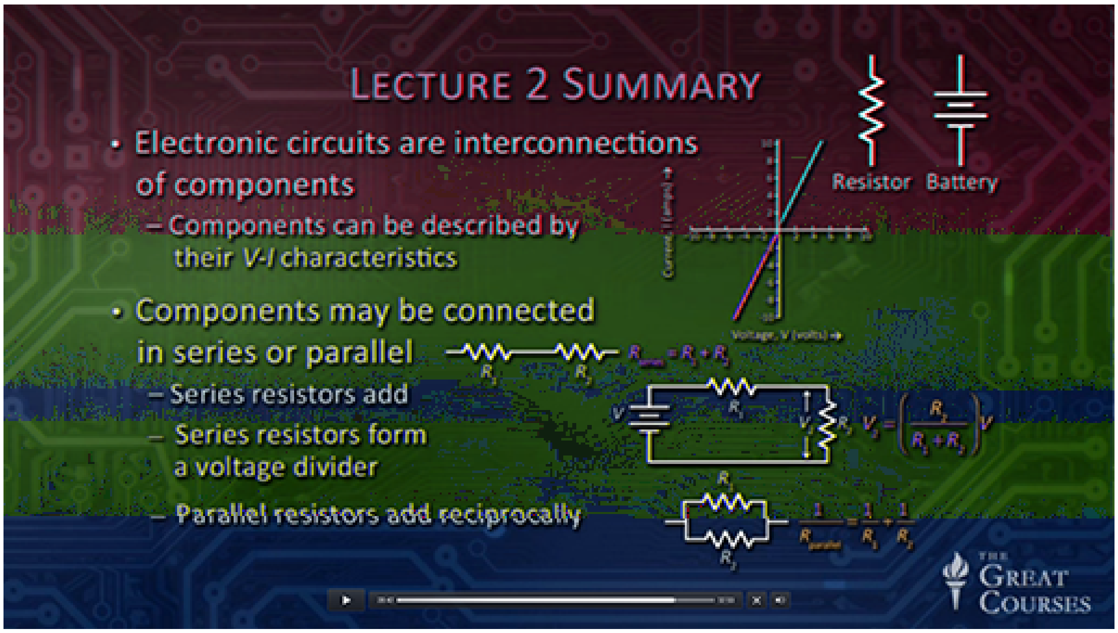
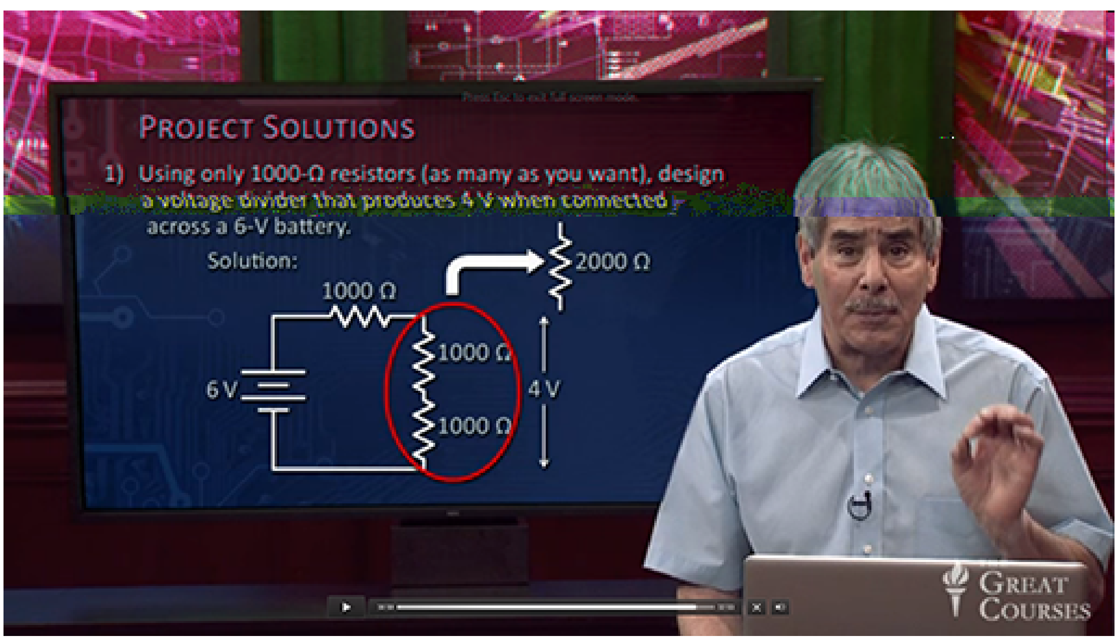
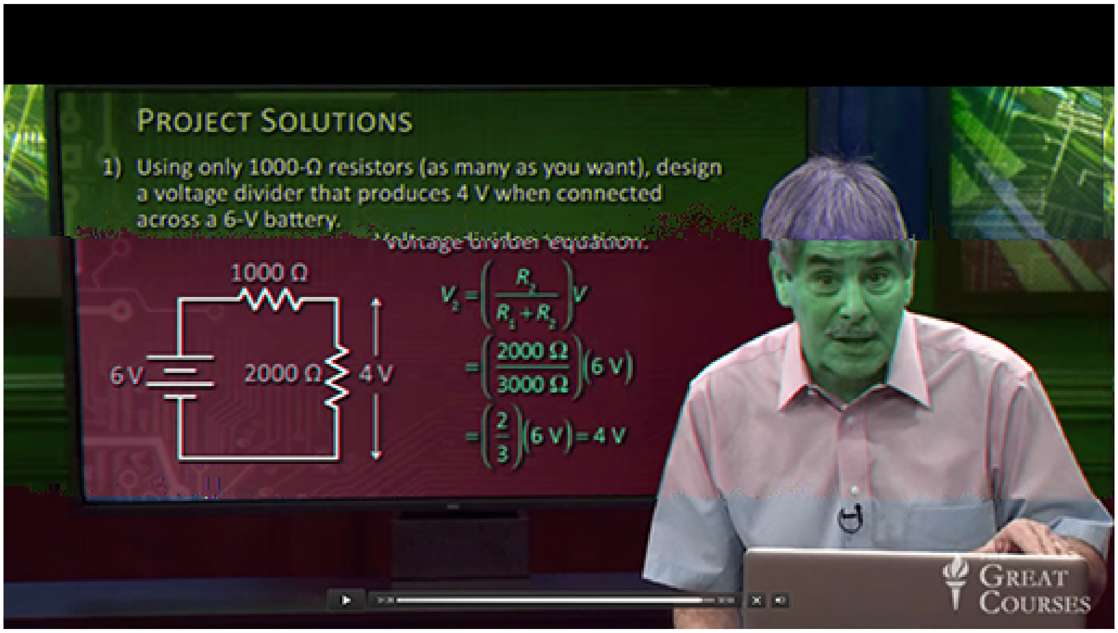
Electronics (Great Courses)

Lecture 2



Project




PROJECT SOLUTIONS
1) Using only 1000-Ω resistors (as many as you want), design a voltage divider that produces 4 V when connected across a 6-V battery.
