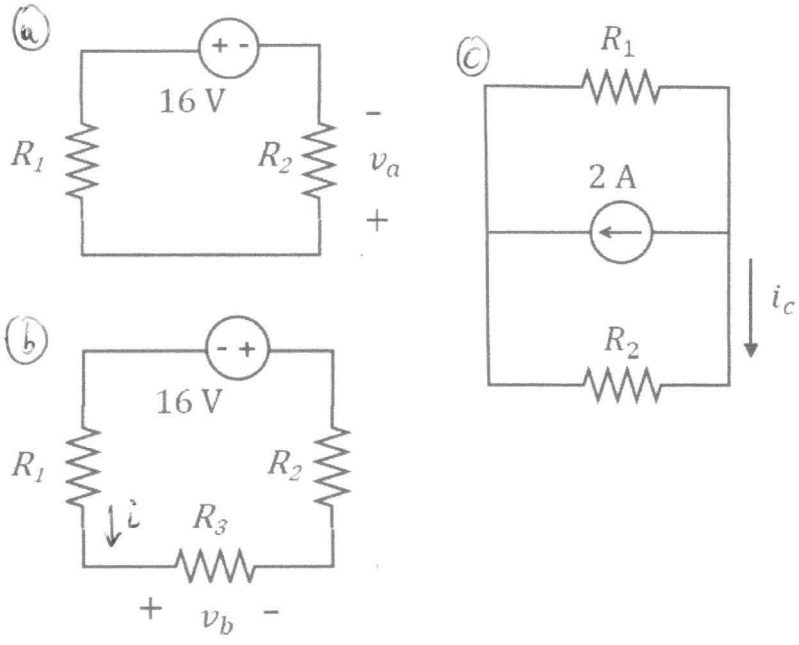
ic (A) :

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

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

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

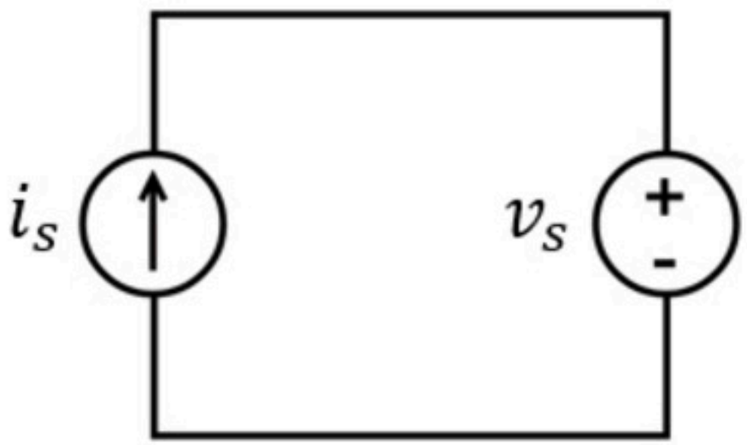
(c) CURRENT DIVIDER: $i_c = (-2) \frac{R_1}{R_1+R_2} = (-2) \cdot \frac{2}{2+6} = -0.5$

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

Basic concepts 007

Problem has been graded.

Find the power P_1 supplied by the current source and the power P_2 supplied by the voltage source.



Given Variables:

v_s : 10 V

i_s : 6 A

Calculate the following:

P_1 (W) :

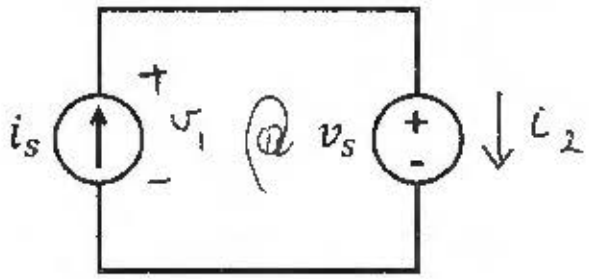
P_2 (W) :

> Hint: The voltage across a current source can be non-zero

Find the power P_1 supplied by the current source and the power P_2 supplied by the voltage source.

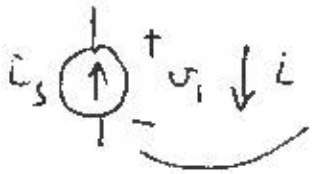
Vs = 10 V

Is = 4 A



KVL ① : $v_1 = v_s = 10\,V$

KCL : $i_2 = i_s = 4\,A$

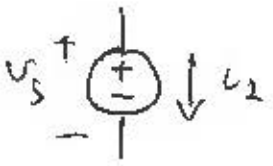


for passive sign convention

$P_1 = v_1 \cdot i = 10\,(-4) = -40\,W$ received

$i = -i_s = -4A$

$P_1 = 40\,W$ supplied



already passive sign convention

$P_2 = v_s \cdot i_2 = 10\ 4 = 40\,W$ received

$P_2 = -40\,W$ supplied

Check : $\sum P_{\text{received}} = \sum P_{\text{supplied}} \Rightarrow 0 = 40 - 40$

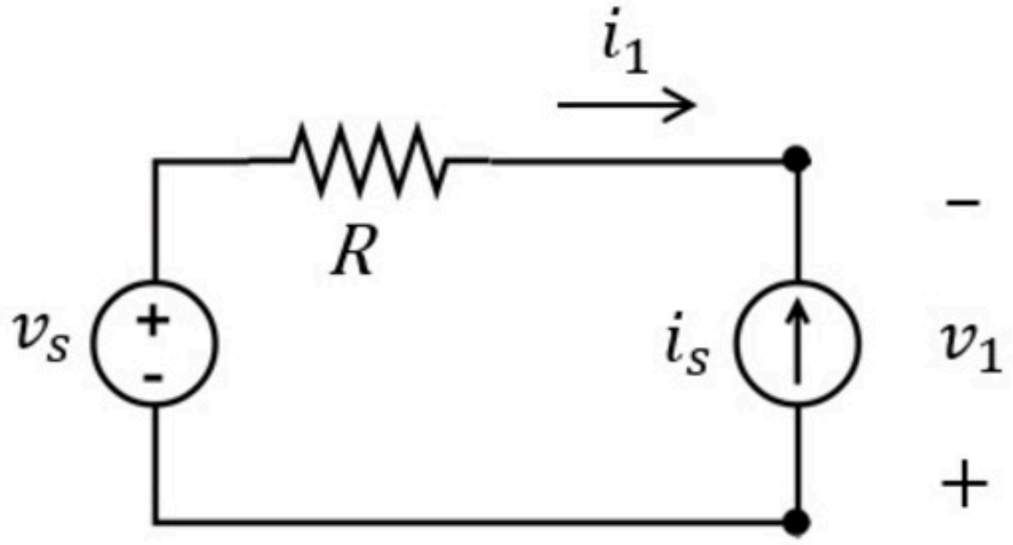
OK

Basic Concepts 008b

Problem has been graded.

The current source supplies 100 W of power.

What is the current i_1?
What is the voltage v_1?
What is the value of the voltage source v_s?



Given Variables:

R : 5 ohm

i_s : 10 A

Calculate the following:

i1 (A) :

---

v1 (V) :

---

vs (V) :

> Hint: Check the signs

The current source supplies 100 W of power.

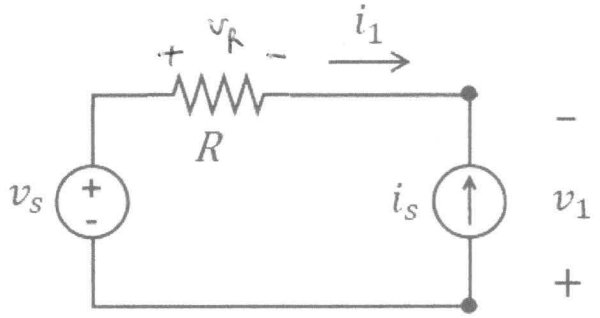
What is the current i_1?

What is the voltage v_1?

What is the value of the voltage source v_s?

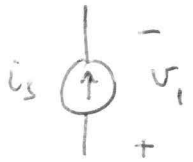
R = 2 Ω

is = 25 A



$i_1 = -i_s$

$\boxed{i_1 = -25\ A}$



PASSIVE SIGN CONVENTION

$P = 100W$ SUPPLIED $\Rightarrow$ $P = -100W$ RECEIVED

$= i_s \cdot v_1$

$\Downarrow$

$v_1 = \frac{-100}{25} = -4V$

$\boxed{v_1 = -4V}$

KVL: $v_s + v_1 = v_R$

$v_s = v_R - v_1 = R \cdot i_1 - v_1 = 2(-25) - (-4)$

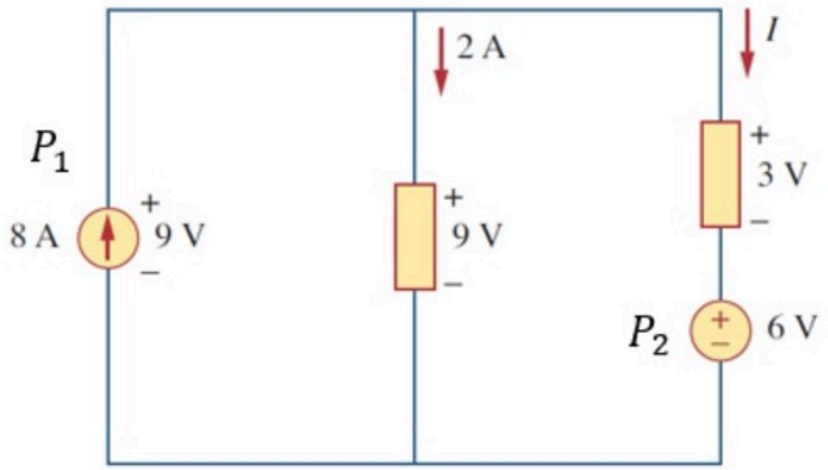
$= -50 + 4 = -46$

$\boxed{v_s = -46\ V}$

PP - Basic concepts 009

Problem has been graded.

