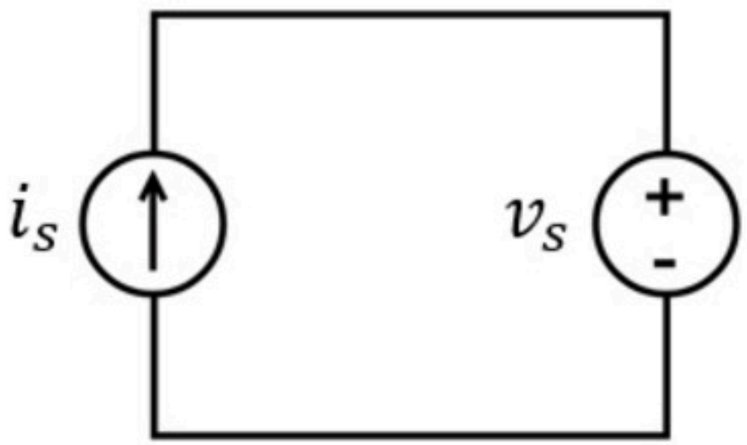
Basic concepts 007

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) :

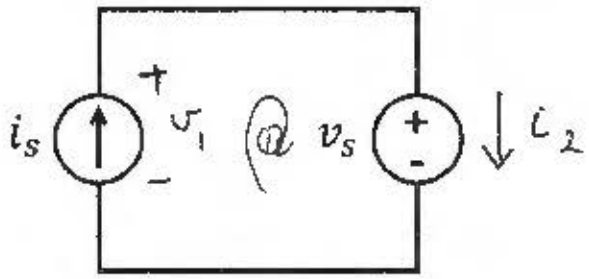
P_2 (W) :

> 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.

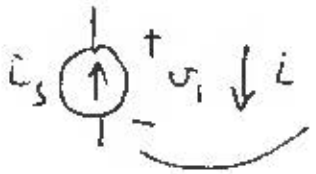
Vs = 10 V

Is = 4 A



KVL ① : $v_1 = v_s = 10\,V$

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

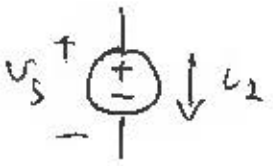


for passive sign convention

$P_1 = v_1 \cdot i = 10\,(-4) = -40\,W$ 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 : $\sum P_{\text{received}} = \sum P_{\text{supplied}} \Rightarrow 0 = 40 - 40$

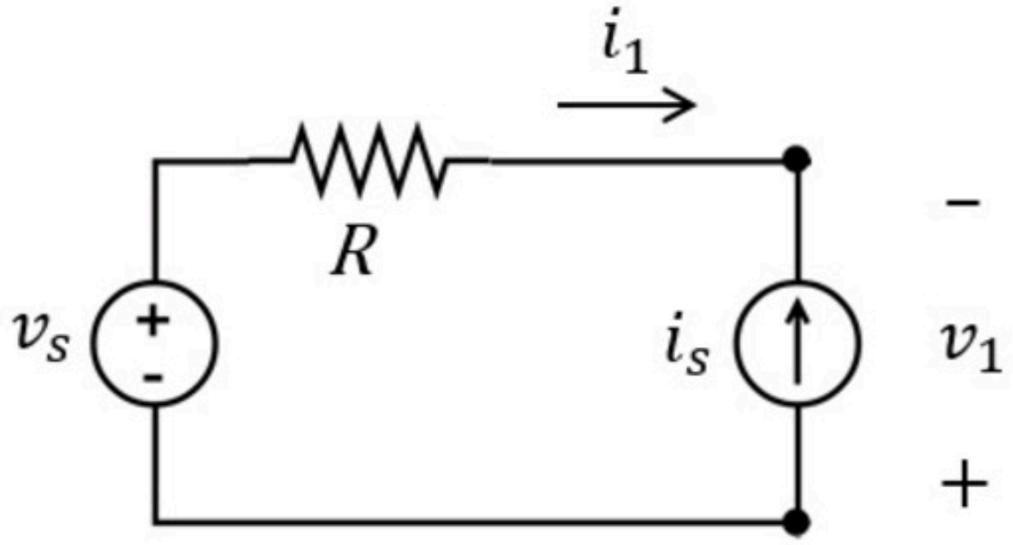
OK

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.

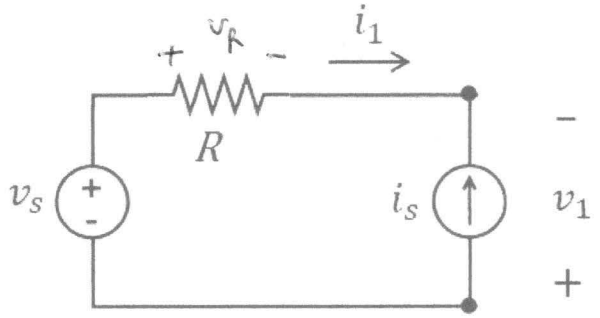
What is the current i_1?

What is the voltage v_1?

What is the value of the voltage source v_s?

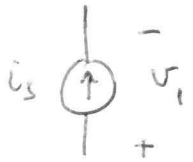
R = 2 Ω

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: $v_s + v_1 = v_R$

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

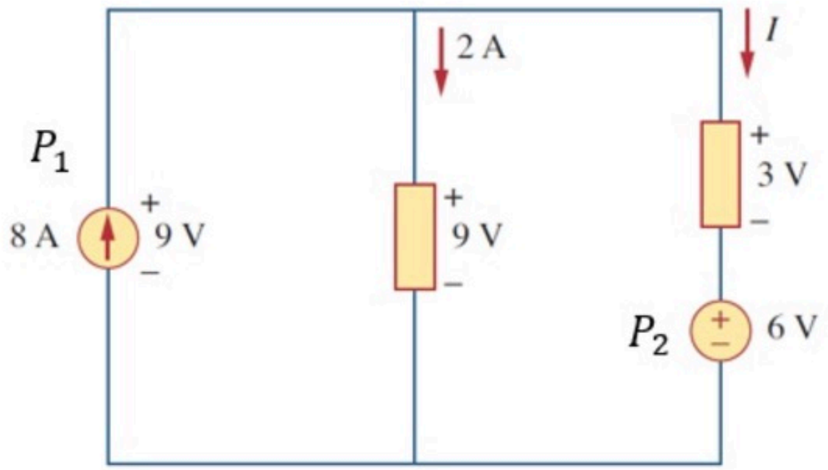
$= -50 + 4 = -46$

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

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) :

