

Chapter 3 - Resistive Circuits

Lecture 8

Sections 3.5-3.6

Learning Objectives

3.5 Series Voltage
and Parallel
Current Sources

3.6 Circuit Analysis

Summary

MEMS 0031 Electrical Circuits

Mechanical Engineering and Materials Science Department
University of Pittsburgh



Student Learning Objectives

Chapter 3 -
Resistive Circuits

MEMS 0031

At the end of the lecture, students should be able to:

- ▶ Construct equivalent voltage sources in series
- ▶ Construct equivalent current sources in parallel
- ▶ Understand the operation of an Ohm meter

[Learning Objectives](#)

[3.5 Series Voltage
and Parallel
Current Sources](#)

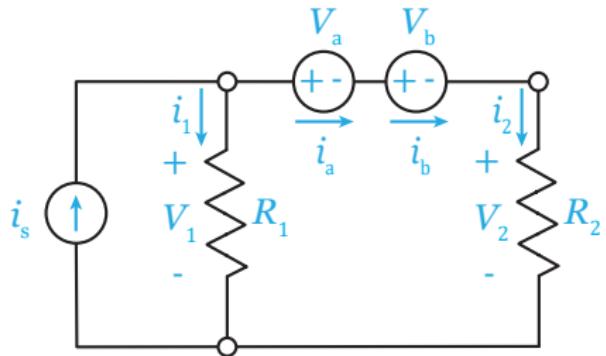
[3.6 Circuit Analysis](#)

[Summary](#)



Voltage Sources in Series

- ▶ Determine the effect of two voltage sources in series



Learning Objectives

3.5 Series Voltage
and Parallel
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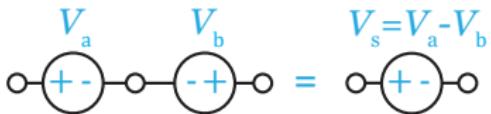
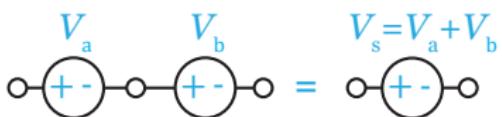
3.6 Circuit Analysis

Summary



Voltage Sources in Series

- The following equivalent voltage source can be made, based upon polarity of the constitutive sources

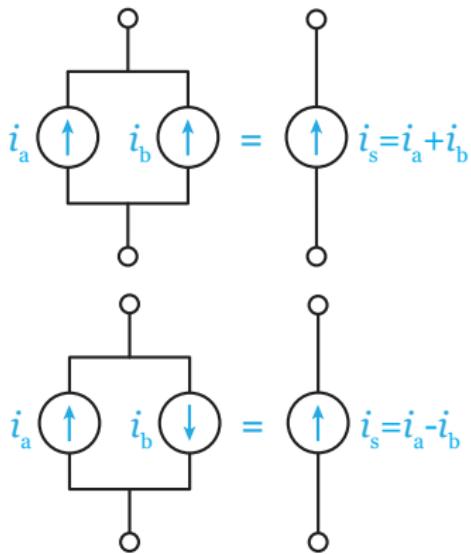


- Why can't we have two voltage sources in parallel?



Current Sources in Parallel

- ▶ The following equivalent current source can be made, based upon directionality of the constitutive sources

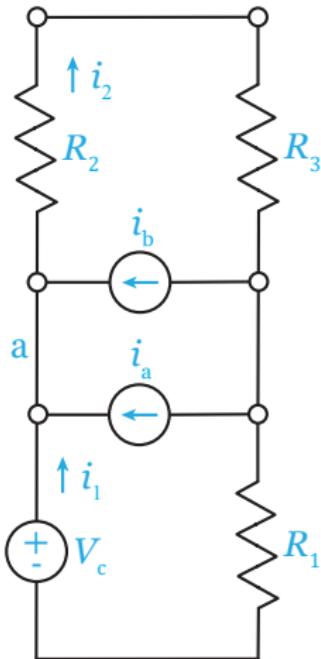


- ▶ Why can't we have two current sources in series?



Example #1

- ▶ Determine the equivalent circuit. Validate with KCL



Learning Objectives

3.5 Series Voltage
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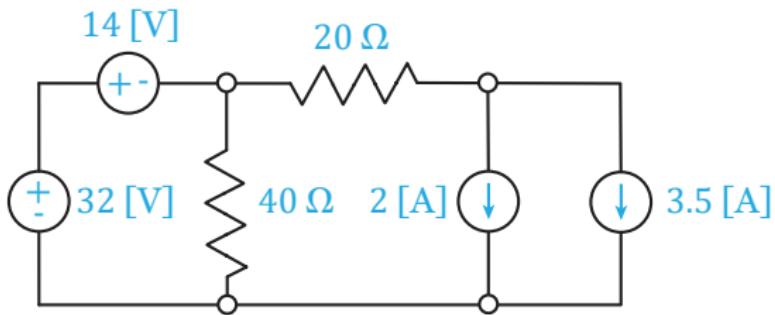
3.6 Circuit Analysis