Find the power supplied by the current source and the voltage source.



Given Variables:

. : . .

Calculate the following:

P1 (W) :

72 ✓

P2 (W) :

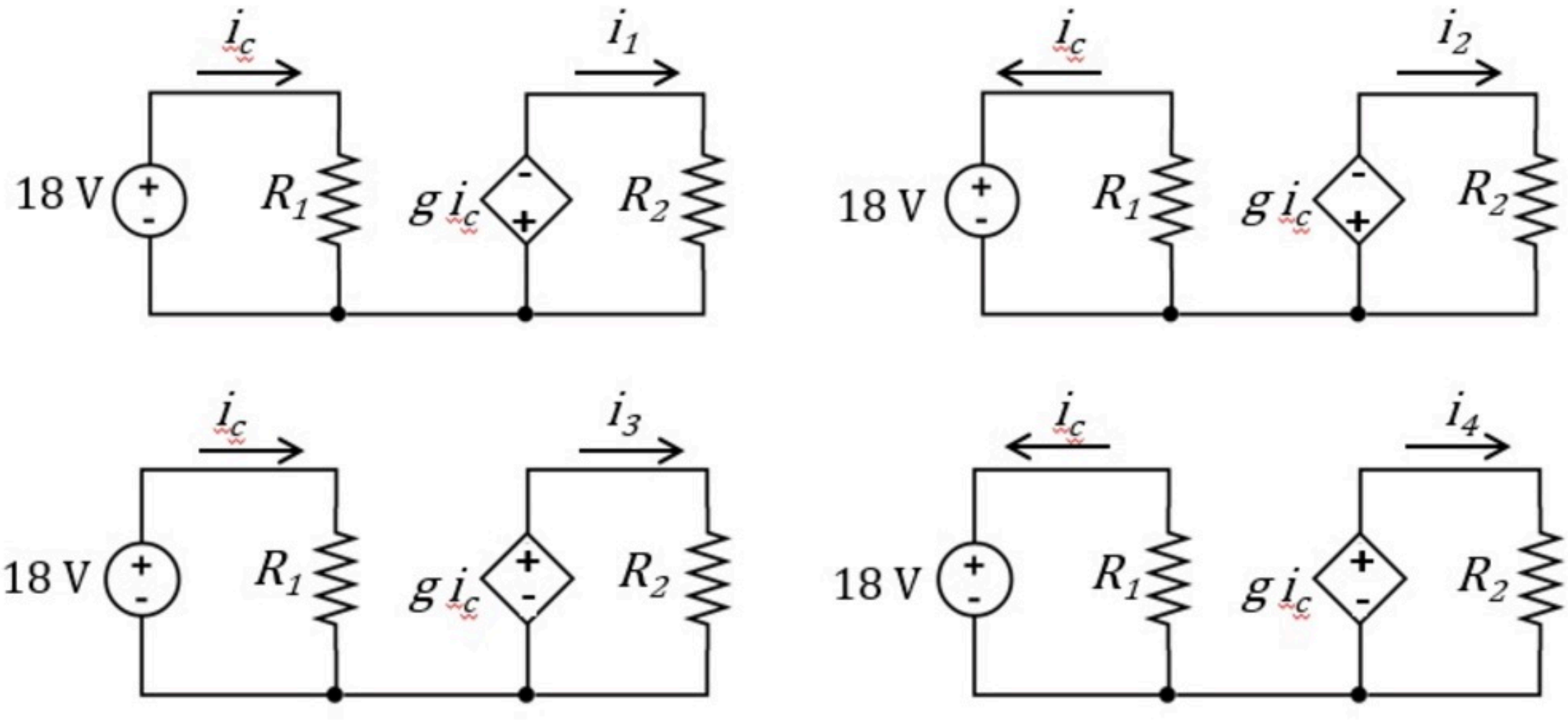
-36 ✓

Hint: Use KCL to find the missing current

Basic concepts 010

Problem has been graded.

Find the currents i_1, i_2, i_3 and i_4.



Given Variables:

R_1 : 4 ohm

R_2 : 9 ohm

g : 6 V/A

Calculate the following:

i_1 (A) :

---

i_2 (A) :

---

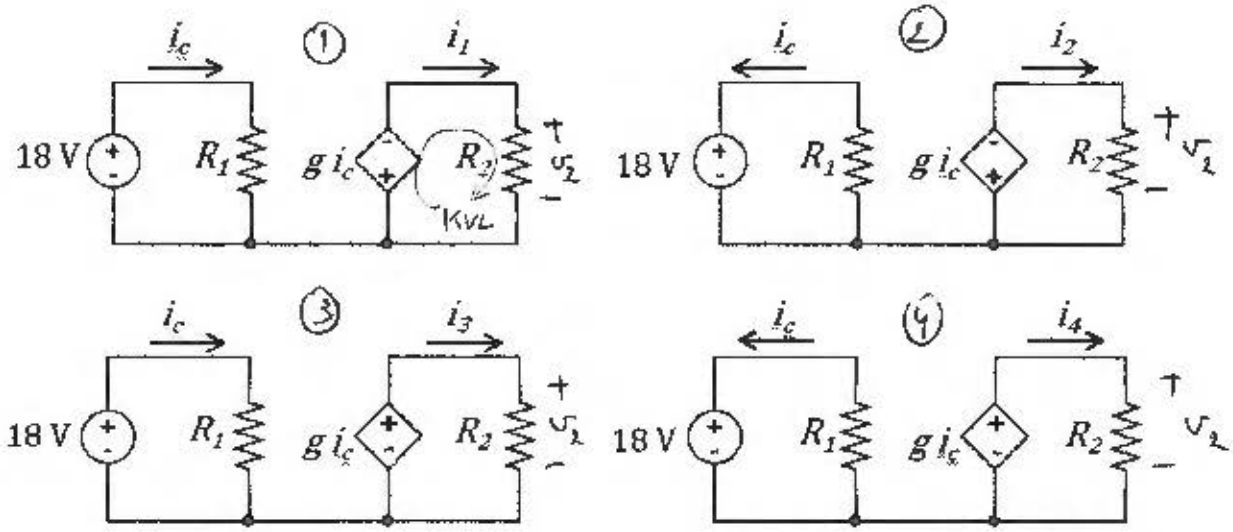
i_3 (A) :

---

i_4 (A) :

Hint: Check the signs of the sources and the current arrows

Find the currents i_1, i_2, i_3 and i_4.



R1 = 4 Ω

R2 = 3 Ω

g = 2 V/A

in ①: $i_c = \frac{18}{R_1} = 4.5\ A$

KVL in right part: $g i_c + v_2 = 0$

$\Rightarrow v_2 = -g i_c = -9\ V$

$i_1 = \frac{v_2}{R_2} = \frac{-9}{3} \Rightarrow \boxed{i_1 = -3\ A}$

in ②: $i_c = -4.5\ A$

$v_2 = -g i_c = 9\ V$

$i_2 = \frac{v_2}{R_2} = \frac{9}{3}$

$\boxed{i_2 = 3\ A}$

in ③: $i_c = 4.5\ A$

$v_2 = g i_c = 9\ V$

$i_3 = \frac{v_2}{R_2} = \frac{9}{3}$

$\boxed{i_3 = 3\ A}$

in ④: $i_c = -4.5\ A$

$v_2 = g i_c = -9\ V$

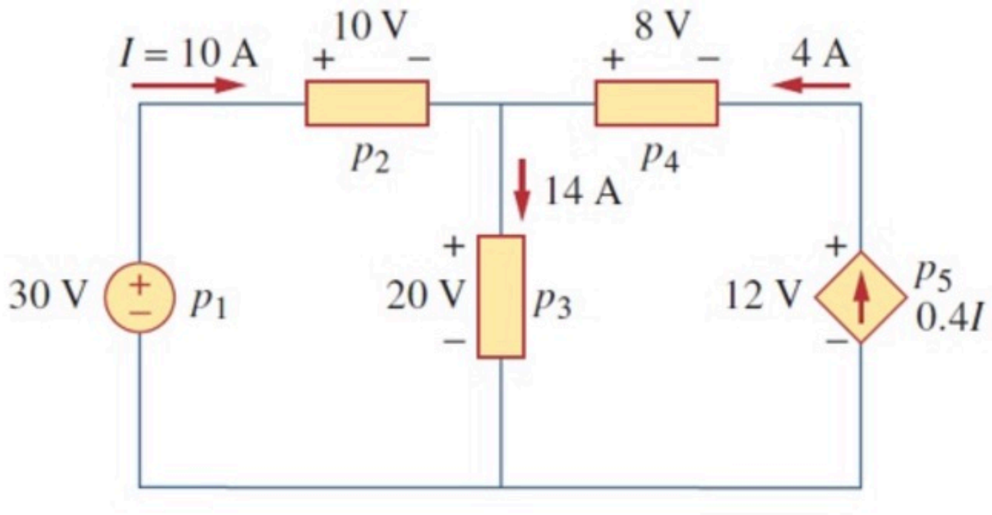
$i_4 = \frac{v_2}{R_2} = \frac{-9}{3}$

$\boxed{i_4 = -3\ A}$

PP - Basic concepts 010

Problem has been graded.