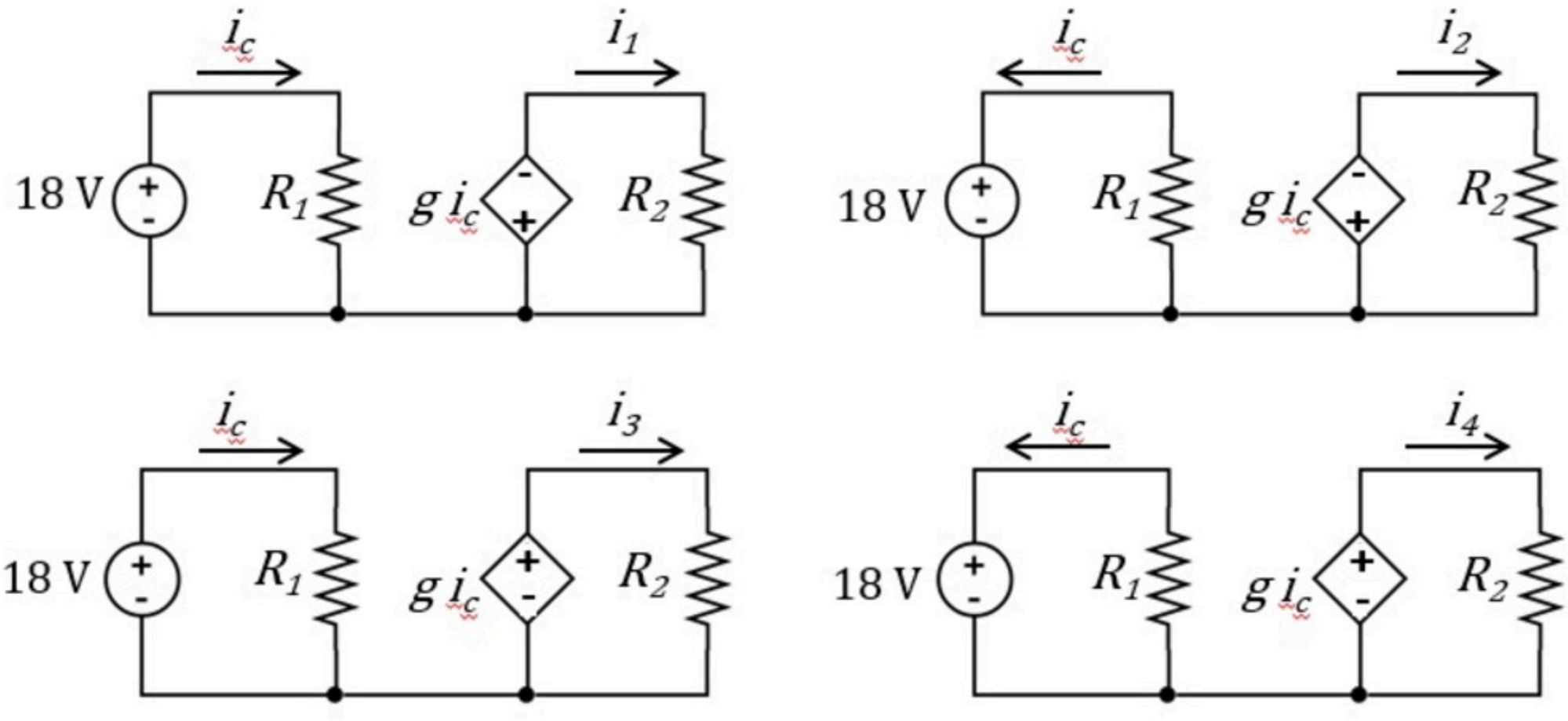
-36 ✓

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) :

---

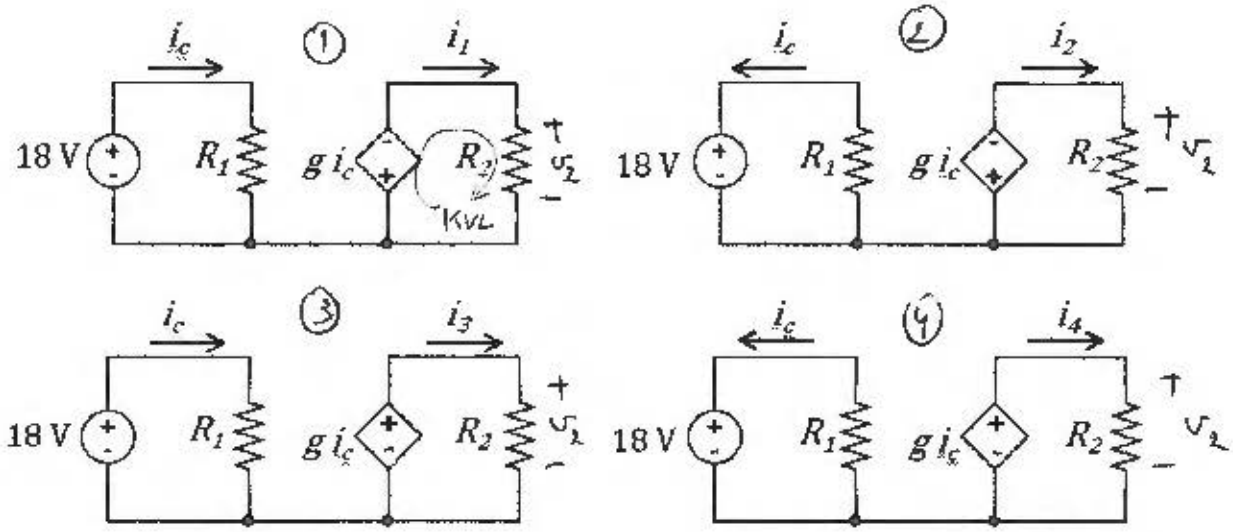
i_3 (A) :

---

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: $i_c = -4.5\ A$

$v_2 = g i_c = -9\ V$

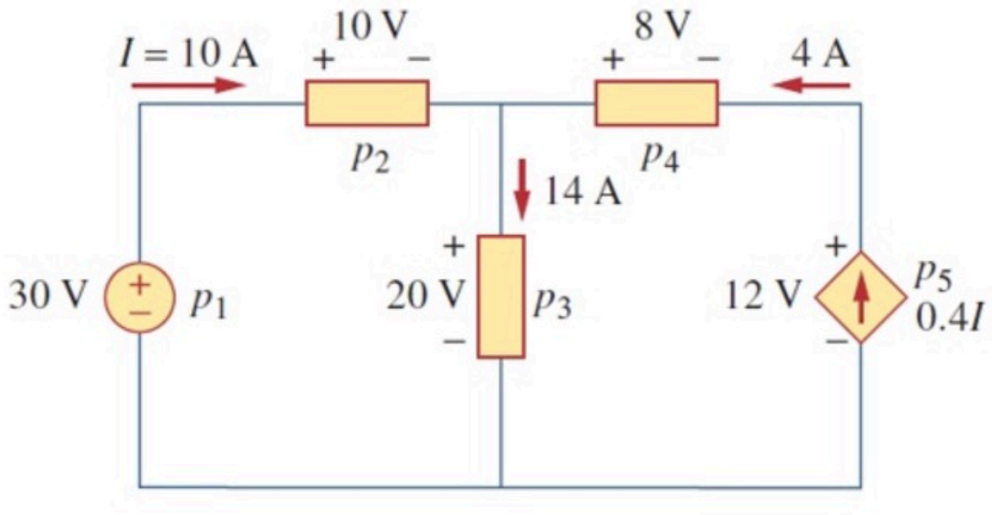
$i_4 = \frac{v_2}{R_2} = \frac{-9}{3}$

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

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) :

