Answer on Question 50350, Physics, Electric Circuits

Question In investigating an existing design of a circuit, it was found that a 25Ω resistor disspates 9W.

The engineer decides to put a 12.5Ω resistor in series with this 25Ω resistor.

What is the power dissipation now in the 25Ω resistor with the same supply voltage after the 12.5Ω resistor was added?

(clue - determine what the supply voltage is from the given information. Then you can either use the voltage divider theory to find the voltage now dropped across the 25? and then work out the power, or you can calculate the total current now drawn by both resistors and then work out the power across the 25? resistor!)

Solution Let us find supply voltage U. It is connected to power P_1 and resistance R_1 as

$$P = \frac{U^2}{R}$$

Hence

$$U = \sqrt{PR} = \sqrt{9 \cdot 25} = 15\,V$$

Now we will find total current after putting more resistance

$$I = \frac{U}{R_1 + R_2} = \frac{15}{25 + 12.5} = 0.4\,A$$

Now we can find power dissipation in this case:

$$P_2 = IU = 0.4 \cdot 15 = 6\,W$$