Find the power supplied by each of the elements.



Given Variables:

. : . .

Calculate the following:

p1 (W) :

300 ✓

p2 (W) :

-100 ✓

p3 (W) :

-280 ✓

p4 (W) :

32 ✓

p5 (W) :

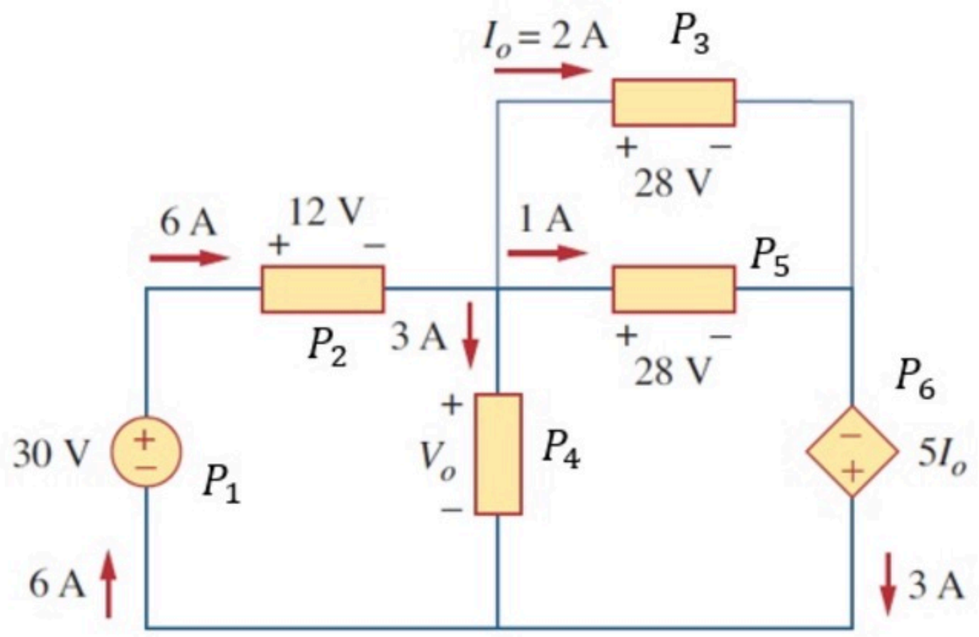
48 ✓

Hint: Check with conservation of power.

PP - Basic concepts 011

Problem has been graded.

Find the power received by each of the elements.



Given Variables:

. : . .

Calculate the following:

P1 (W) :

-180 ✓

P2 (W) :

72 ✓

P3 (W) :

56 ✓

P4 (W) :

54 ✓

P5 (W) :

28 ✓

P6 (W) :

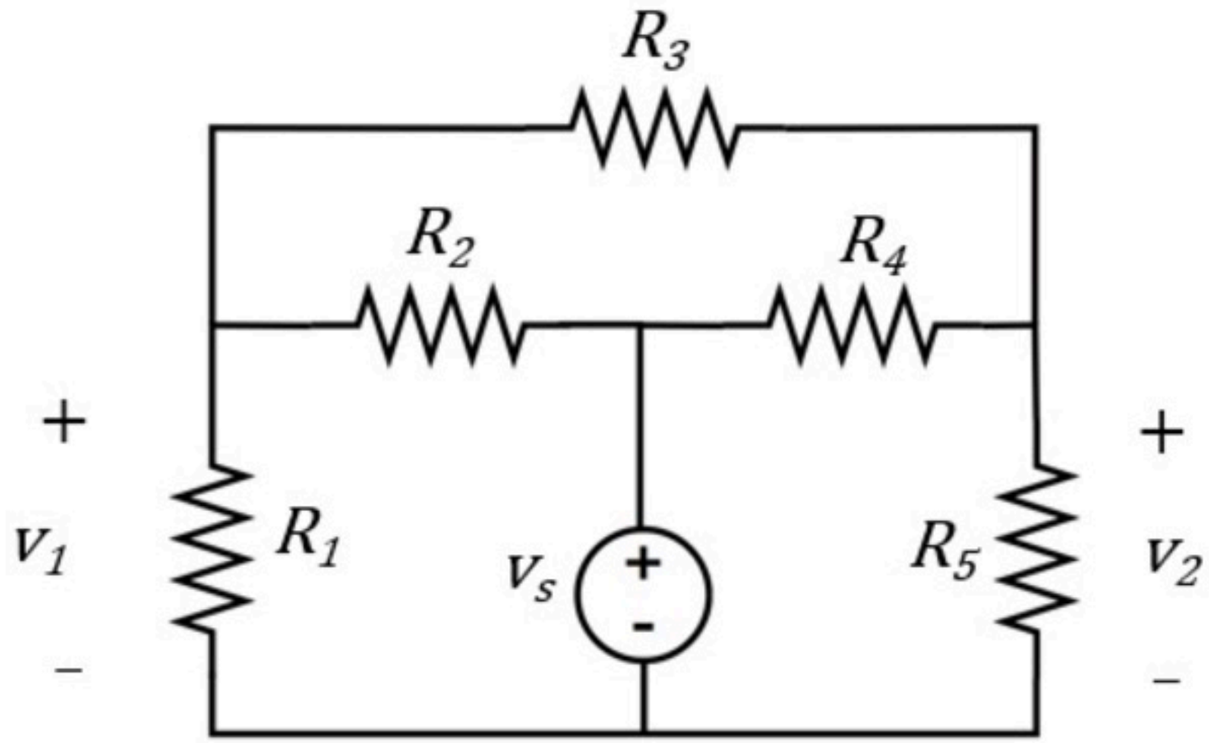
-30 ✓

Hint: Use KVL. Check with conservation of power.

Basic Analysis 001b

Problem has been graded.

We measure v_1 and v_2.
Determine the values of resistances R_2 and R_3.



Given Variables:

R1 : 12 ohm

R4 : 12 ohm

R5 : 2 ohm

vs : 30 V

v1 : 12 V

v2 : 6 V

Calculate the following:

R2 (ohm) :

R3 (ohm) :

> Hint: Find the currents and use Ohm's Law.

We measure v_1 and v_2.
Determine the values of resistances R_2 and R_3.

R1 = 12 Ω

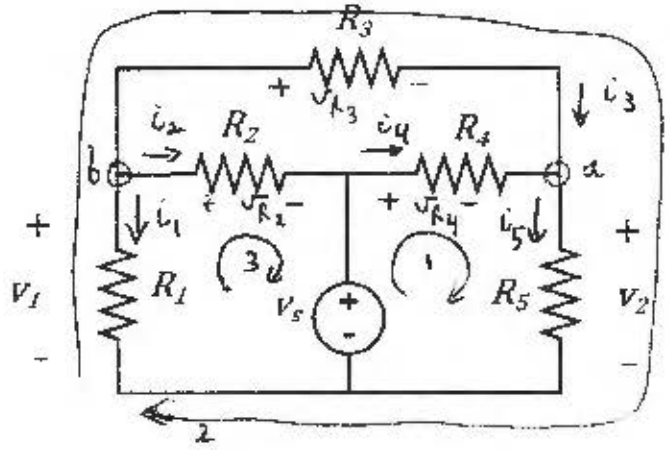
R4 = 9 Ω

R5 = 2 Ω

vs = 24 V

v1 = 12 V

v2 = 6 V



$$i_1 = \frac{v_1}{R_1} = \frac{12}{12} = 1 \qquad i_5 = \frac{v_2}{R_5} = \frac{6}{2} = 3$$

KVL 1: $v_s = v_{R_4} + v_2 \Rightarrow v_{R_4} = v_s - v_2 = 24 - 6 = 18$

$$i_4 = \frac{v_{R_4}}{R_4} = \frac{18}{9} = 2$$

KCL a: $i_3 + i_4 = i_5 \Rightarrow i_3 = i_5 - i_4 = 3 - 2 = 1$

KVL 2: $v_1 = v_{R_3} + v_2 \Rightarrow v_{R_3} = v_1 - v_2 = 6$

$$R_3 = \frac{v_{R_3}}{i_3} = \frac{6}{1} \Rightarrow \boxed{R_3 = 6\ \Omega}$$

KCL b: $i_1 + i_2 + i_3 = 0 \Rightarrow i_2 = -i_1 - i_3 = -1 - 1 = -2$

KVL 3: $v_1 = v_{R_2} + v_s \Rightarrow v_{R_2} = v_1 - v_s = 12 - 24 = -12$

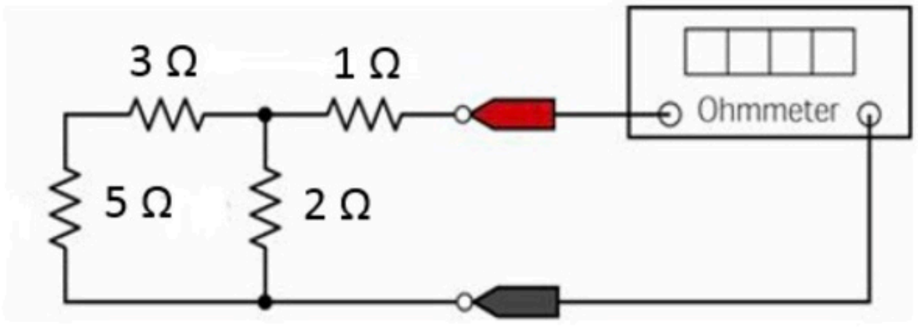
$$R_2 = \frac{v_{R_2}}{i_2} = \frac{-12}{-2} \Rightarrow \boxed{R_2 = 6\ \Omega}$$

PP - Basic analysis 001

Problem has been graded.