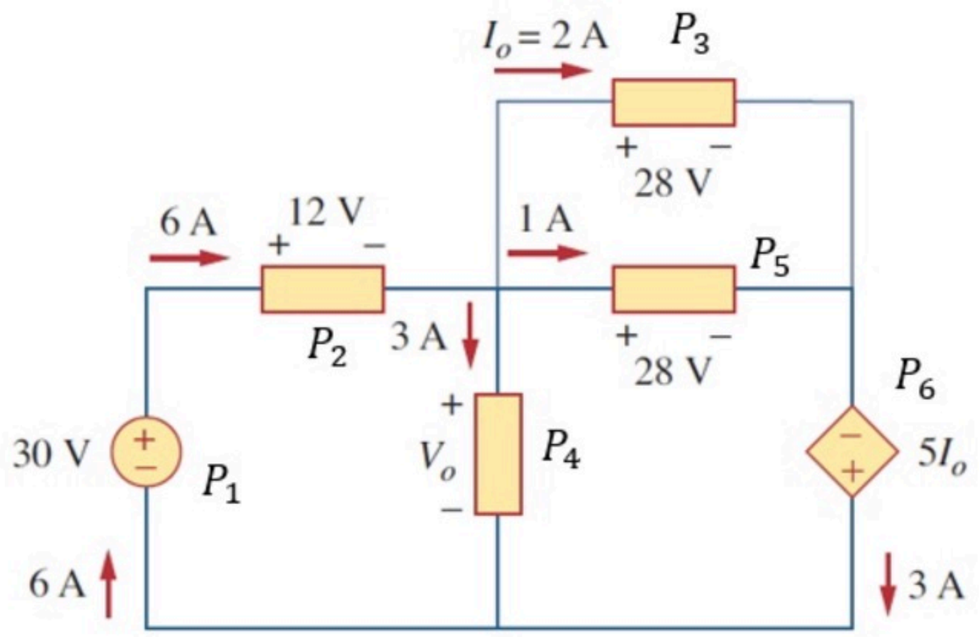
48 ✓

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) :

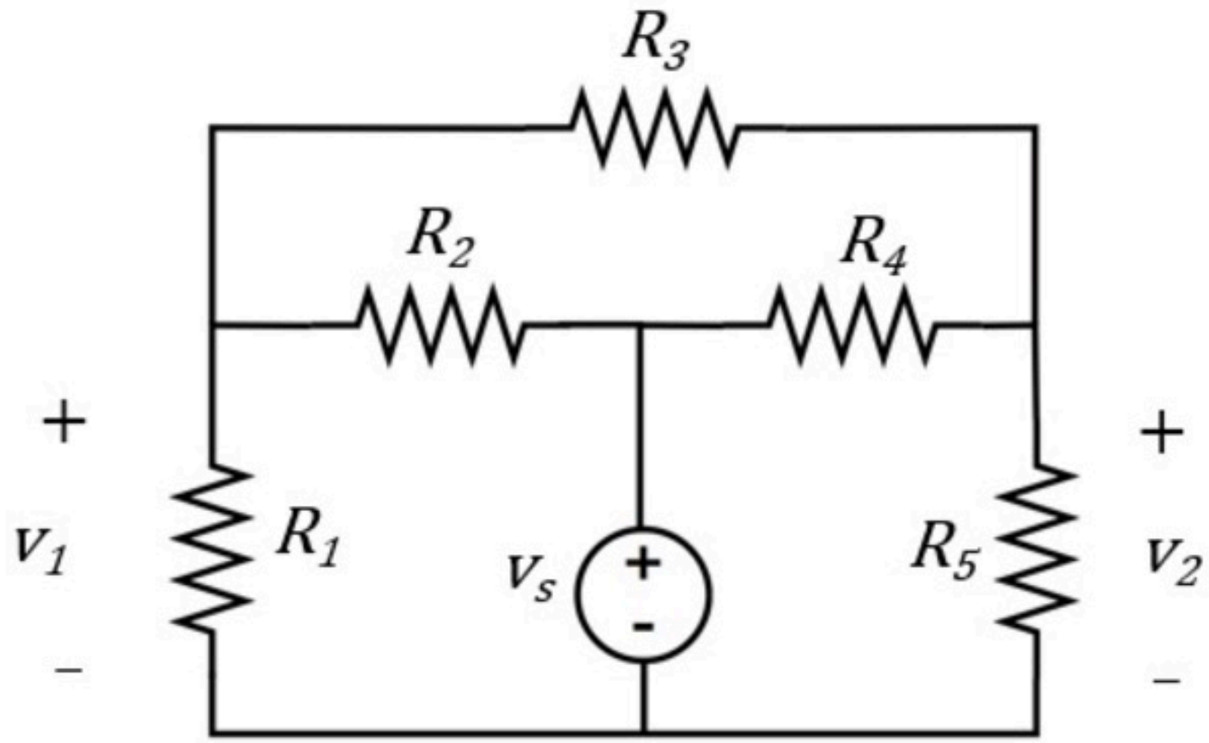
-30 ✓

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

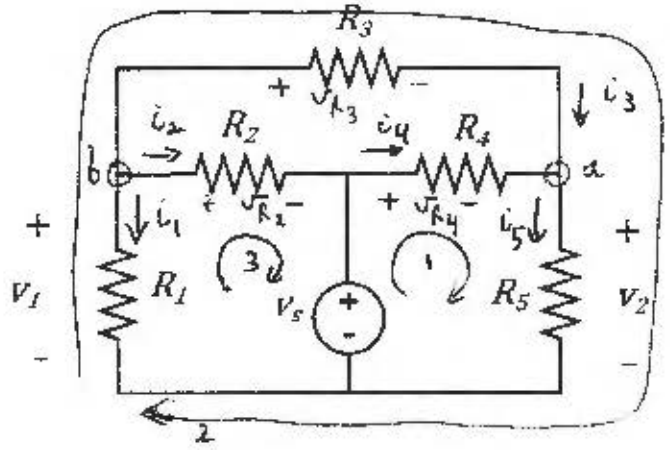
R4 = 9 Ω

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

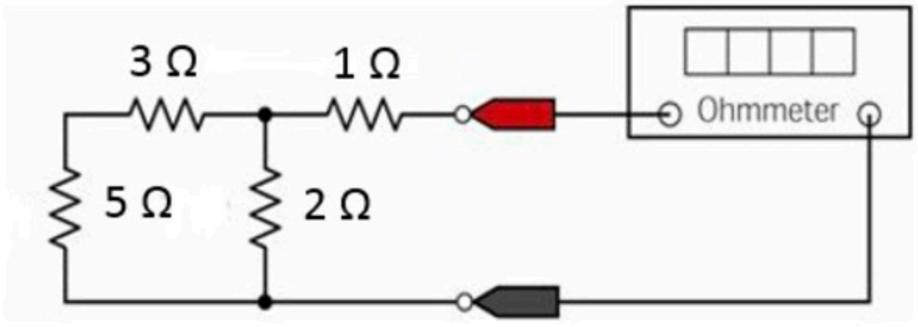
$$R_2 = \frac{v_{R_2}}{i_2} = \frac{-12}{-2} \Rightarrow \boxed{R_2 = 6\ \Omega}$$

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) :