Voltage divider equation:
1000 Ω
6 V
2000 Ω
4 V
$V_2 = \left(\frac{R_2}{R_1+R_2}\right)V$
$= \left(\frac{2000\ \Omega}{3000\ \Omega}\right)(6\text{ V})$
$= \left(\frac{2}{3}\right)(6\text{ V}) = 4\text{ V}$
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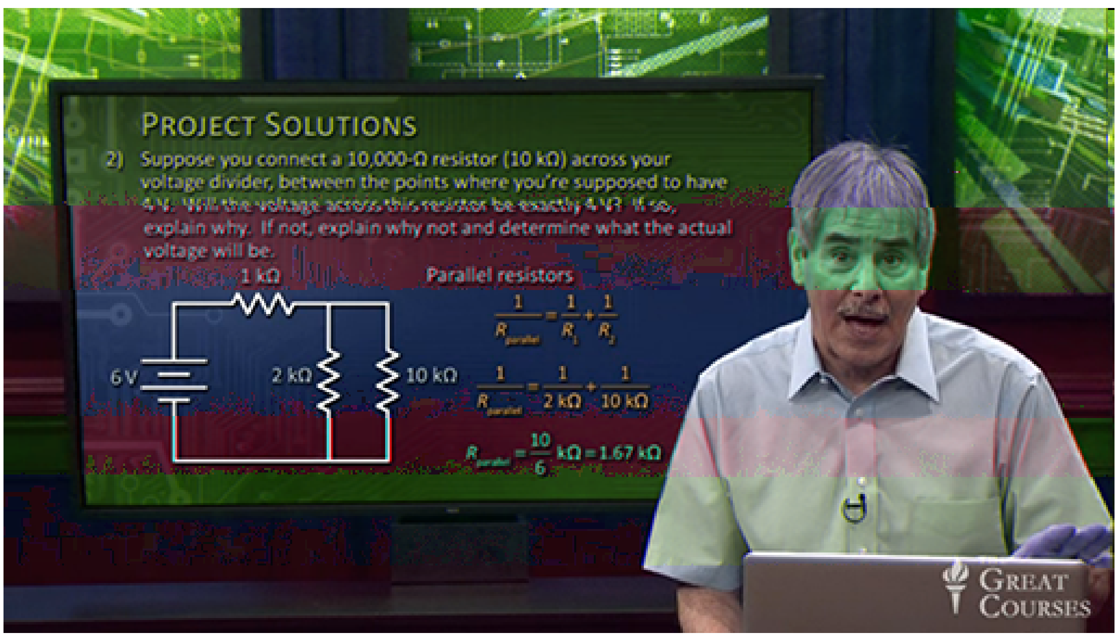
PROJECT SOLUTIONS
2) Suppose you connect a 10,000-Ω resistor (10 kΩ) across your voltage divider, between the points where you're supposed to have 4 V. Will the voltage across this resistor be exactly 4 V? If so, explain why. If not, explain why not and determine what the actual voltage will be.
1 kΩ
6 V
2 kΩ
10 kΩ
Parallel resistors
$\frac{1}{R_{parallel}} = \frac{1}{R_1} + \frac{1}{R_2}$
$\frac{1}{R_{parallel}} = \frac{1}{2\text{ k}\Omega} + \frac{1}{10\text{ k}\Omega}$
$R_{parallel} = \frac{10}{6}\text{ k}\Omega = 1.67\text{ k}\Omega$
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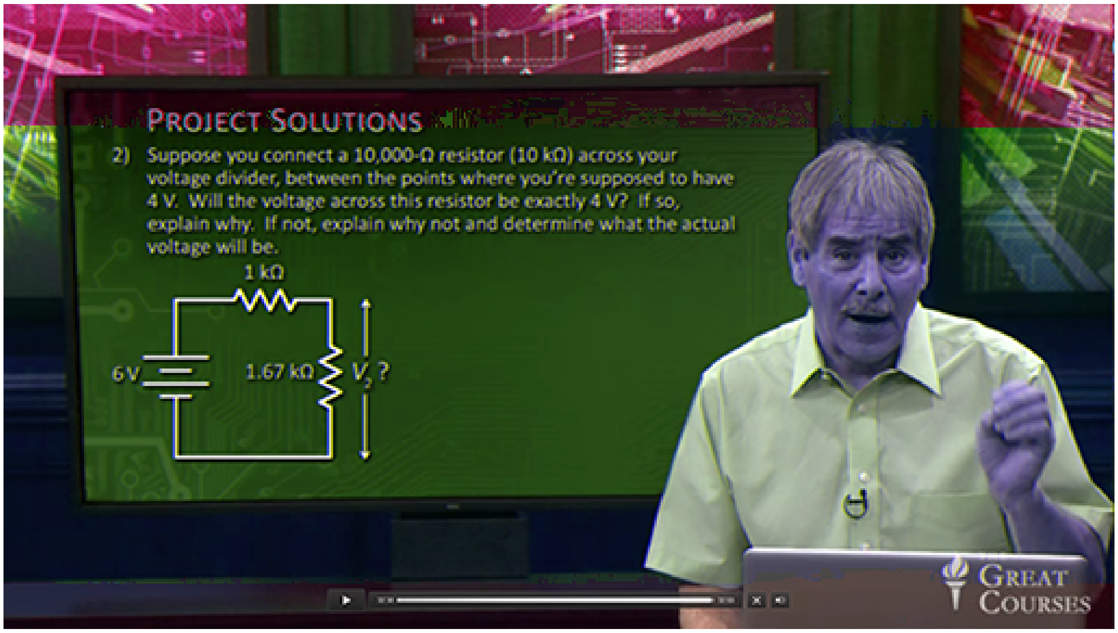
Project Solutions
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1 kΩ
6 V
1.67 kΩ
V_2 ?