This circuit contains an ohmmeter. An ohmmeter is an instrument that measures the equivalent resistance of the circuit connected to its terminals. Note that you can set a multimeter to the ohm-setting to act as an ohmmeter, as you can test in the lab.

Determine the resistance, R, measured by the ohmmeter.



Given Variables:

. : . .

Calculate the following:

R (ohm) :

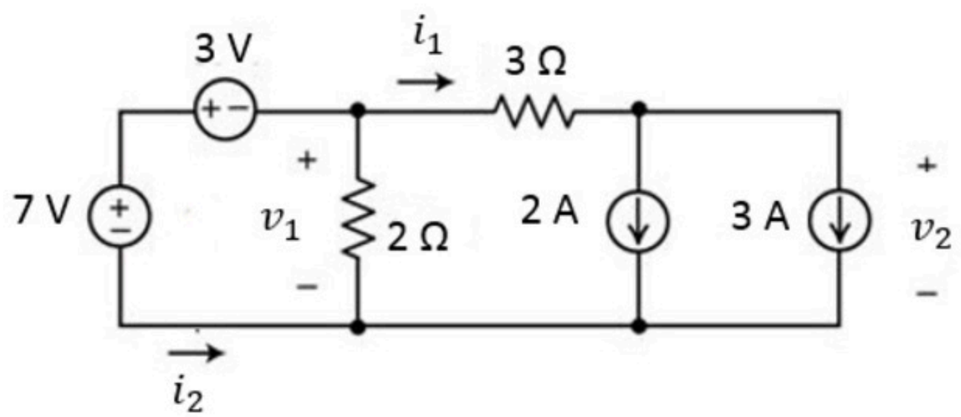
2.6 ✓

Hint: Use series and parallel connection of resistors

PP - Basic analysis 002

Problem has been graded.

Find values of v1, i1, v2 and i2.



Given Variables:

. : . .

Calculate the following:

v1 (V) :

4 ✓

i1 (A) :

5 ✓

v2 (V) :

-11 ✓

i2 (A) :

-7 ✓

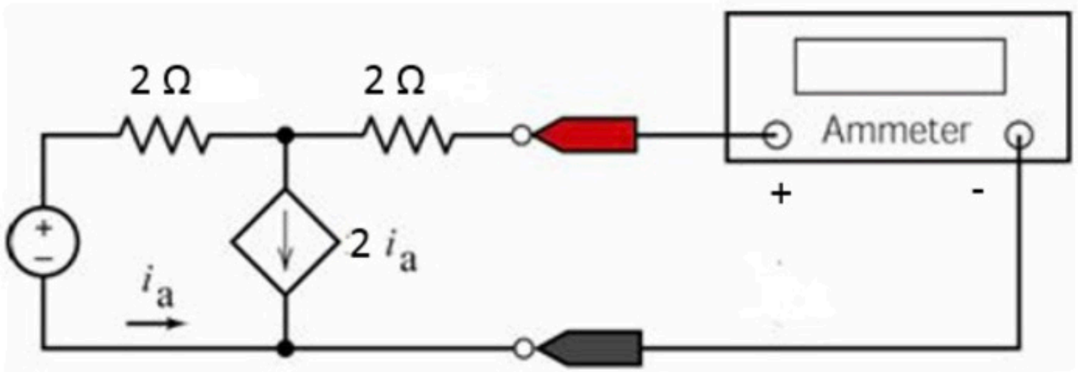
Hint: Use KVL and KCL

PP - Basic analysis 003

Unlimited Attempts.

What is the reading X from the ammeter?

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



Given Variables:

. : . .

Calculate the following:

X (A) :

3 ✓

Y (V) :

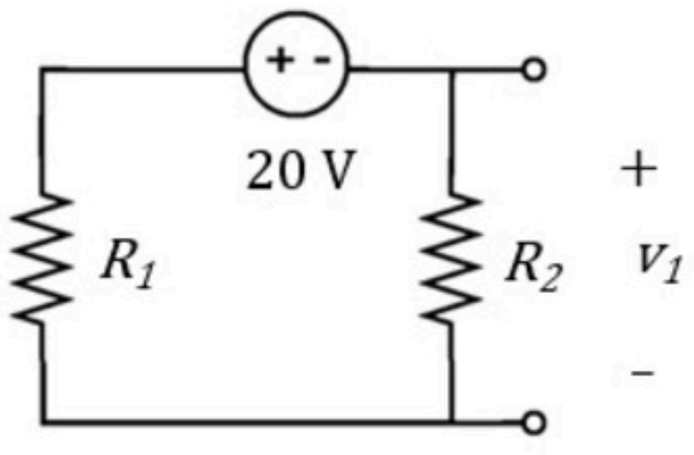
8 ✓

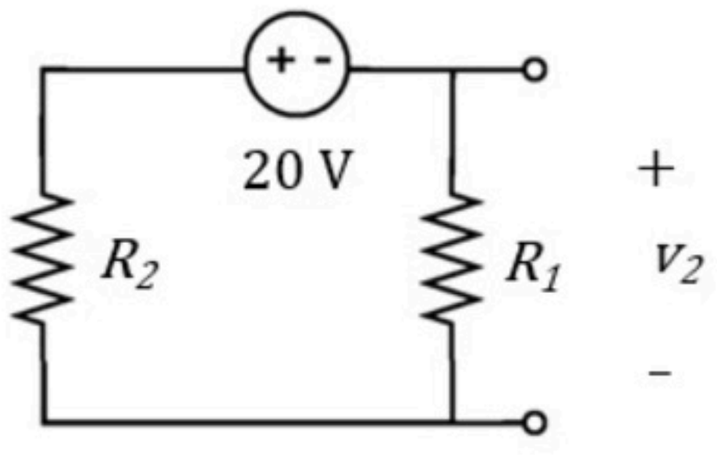
Hint: Ammeters and volt meters behave as short and open circuits respectively

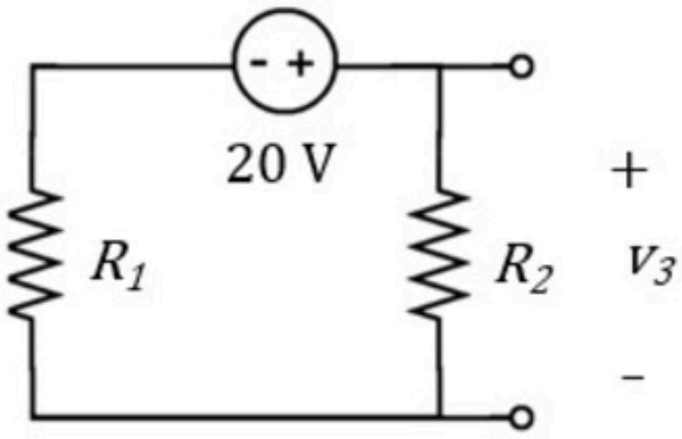
Basic analysis 004

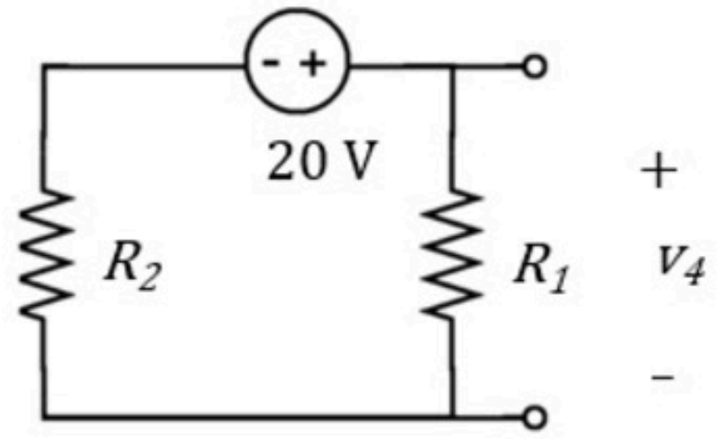
Problem has been graded.