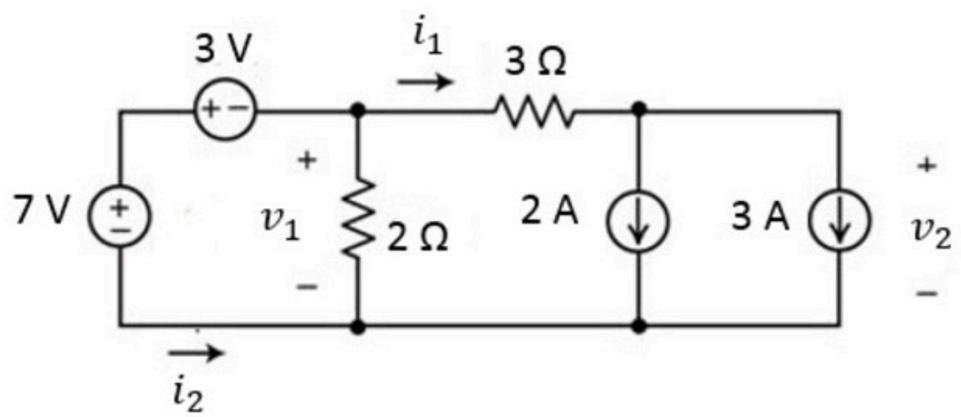
2.6 ✓

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 ✓

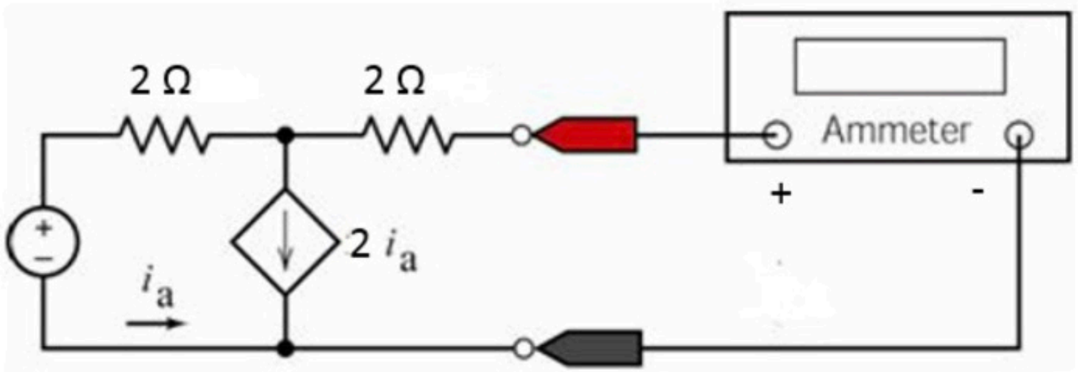
Hint: Use KVL and KCL

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) :

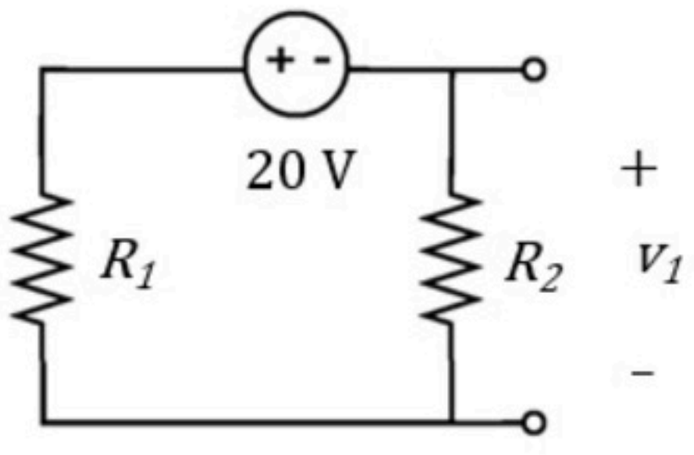
8 ✓

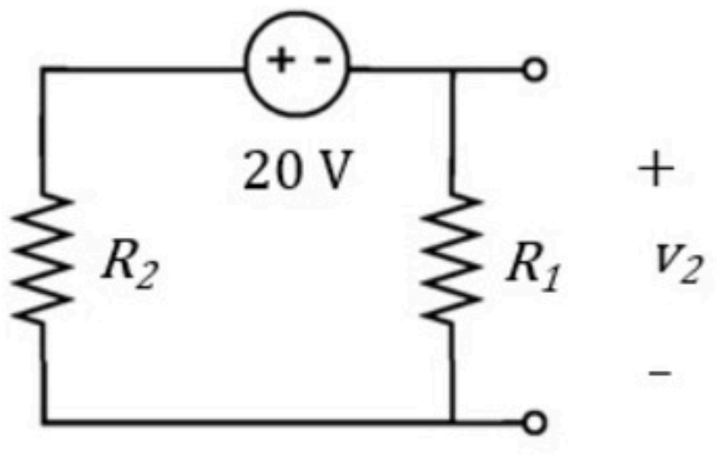
Hint: Ammeters and volt meters behave as short and open circuits respectively

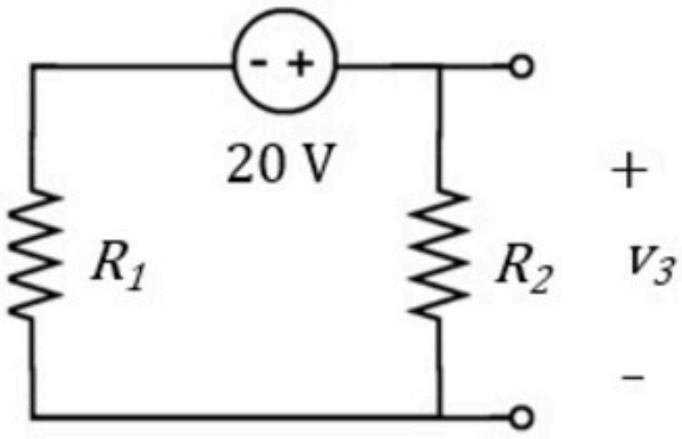
Basic analysis 004

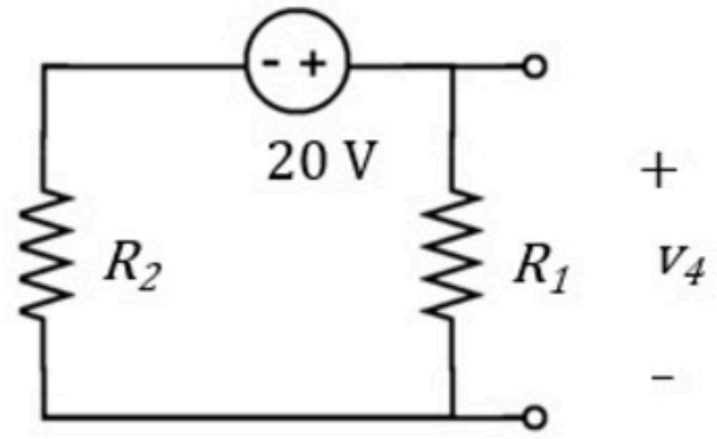
Problem has been graded.

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) :

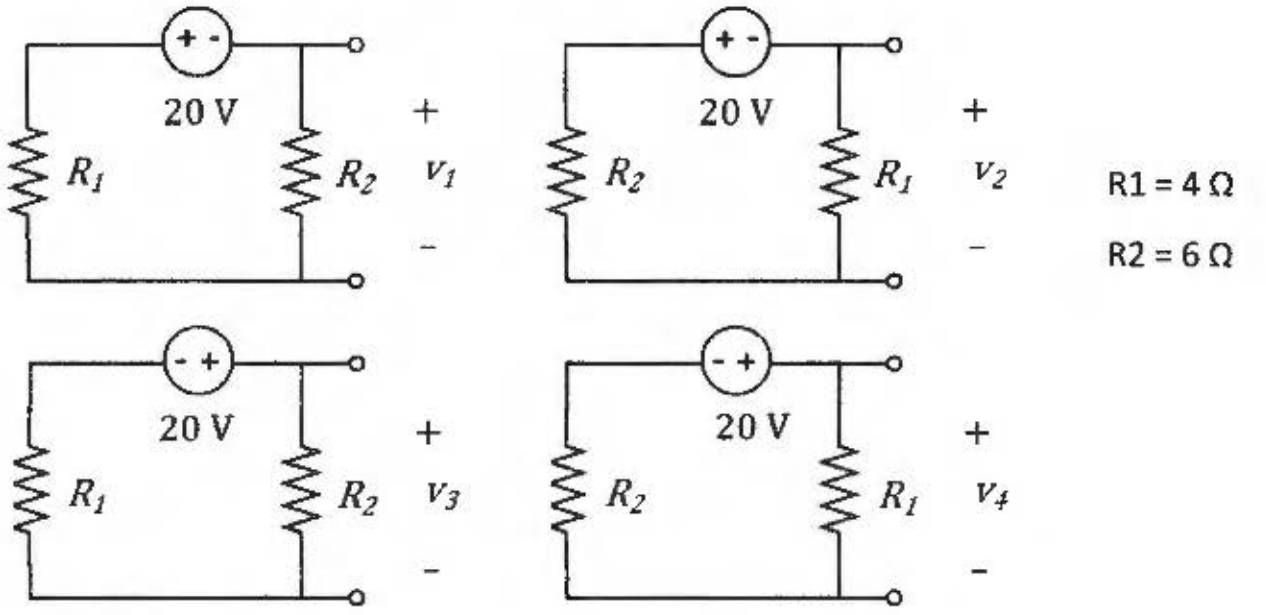
v2 (V) :

v3 (V) :

