

Name _____

Class _____

Date _____

By the end of this worksheet I can...

- ☐ use $V = IR$ to find voltage, current or resistance
- ☐ calculate total resistance, current and voltages in series circuits
- ☐ calculate total resistance and branch currents in parallel circuits
- ☐ solve combined series and parallel circuits

I DO

Key ideas and worked example Read this first

$V = IR$

Voltage = current $\times$ resistance (Ohm's law)

- V in volts, I in amps, R in ohms (Ω)
- Convert first: $4.7 \text{ k}\Omega = 4700 \Omega$, $30 \text{ mA} = 0.03 \text{ A}$

	Series	Parallel
Resistance	$R_T = R_1 + R_2 + \dots$	$1/R_T = 1/R_1 + 1/R_2 + \dots$ (two: $R_1 R_2 \div (R_1 + R_2)$)
Current	The same everywhere	Splits: $I_T = I_1 + I_2 + \dots$
Voltage	Shared: $V_S = V_1 + V_2 + \dots$	The same across every branch

10 Ω and 17 Ω resistors are connected in series to a 9 V supply.

Example Calculate the total resistance, the current and the voltage across each resistor.

Worked answer set out every step like this

$$R_T = 10 + 17 = 27 \Omega$$

$$I = V \div R = 9 \div 27 = 0.333 \text{ A}$$

$$V_1 = 0.333 \times 10 = 3.33 \text{ V}; V_2 = 0.333 \times 17 = 5.67 \text{ V}$$

$$\text{Check: } 3.33 + 5.67 = 9 \text{ V}$$

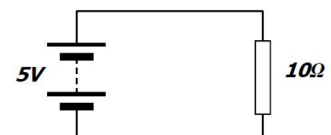
YOU DO

On your own Show your working. Check your answers afterwards.

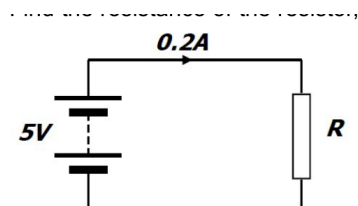
1 Calculate the missing quantity in each circuit.

a) Find the current.

a. Find the current.

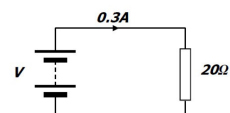


b) Find the resistance R.



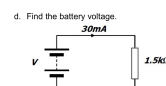
c) Find the battery voltage.

c. Find the battery voltage.



d. Find the battery voltage.

d) Find the battery voltage (30 mA through 1.5 kΩ).



2 For each series circuit, calculate the total resistance, the current and the voltage across each resistor.

	R_1	R_2	V_s	R_T	I	V_1	V_2
a	20 Ω	1.5 k Ω	12 V				
b	100 Ω	1.3 k Ω	12 V				
c	260 k Ω	1 M Ω	33 V				

3 For each parallel circuit, calculate the total resistance, the circuit current and the current in each resistor.

	Resistors in parallel	V_s	R_T	I_T	Branch currents
a	12 Ω , 8 Ω	12 V			
b	5.7 k Ω , 90 Ω	110 V			

4 Three resistors in parallel are connected in series with R_4 , across a 230 V supply.

	R_1	R_2	R_3	R_4 (series)
c	470 Ω	660 Ω	50 Ω	1 k Ω
d	440 Ω	610 Ω	30 Ω	2.2 k Ω

a) For each, calculate the total resistance and the circuit current.

b) For each, calculate the voltage across the parallel section and the current in each parallel resistor.

5 15 k Ω and 25 k Ω resistors are connected in parallel to a 6 V supply. Calculate the total resistance and the circuit current.

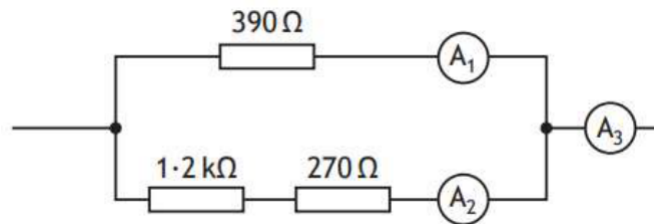
6 2 k Ω , 5 k Ω and 10 k Ω resistors are connected in parallel to a 10 V supply. Calculate the total resistance, the circuit current and the current through the 2 k Ω resistor.

7 A burglar alarm has two buzzers (200 Ω and 300 Ω) in parallel on an 8 V supply. Calculate the circuit resistance, the circuit current and the current through the 200 Ω buzzer.

8 A student needs 50 Ω but only has two 100 Ω resistors. Draw a solution and prove it with a calculation.

9 A 6 V supply feeds 30 Ω and 20 Ω resistors in parallel, in series with a 10 Ω resistor. Calculate the total resistance, the circuit current, the voltage across the 10 Ω resistor and the current through the 30 Ω resistor.

10 SQA 2019, question 8. Part of the circuit in a smart speaker is shown.



a) Calculate the total resistance of the circuit. (3 marks)

b) The reading on A_1 is 0.031 A. Calculate the voltage across the $390\ \Omega$ resistor. (2 marks)

c) Calculate the current A_2 . (3 marks)

d) Calculate the current A_3 . (1 mark)

Check and reflect

Mark your answers with the answer sheet. Which “I can” statement above still needs work? Look back at the notes for that topic on the site.