Determine the voltages v_1, v_2, v_3 and v_4









Given Variables:

R1 : 4 ohm

R2 : 6 ohm

Calculate the following:

v1 (V) :

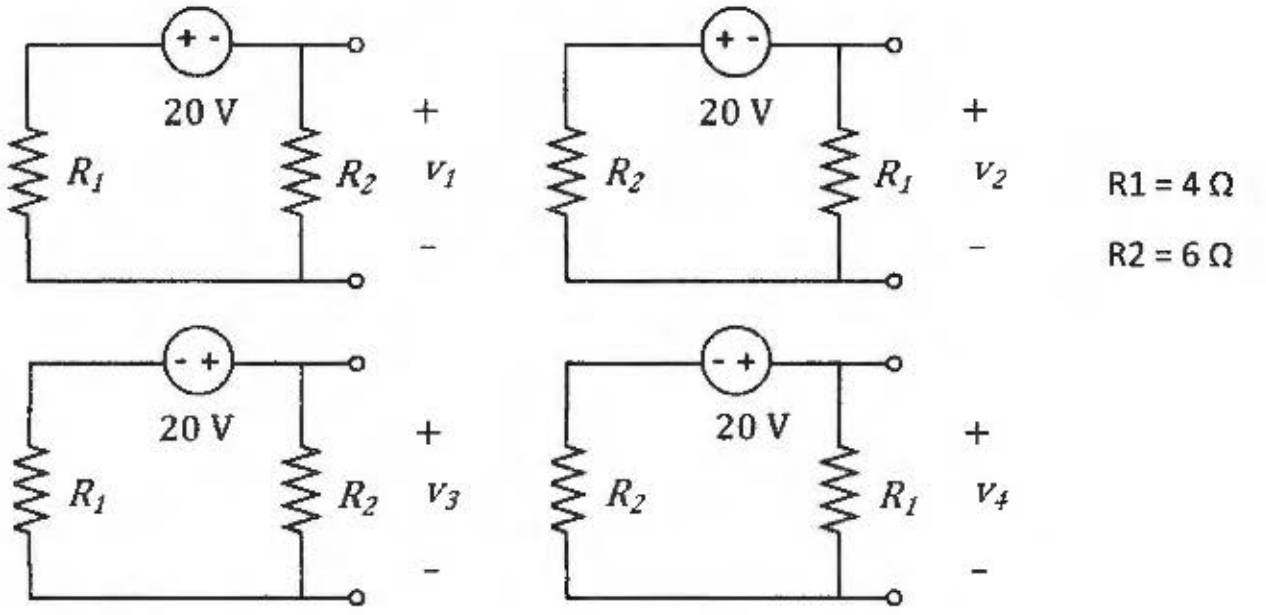
v2 (V) :

v3 (V) :

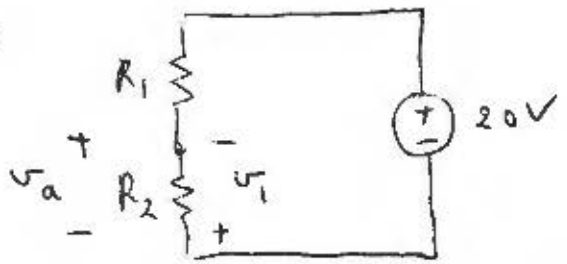
v4 (V) :

Hint: Voltage divider and mind the signs.

Determine the voltages v_1, v_2, v_3 and v_4



(a) VOLTAGE DIVIDER



$$V_a = 20 \cdot \frac{R_2}{R_1 + R_2} = 20 \, \frac{6}{10} = 12 \text{ V}$$

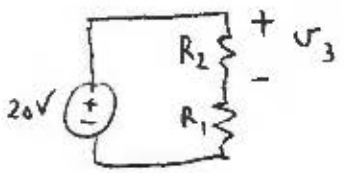
$V_1 = -V_a$

$\boxed{V_1 = -12 \text{ V}}$

(b) SAME IDEA : $V_2 = -20 \cdot \frac{R_1}{R_1 + R_2} = -20 \cdot \frac{4}{10} = -8$

$\boxed{V_2 = -8 \text{ V}}$

(c)



$$V_3 = 20 \cdot \frac{R_2}{R_1 + R_2} = 20 \cdot \frac{6}{10} = 12$$

$\boxed{V_3 = 12 \text{ V}}$

(d) $$V_4 = 20 \cdot \frac{R_1}{R_1 + R_2} = 20 \, \frac{4}{10} = 8$$

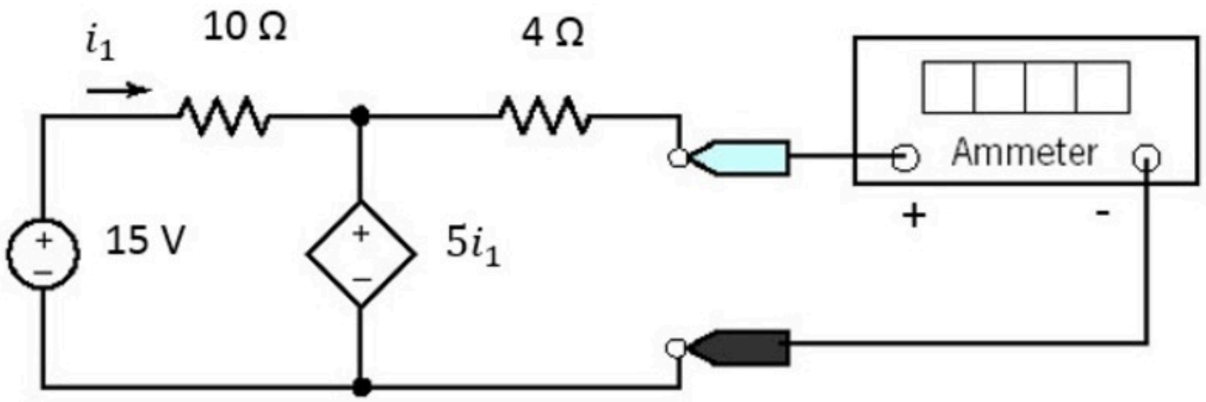
$\boxed{V_4 = 8 \text{ V}}$

PP - Basic analysis 004

Unlimited Attempts.

What is the reading X from the ammeter?

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



Given Variables:

. : . .

Calculate the following:

X (A) :

1.25 ✓

Y (V) :

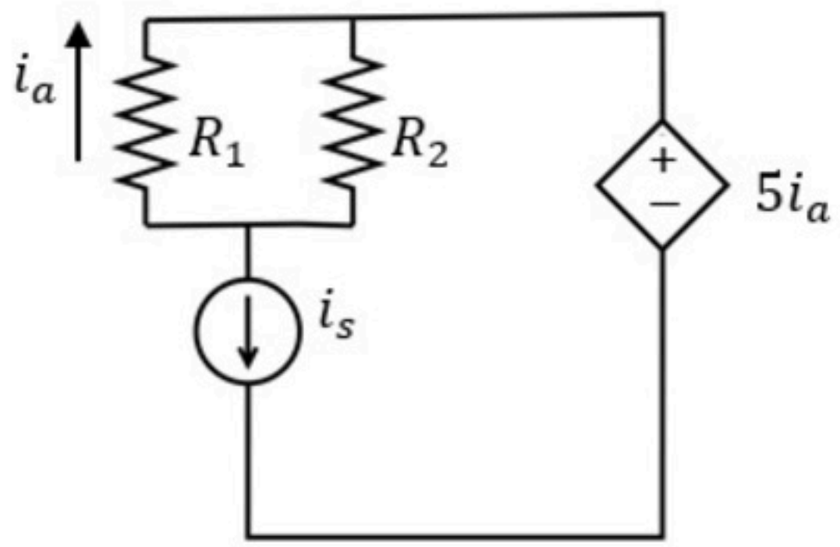
5 ✓

Hint: Ammeters and volt meters behave as short and open circuits respectively

Basic analysis 005

Problem has been graded.

Find the power supplied by the dependent source.



Given Variables:

R1 : 5 ohm

R2 : 20 ohm

is : 5 A

Calculate the following:

P (W) :

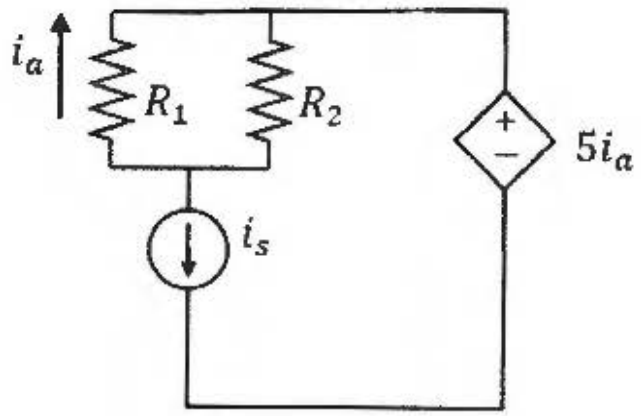
> Hint: Use current divider

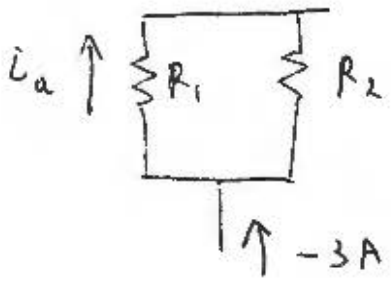
Find the power supplied by the dependent source.