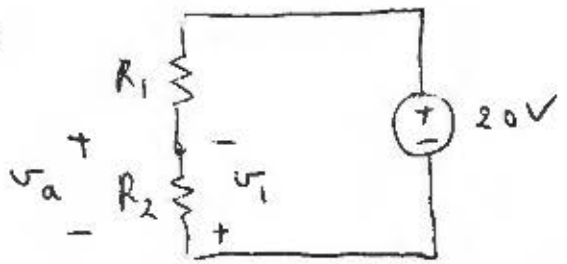
v4 (V) :

Hint: Voltage divider and mind the signs.

Determine the voltages v_1, v_2, v_3 and v_4



(a) VOLTAGE DIVIDER



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

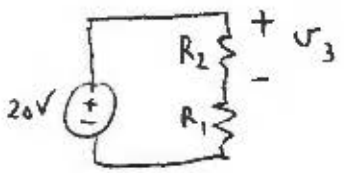
$V_1 = -V_a$

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

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

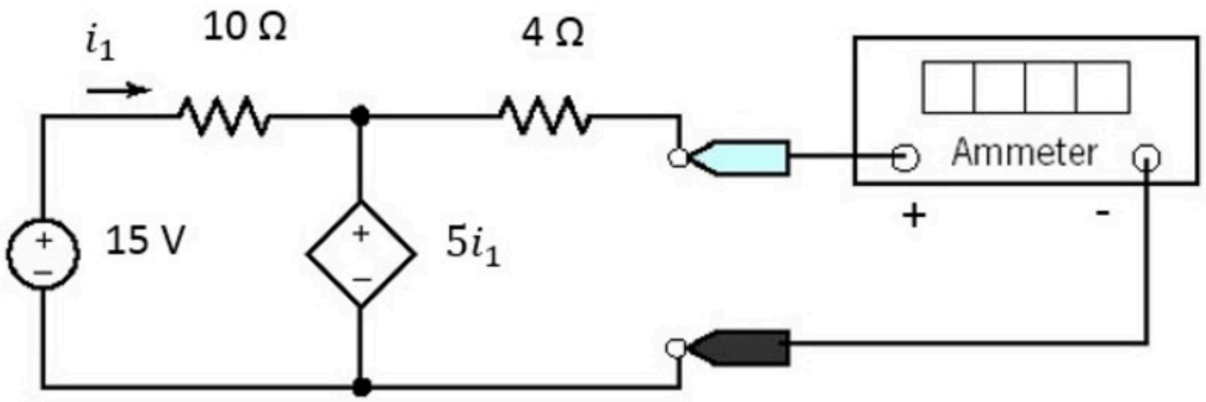
$\boxed{V_4 = 8 \text{ V}}$

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) :

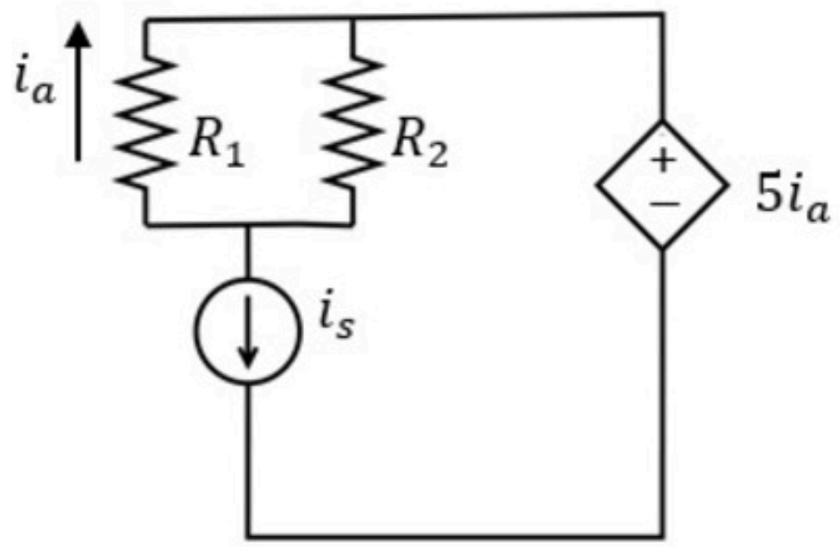
5 ✓

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) :

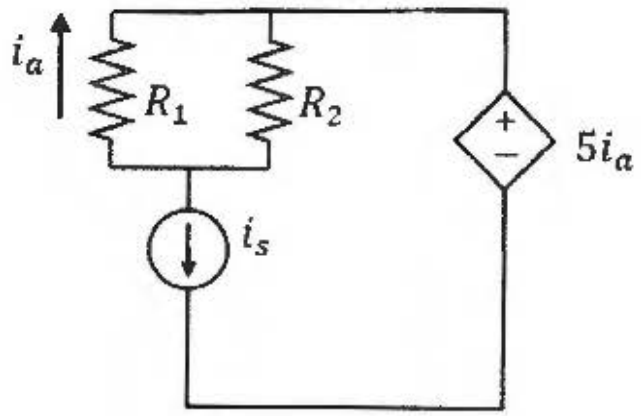
> Hint: Use current divider

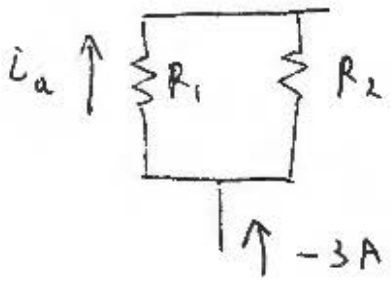
Find the power supplied by the dependent source.

R1 = 14 Ω

R2 = 7 Ω

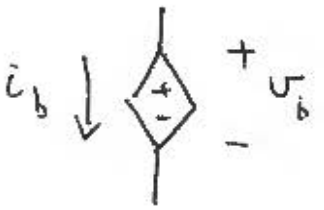
is = 3 A





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)

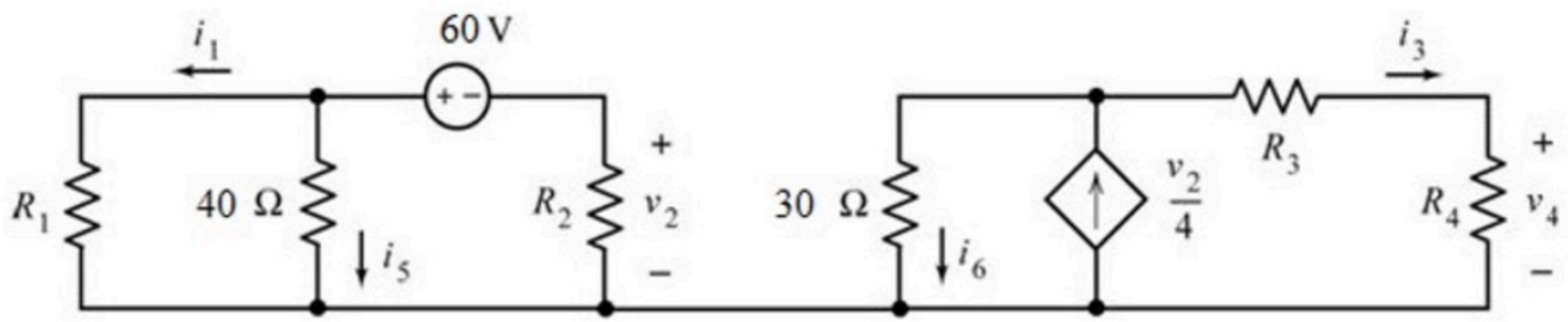
$P = -15W$ SUPPLIED

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) :

