

# Chapter 3 - Resistive Circuits

## Lecture 6 Section 3.3

### MEMS 0031 Electrical Circuits

Mechanical Engineering and Materials Science Department  
University of Pittsburgh



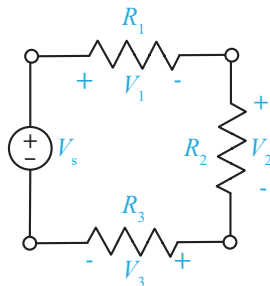
# Student Learning Objectives

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

- ▶ Understand how resistors in series divide voltage
- ▶ Formulate an expression for the voltage across a resistor in series with other resistors



- Considering the following circuit. What is the voltage drop across each resistor?



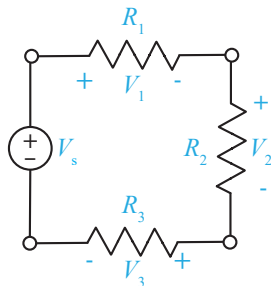
Learning Objectives

3.3 Series Resistors

Summary



- Can we formulate a general expression for the voltage drop across a resistor that exists in series?



Learning Objectives

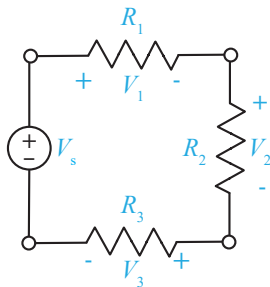
3.3 Series Resistors

Summary



# Equivalent Resistance

- Replace the resistors in series as one resistor.



Learning Objectives

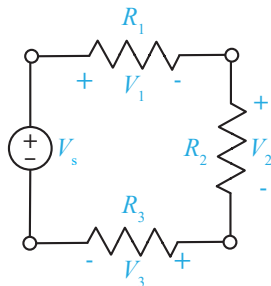
3.3 Series Resistors

Summary



# Equivalent Resistance

- Does the equivalent resistor satisfy the conservation of electrical power and Ohm's law?



Learning Objectives

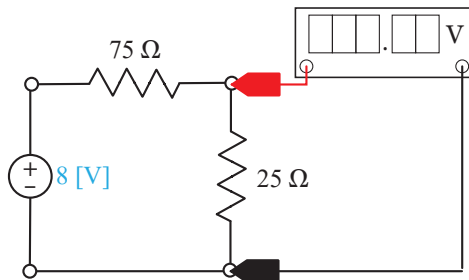
3.3 Series Resistors

Summary



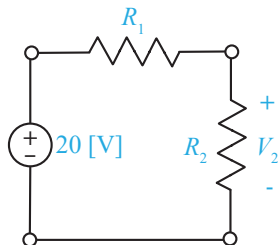
# Example #1

- Determine the voltage measured by the voltmeter:



## Example #2

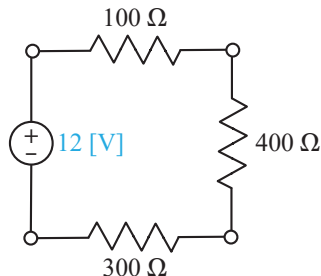
- Design a voltage divider such that  $V_2=0.8V_s$  and no more than 1 [mW] of power is supplied by the source, given  $V_s=20$  [V].





## Example #3

- Find the voltage drop across each resistor:



# Student Learning Objectives

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

- ▶ Understand how resistors in series divide voltage
  - ▶ Resistors in series carry the same current.  
However, there exists a potential to drive the current through all the resistors. Thus, the voltage drop across a resistor in series with other resistors is a proportion of the total potential.
- ▶ Formulate an expression for the voltage across a resistor in series with other resistors

$$V_j = \left( \frac{R_j}{\sum_{i=1}^N R_i} \right) V_s$$



# Suggested Problems

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Resistive Circuits

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► 3.3-1, 3.3-2, 3.3-3, 3.3-5, 3.3-6, 3.3-7

Learning Objectives

3.3 Series Resistors

Summary