R1 = 14 Ω

R2 = 7 Ω

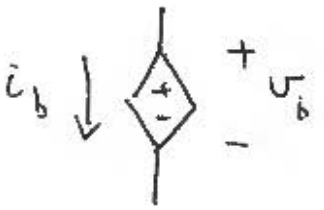
is = 3 A





CURRENT DIVIDER

$$i_a = (-3)\cdot\frac{R_2}{R_1+R_2} = -3\cdot\frac{7}{21} = -1A$$



$$v_b = 5i_a = -5V$$

$$i_b = -i_s = -3A$$

$$P = v_b\, i_b = 15\,W$$ RECEIVED (PASSIVE SIGN CONVENTION)

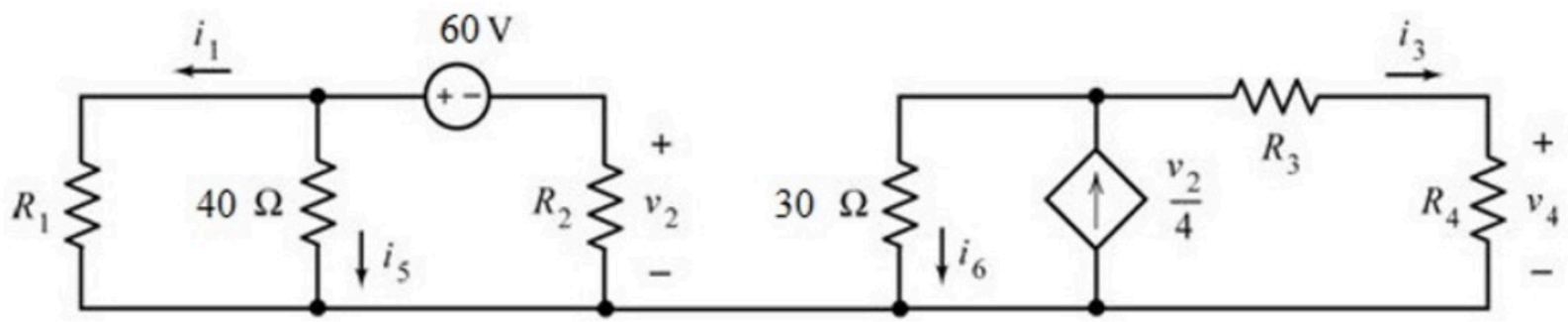
$P = -15W$ SUPPLIED

PP - Basic analysis 005

Problem has been graded.

Someone did measurements on this circuit and found that
i_1 = 1 A, v_2 = -20 V, i_3 = -2 A and v_4 = -30 V.

Find the values of R1, R2, R3 and R4.



Given Variables:

. : . .

Calculate the following:

R1 (ohm) :

40 ✓

R2 (ohm) :

10 ✓

R3 (ohm) :

30 ✓

R4 (ohm) :

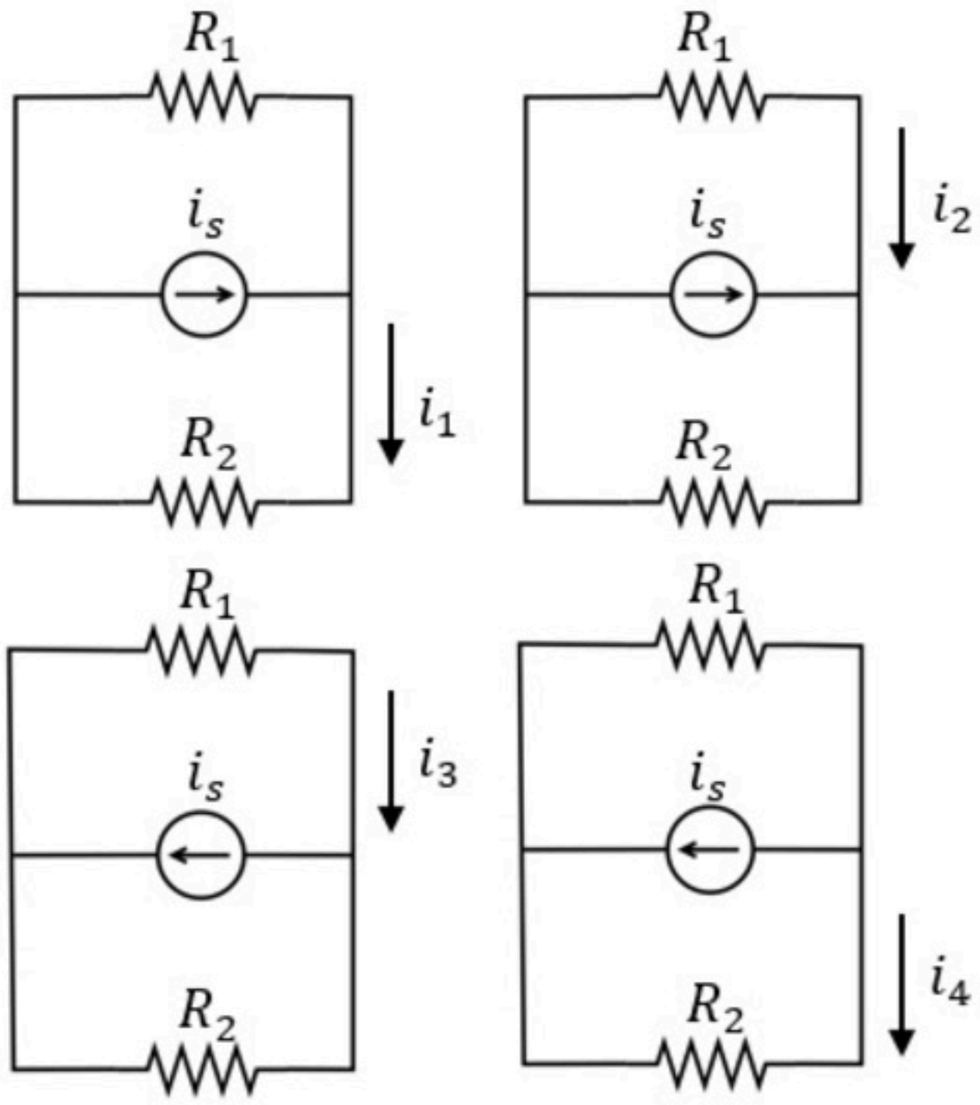
15 ✓

Hint: Use KVL and KCL

Basic analysis 006

Problem has been graded.

Determine the currents i_1, i_2, i_3 and i_4



Given Variables:

R1 : 25 ohm

R2 : 50 ohm

is : 21 A

Calculate the following:

i1 (A) :

---

i2 (A) :

---

i3 (A) :

---

i4 (A) :

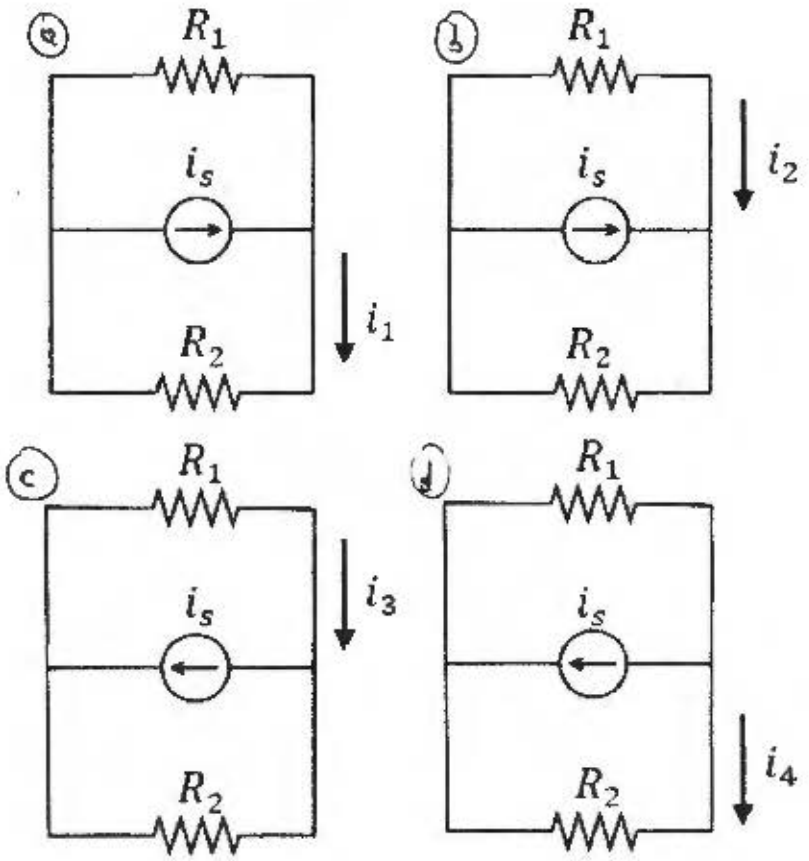
Hint: Use current divider

Determine the currents i_1, i_2, i_3 and i_4

R1 = 30 Ω

R2 = 10 Ω

is = 18 A



(a) CURRENT DIVIDER: $i_1 = i_s \cdot \frac{R_1}{R_1+R_2} = 18\ \frac{30}{40} = 13.5\ A$

$i_1 = 13.5\ A$

(b) $-i_2 = i_s \cdot \frac{R_2}{R_1+R_2} = 18\ \frac{10}{40} = 4.5\ A \Rightarrow$ $i_2 = -4.5\ A$