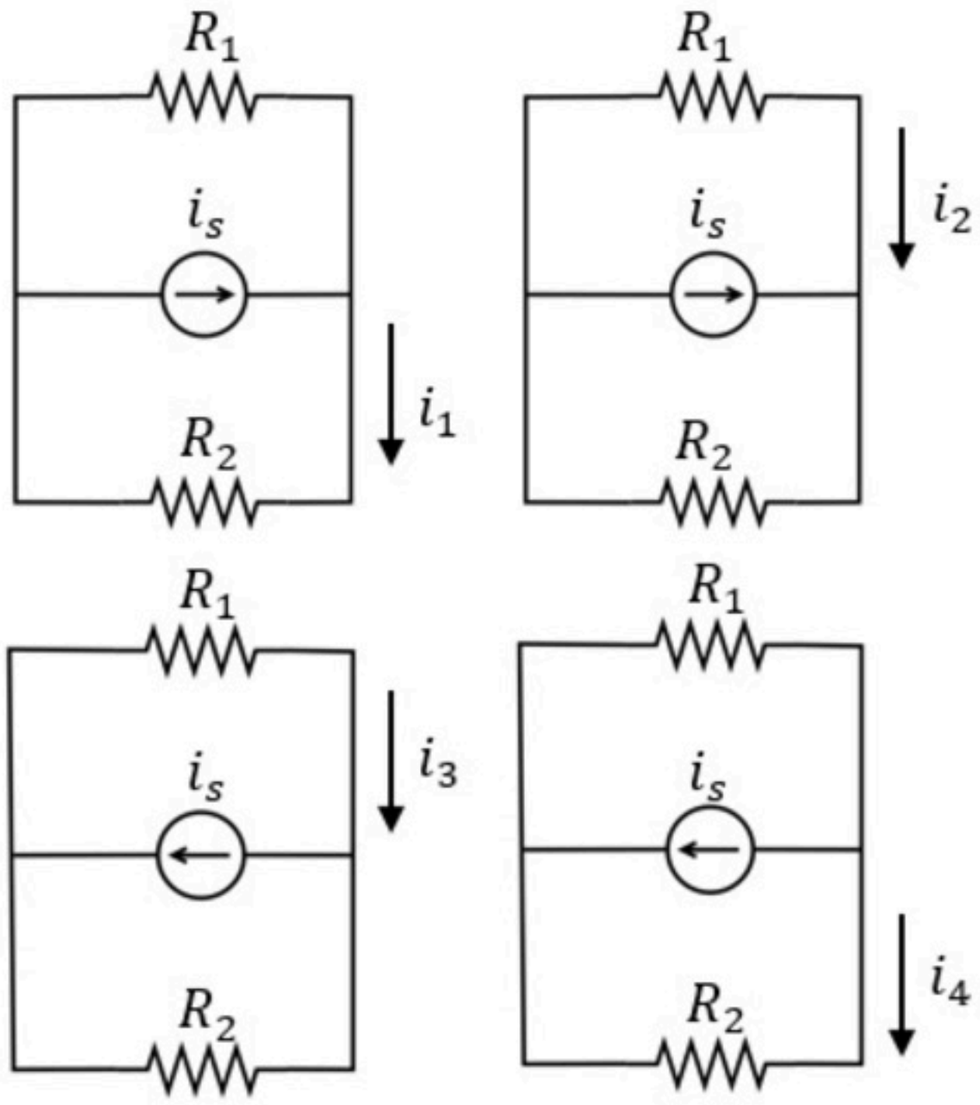
15 ✓

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) :

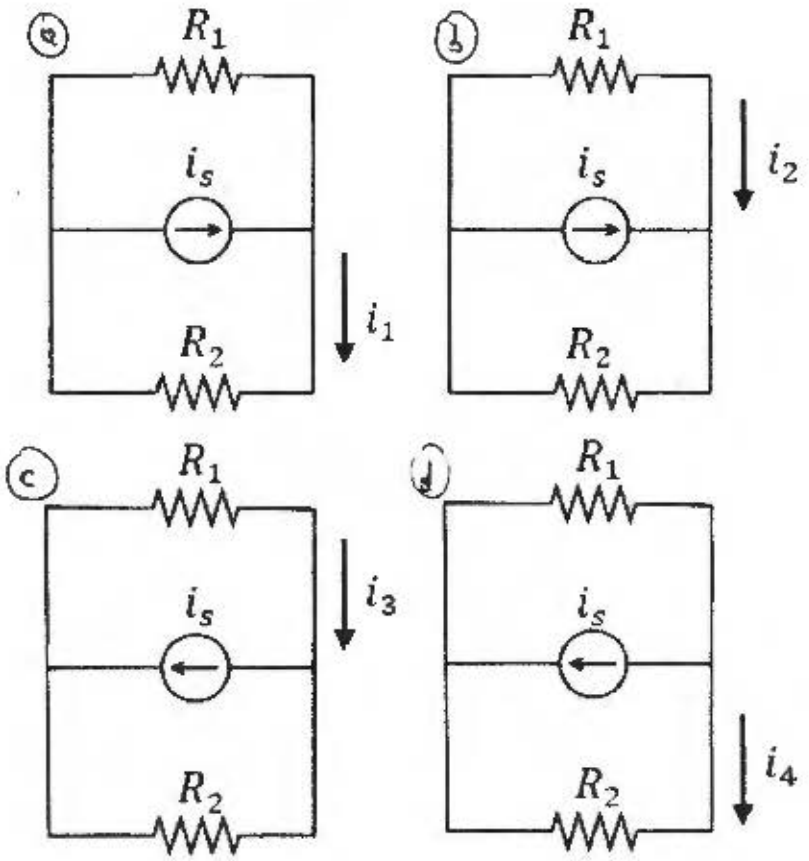
Hint: Use current divider

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

$i_3 = 4.5\ A$

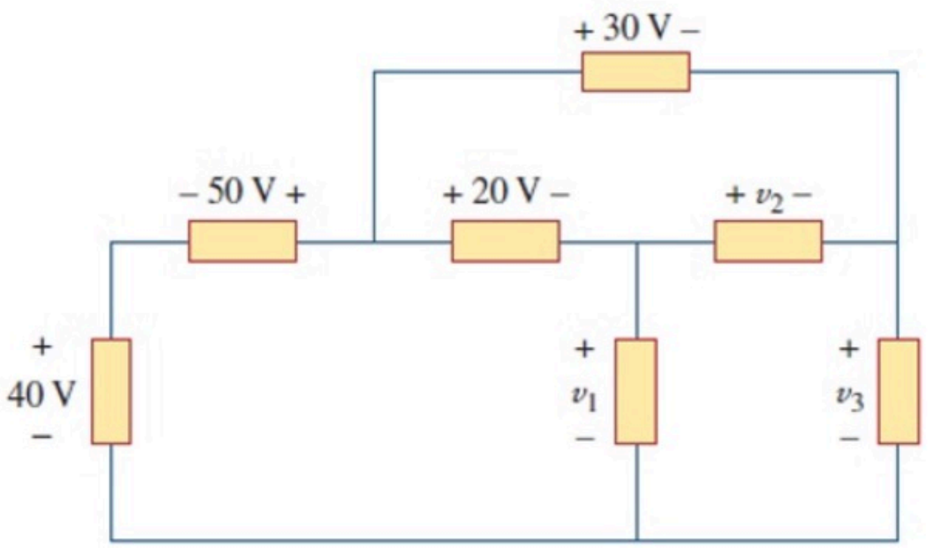
(d) $-i_4 = i_s \cdot \frac{R_1}{R_1+R_2} = 18\ \frac{30}{40}$