Summary



Example #2

- ▶ Determine the equivalent circuit



Learning Objectives

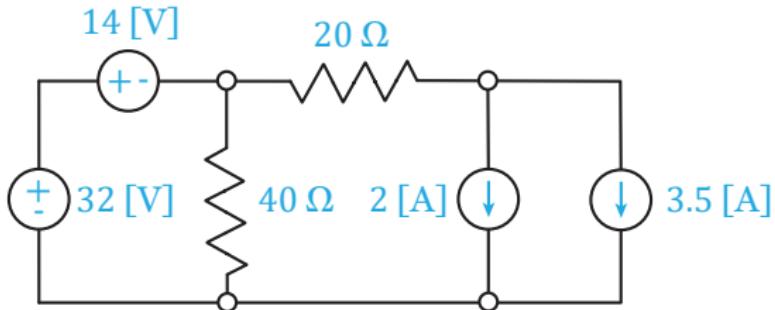
3.5 Series Voltage
and Parallel
Current Sources

3.6 Circuit Analysis

Summary



Example #2



Learning Objectives

3.5 Series Voltage
and Parallel
Current Sources

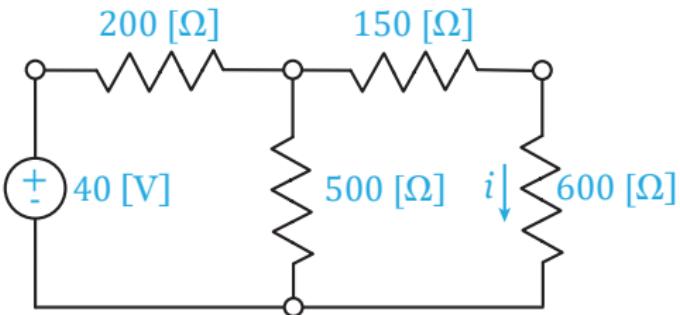
3.6 Circuit Analysis

Summary



Example #3

► Find i



Learning Objectives

3.5 Series Voltage
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Current Sources

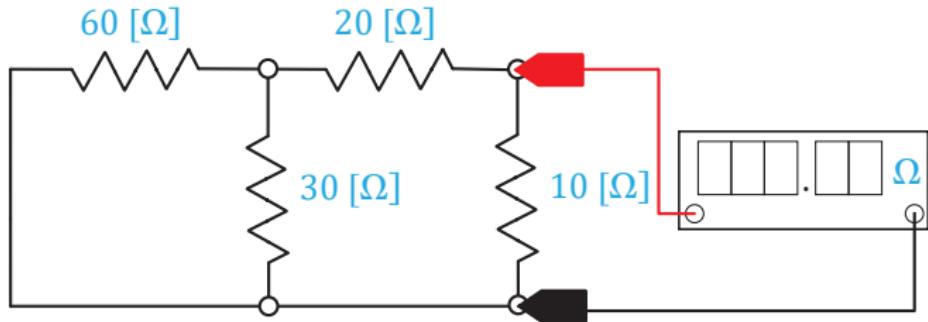
3.6 Circuit Analysis

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Ohm Meters

- ▶ Ohm meters are used to measure the resistance of either an element or network



Learning Objectives

3.5 Series Voltage
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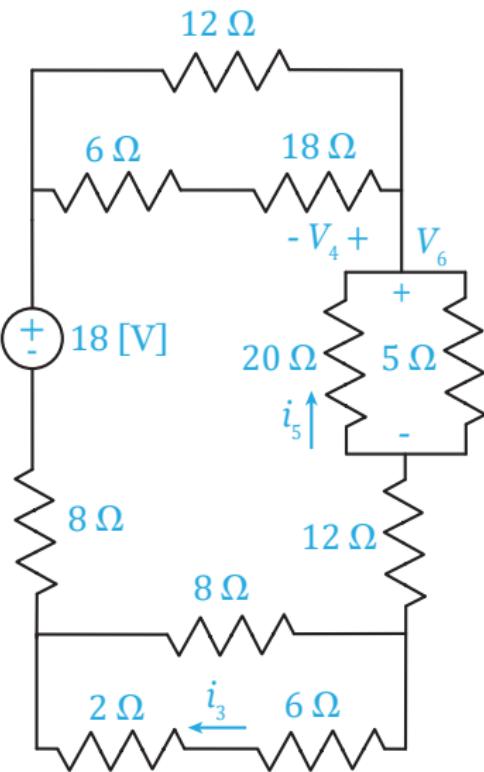
3.6 Circuit Analysis