(c) $i_3 = i_s\ \frac{R_2}{R_1+R_2} = 18\ \frac{10}{40}$

$i_3 = 4.5\ A$

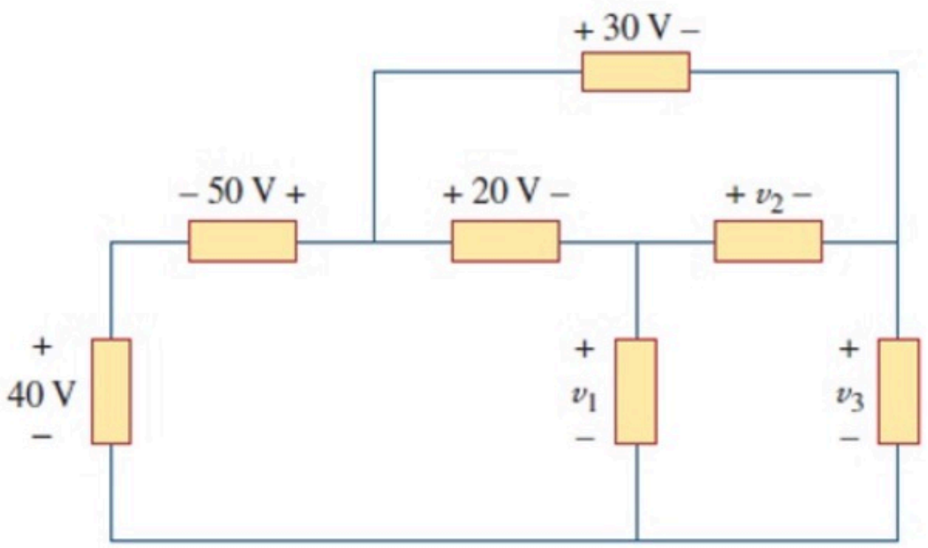
(d) $-i_4 = i_s \cdot \frac{R_1}{R_1+R_2} = 18\ \frac{30}{40}$

$i_4 = -13.5\ A$

PP - Basic analysis 006

Problem has been graded.

Find the values of the missing voltages.



Given Variables:

. : . .

Calculate the following:

v1 (V) :

70 ✓

v2 (V) :

10 ✓

v3 (V) :

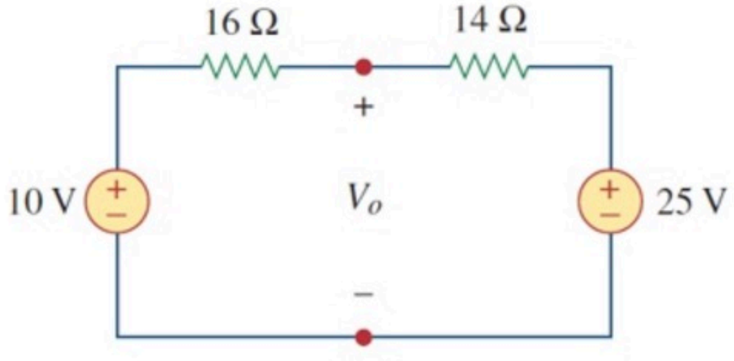
60 ✓

Hint: Use KVL

PP - Basic analysis 007

Problem has been graded.

Calculate the voltage V_o.



Given Variables:

. : . .

Calculate the following:

Vo (V) :

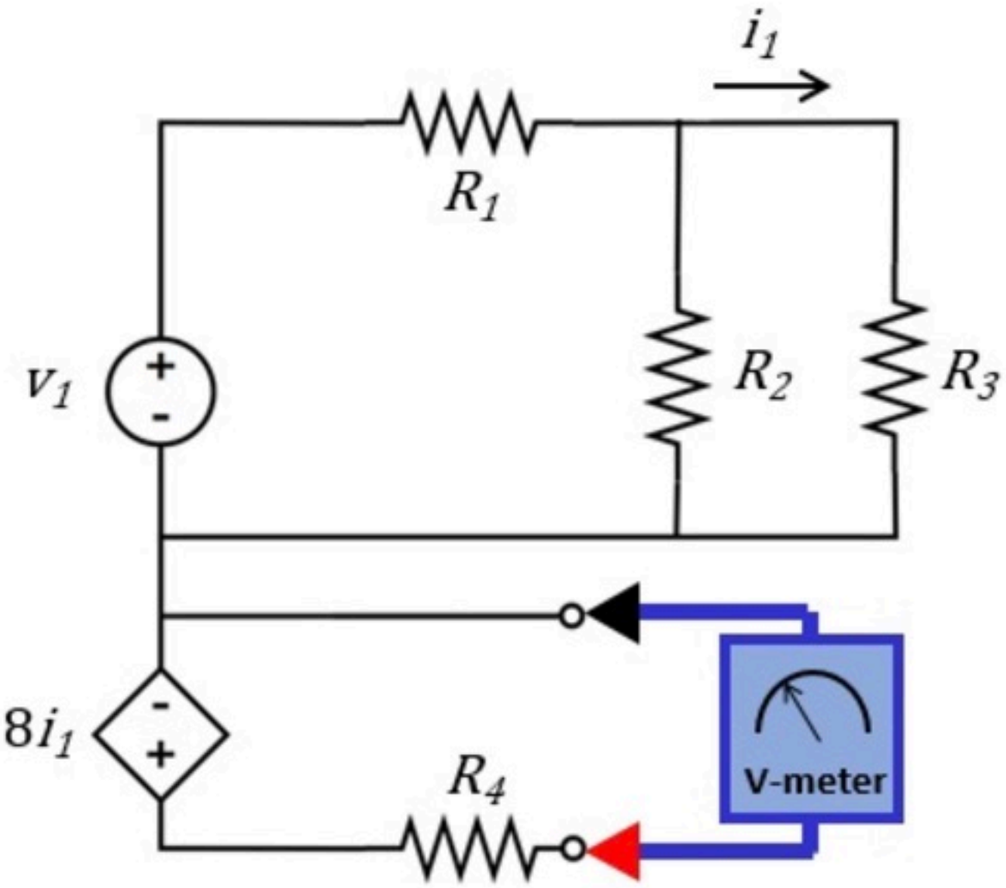
18 ✓

Hint: Use KVL or combine the sources

Basic analysis 008

Problem has been graded.

Find the volt meter reading X.



Given Variables:

v1 : 20 V

R1 : 10 ohm

R2 : 15 ohm

R3 : 10 ohm

R4 : 20 ohm

Calculate the following:

X (V) :

Hint: Mind the direction of the V meter

Find the volt meter reading X.

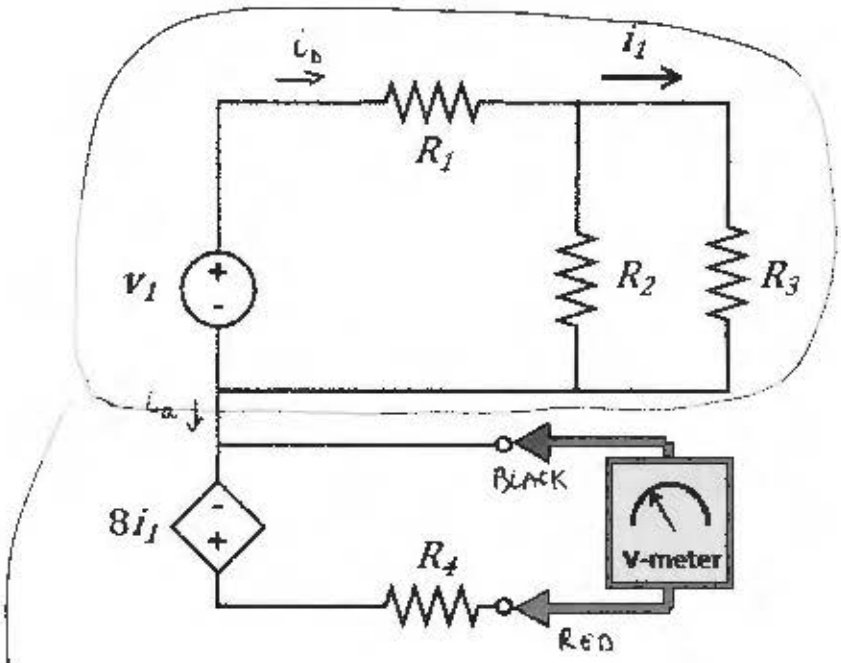
v1 = 10 V

R1 = 10 Ω

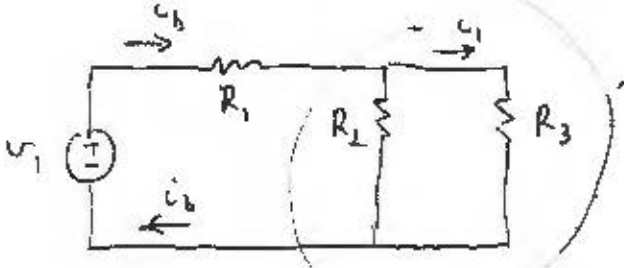
R2 = 15 Ω

R3 = 10 Ω

R4 = 10 Ω



GENERALIZED KCL : $i_a = 0$



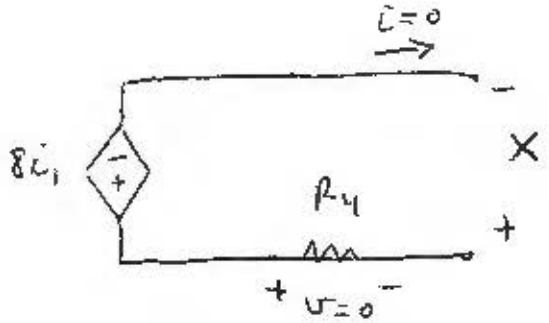
$$R_2 // R_3 = \left(\frac{1}{15} + \frac{1}{10}\right)^{-1}$$

$$= \left(\frac{1}{5} \cdot \left(\frac{1}{3} + \frac{1}{2}\right)\right)^{-1}$$

$$= \left(\frac{1}{5} \cdot \frac{5}{6}\right)^{-1} = 6\ \Omega$$

$$i_b = \frac{v_1}{R_1 + R_2 // R_3} = \frac{10}{10 + 6} = \frac{10}{16}$$

CURRENT DIVIDER. $i_1 = i_b \dfrac{R_2}{R_2 + R_3} = \dfrac{\cancel{10}^{2}}{16_{8}} \cdot \dfrac{\overset{3}{\cancel{15}}}{\cancel{25}_{8}} = \dfrac{3}{8}$