$i_4 = -13.5\ A$

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) :

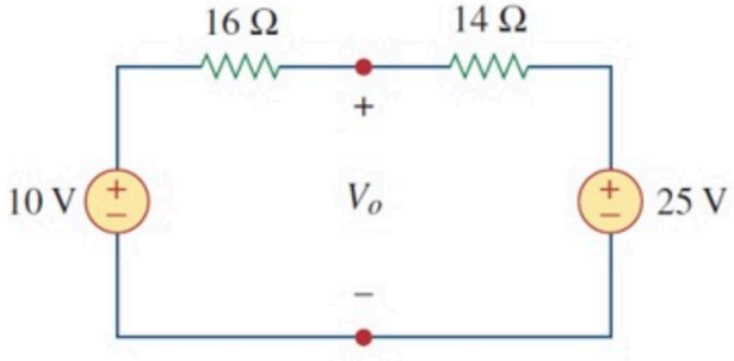
60 ✓

Hint: Use KVL

PP - Basic analysis 007

Problem has been graded.

Calculate the voltage V_o.



Given Variables:

. : . .

Calculate the following:

Vo (V) :

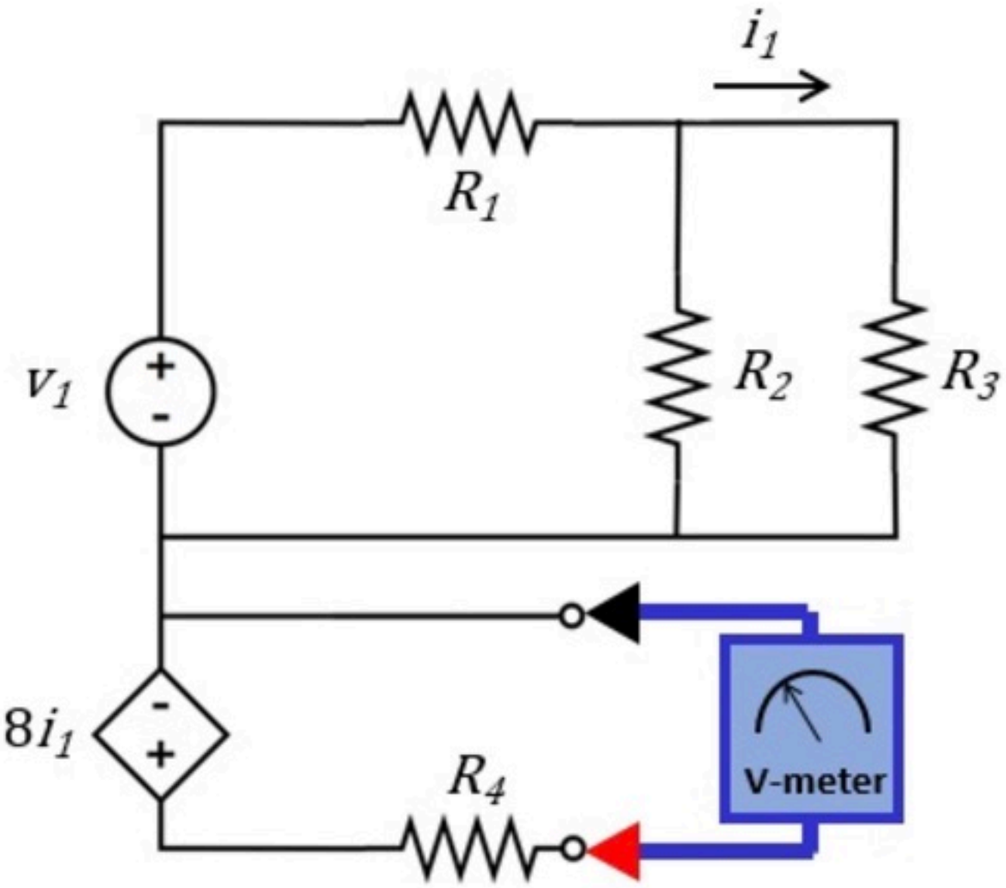
18 ✓

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.

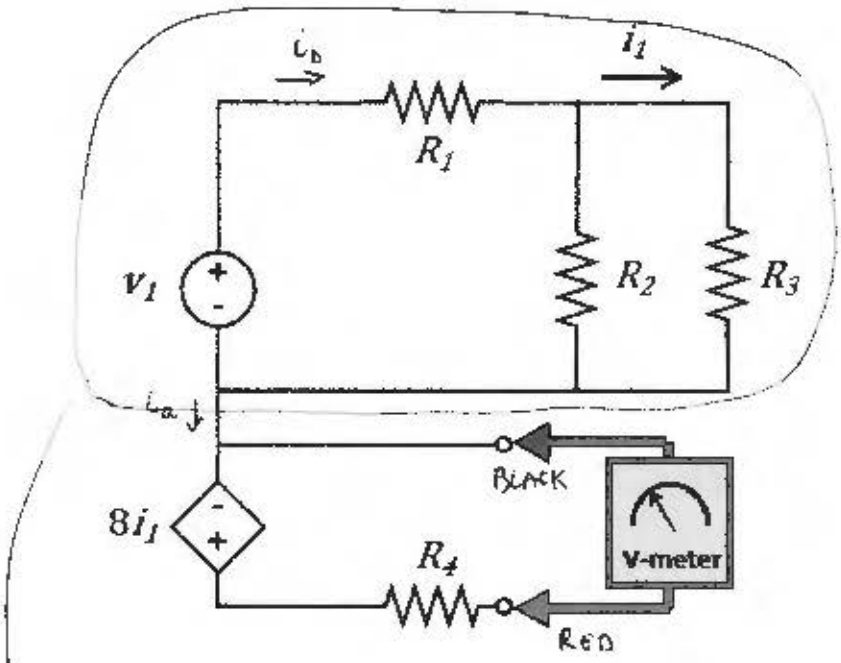
v1 = 10 V

R1 = 10 Ω

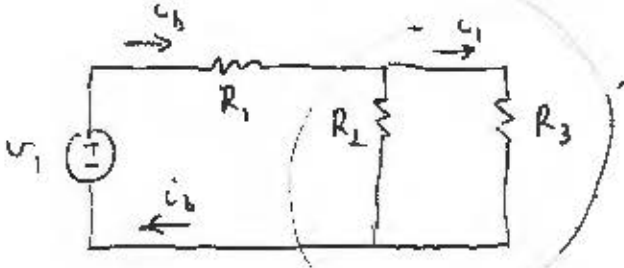
R2 = 15 Ω

R3 = 10 Ω

R4 = 10 Ω



GENERALIZED KCL : $i_a = 0$



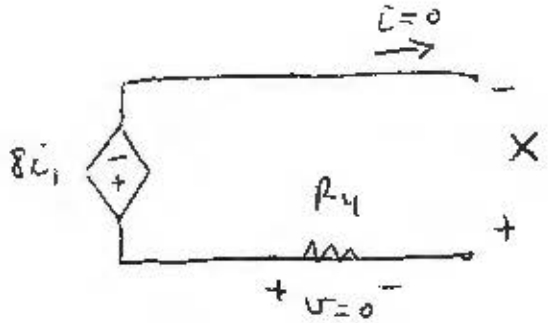
$$R_2 // R_3 = \left(\frac{1}{15} + \frac{1}{10}\right)^{-1}$$