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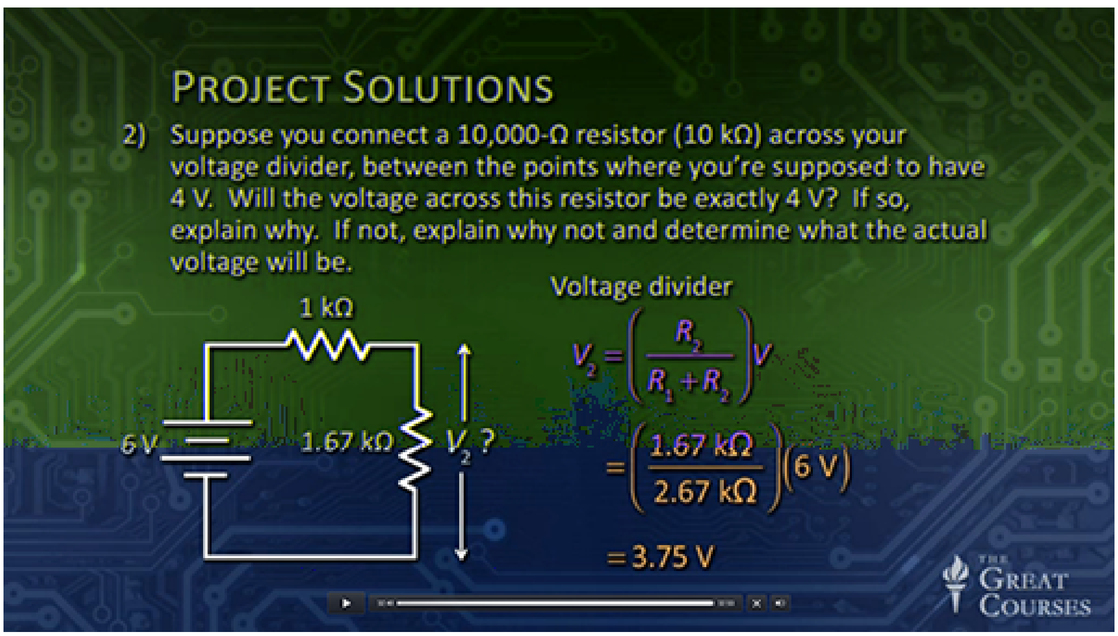
Project Solutions
2) Suppose you connect a 10,000-Ω resistor (10 kΩ) across your voltage divider, between the points where you're supposed to have 4 V. Will the voltage across this resistor be exactly 4 V? If so, explain why. If not, explain why not and determine what the actual voltage will be.
Voltage divider
1 kΩ
6 V
1.67 kΩ
V_2 ?
$V_2 = \left(\frac{R_2}{R_1+R_2}\right)V$
$= \left(\frac{1.67\ k\Omega}{2.67\ k\Omega}\right)(6\ V)$
$= 3.75\ V$
The Great Courses