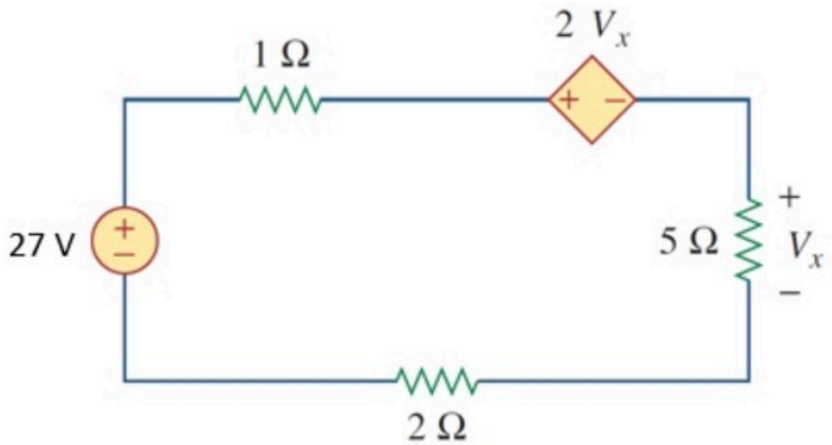
$$\Rightarrow X = 8 i_1 = 8 \cdot \frac{3}{8}$$

$$\boxed{X = 3\,V}$$

PP - Basic analysis 008

Problem has been graded.

Calculate the voltage V_x.



Given Variables:

. : . .

Calculate the following:

Vx (V) :

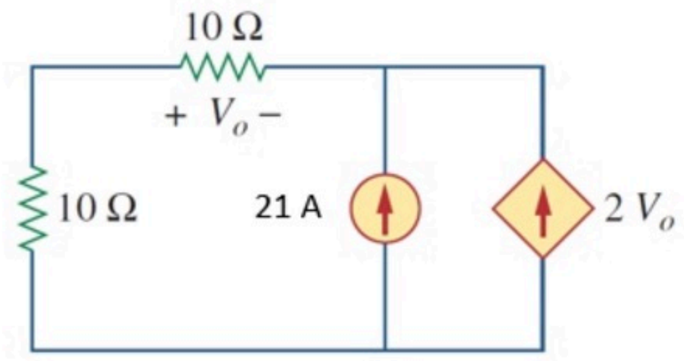
7.5 ✓

Hint: Use KVL

PP - Basic analysis 009

Problem has been graded.

Find the power P supplied by the dependent source.



Given Variables:

. : . .

Calculate the following:

P (W) :

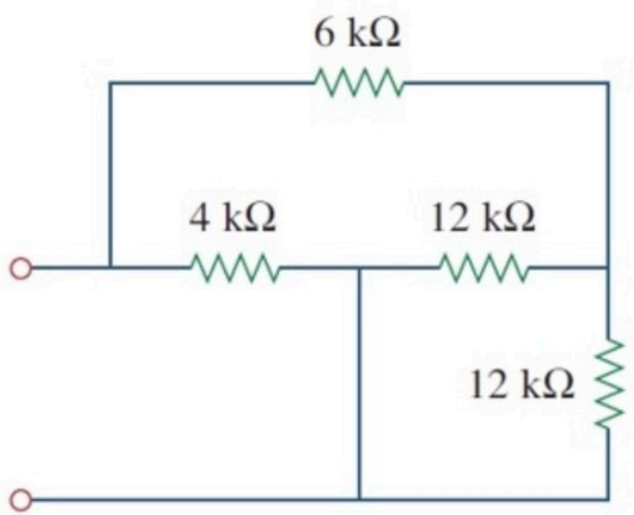
-400 ✓

Hint: Use KCL to find the current through the resistors

PP - Basic analysis 010

Problem has been graded.

Find R_{eq} looking into the terminals.



Given Variables:

. : . .

Calculate the following:

Req (ohm) :

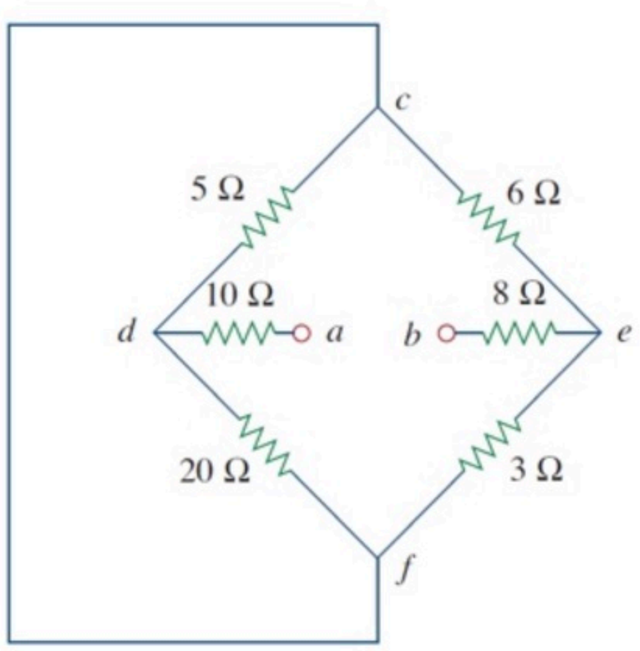
3000 ✓

Hint: Check units

PP - Basic analysis 011

Unlimited Attempts.

Find R_{eq} looking into the terminals.



Given Variables:

. : . .

Calculate the following:

Req (ohm) :

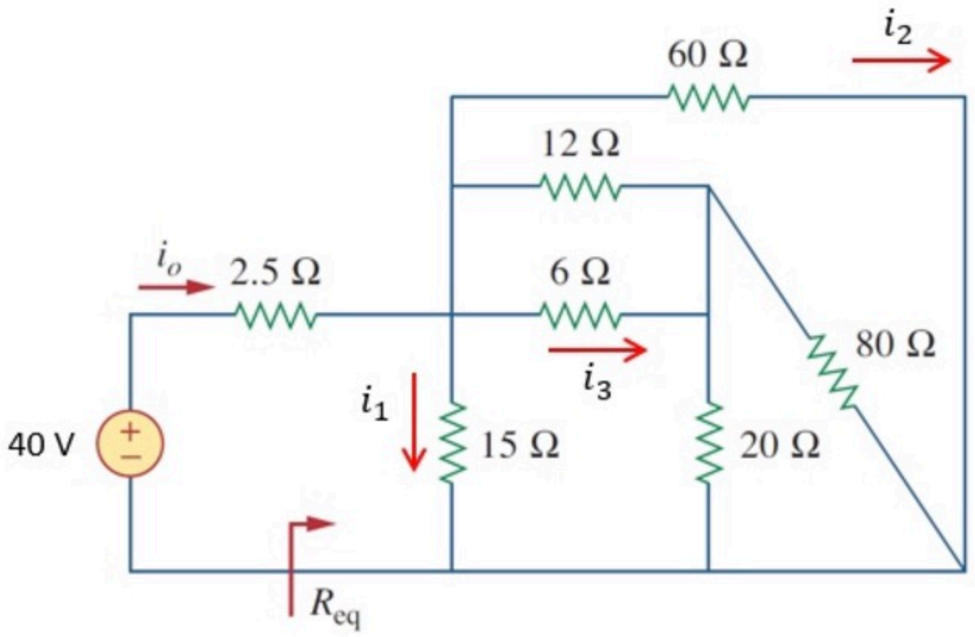
24 ✓

Hint: Use series and parallel connections of resistors

PP - Basic analysis 012

Problem has been graded.

Calculate R_{eq} (does not include the 2.5 Ω resistor) and the currents i_o, i_1, i_2 and i_3.



Given Variables:

. : . .

Calculate the following:

Req (ohm) :

7.5 ✓

i0 (A) :

4 ✓

i1 (A) :

2 ✓

i2 (A) :

0.5 ✓

i3 (A) :

1 ✓

Hint: Use series and parallel connections of resistors