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

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

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

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



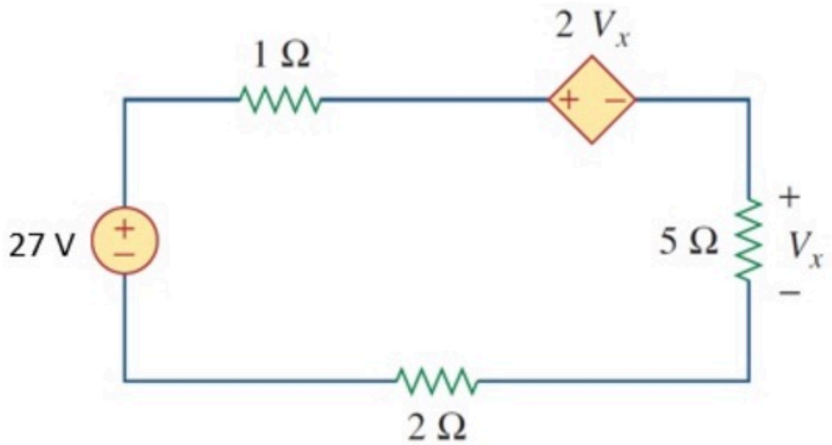
$$\Rightarrow X = 8 i_1 = 8 \cdot \frac{3}{8}$$

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

PP - Basic analysis 008

Problem has been graded.

Calculate the voltage V_x.



Given Variables:

. : . .

Calculate the following:

Vx (V) :

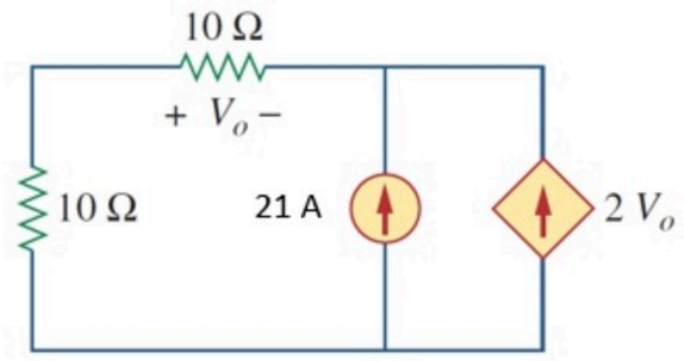
7.5 ✓

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) :

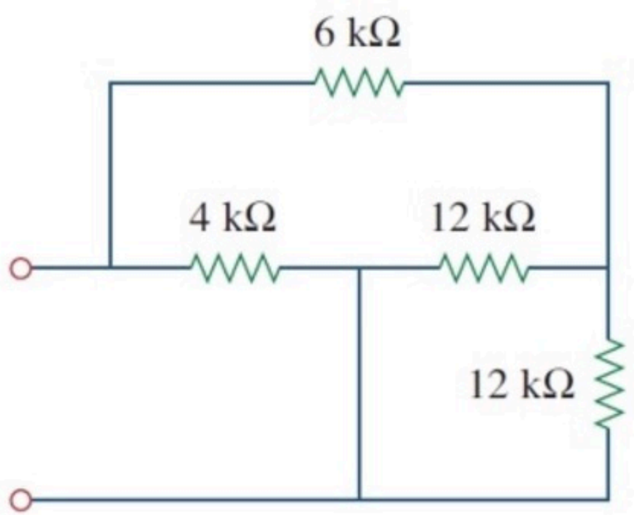
-400 ✓

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) :

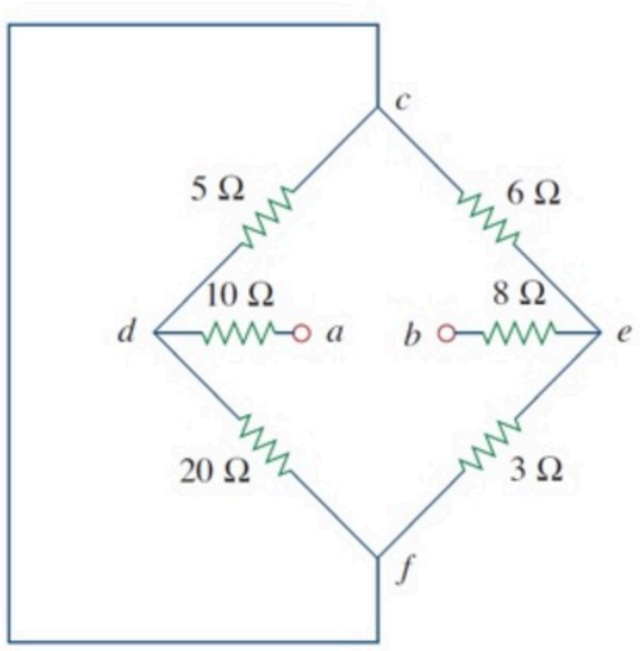
3000 ✓

Hint: Check units

PP - Basic analysis 011

Unlimited Attempts.

Find R_{eq} looking into the terminals.



Given Variables:

. : . .

Calculate the following:

Req (ohm) :

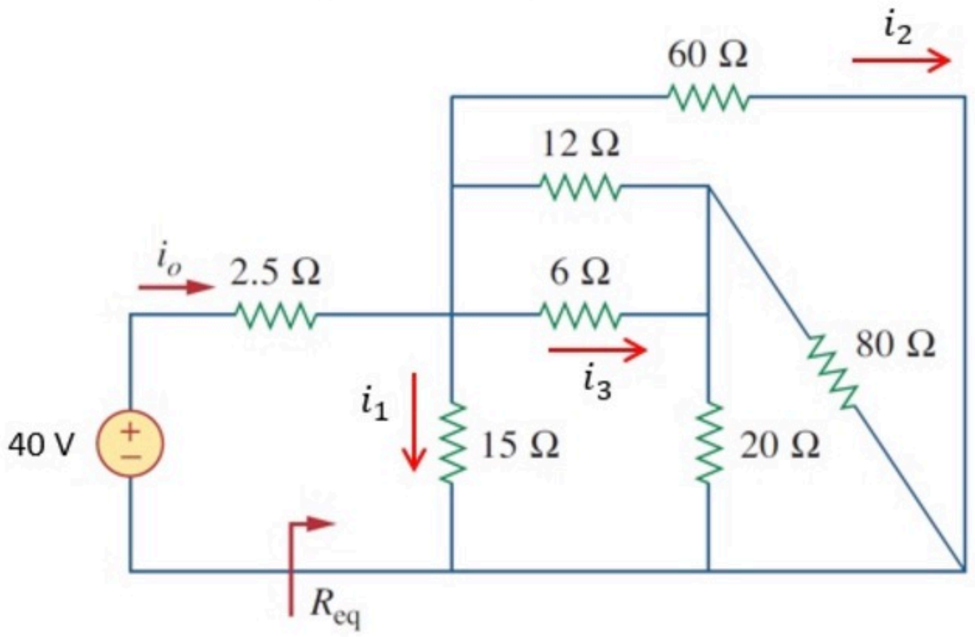
24 ✓

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