Summary



Example #4

- ▶ Find i_3 , V_4 , i_5 and V_6



Learning Objectives

3.5 Series Voltage
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Current Sources

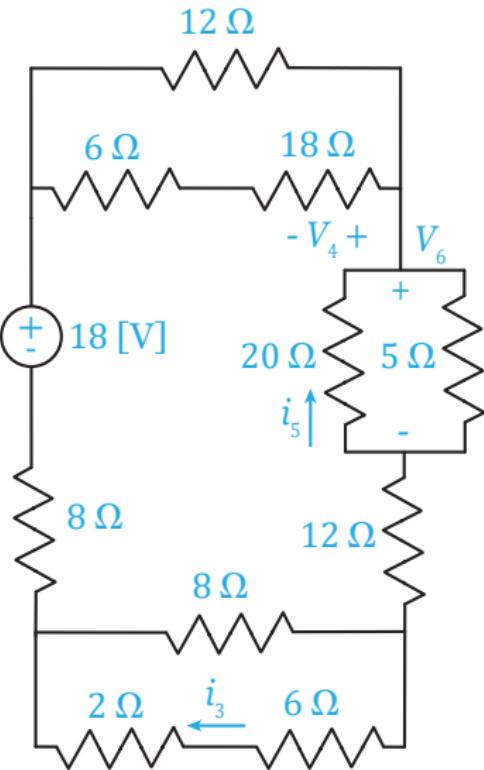
3.6 Circuit Analysis

Summary



Example #4

Solution:



Learning Objectives

3.5 Series Voltage
and Parallel
Current Sources

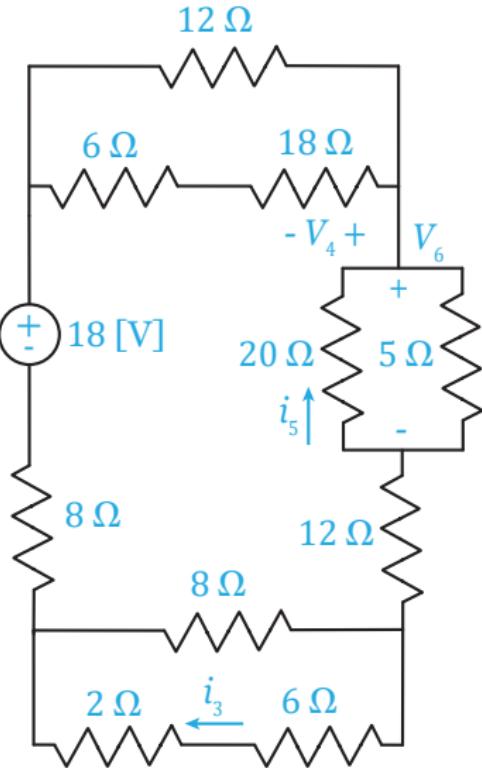
3.6 Circuit Analysis

Summary



Example #4

Solution:



Learning Objectives

3.5 Series Voltage
and Parallel
Current Sources

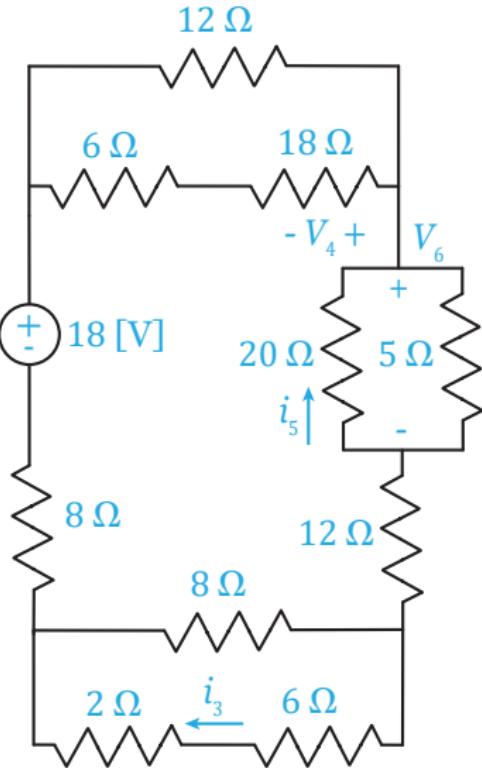
3.6 Circuit Analysis

Summary



Example #4

Solution:



Learning Objectives

3.5 Series Voltage
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Current Sources

3.6 Circuit Analysis

Summary



Student Learning Objectives

At the end of the lecture, students should be able to:

- ▶ Construct equivalent voltage sources in series
 - ▶ Voltage sources in series obey additive and subtractive arithmetic properties. Voltage sources in parallel are dictated by the strongest source, and are unsafe.
- ▶ Construct equivalent current sources in parallel
 - ▶ Current sources in parallel also obey additive and subtractive arithmetic properties. Current sources in series violate conservation of charge carriers.
- ▶ Understand the operation of an Ohm meter
 - ▶ When connected to a circuit, an ohm meter measures the equivalent resistance. When connected to an element not in a circuit, it measures the resistance of the element.

[Learning Objectives](#)

[3.5 Series Voltage
and Parallel
Current Sources](#)

[3.6 Circuit Analysis](#)

[Summary](#)



Suggested Problems

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- ▶ 3.4-8, 3.5-1, 3.5-2, 3.6-1, 3.6-2, 3.6-3, 3.6-11,
3.6-15, 3.6-33

[Learning Objectives](#)

[3.5 Series Voltage
and Parallel
Current Sources](#)

[3.6 Circuit Analysis](#)

[Summary](#)

