

Name \_\_\_\_\_

Class \_\_\_\_\_

Date \_\_\_\_\_

## By the end of this worksheet I can...

- ☐ choose the right formula for each circuit
- ☐ calculate resistance, current and voltage in series, parallel and combined circuits
- ☐ convert between  $k\Omega$  and  $\Omega$ , and A and mA
- ☐ show working and give units

## I DO

## Key ideas Show all working and use the correct units

## V = IR

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

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

|            | 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                                       |

## YOU DO

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

**1 A 12 V supply is connected to a 240  $\Omega$  resistor. Calculate the current.**

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**2 15  $\Omega$  and 35  $\Omega$  resistors are in series on a 10 V supply.**

**a)** Calculate the total resistance.

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**b)** Calculate the current.

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**c)** Calculate the voltage across each resistor.

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**3 100  $\Omega$  and 300  $\Omega$  resistors are in parallel on a 12 V supply.**

**a)** Calculate the total resistance.

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b) Calculate the total current.

c) Calculate the current through the  $100\ \Omega$  resistor.

**4 A current of 0.5 A flows through a resistor on a 9 V supply. Calculate the resistance.**

**5 A  $20\ \Omega$  resistor is in series with  $60\ \Omega$  and  $30\ \Omega$  resistors in parallel. The supply is 18 V.**

a) Calculate the total resistance.

b) Calculate the current.

c) Calculate the voltage across the  $20\ \Omega$  resistor.

**6  $R_1 = 2.2\ \text{k}\Omega$  and  $R_2 = 4.7\ \text{k}\Omega$  are in series on a 12 V supply.**

a) Calculate the total resistance.

b) Calculate the current.

c) Calculate the voltage across  $R_2$ .

**7  $10\ \Omega$ ,  $20\ \Omega$  and  $40\ \Omega$  resistors are in parallel on a 12 V supply.**

a) Calculate the total resistance.

b) Calculate the total current.

c) Calculate the current through the  $20\ \Omega$  resistor.

**8 A current of 2 A flows through a  $15\ \Omega$  resistor. Calculate the supply voltage.**

**9 100  $\Omega$ , 150  $\Omega$  and 250  $\Omega$  resistors are in series on a 20 V supply.**

**a)** Calculate the total resistance.

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**b)** Calculate the current.

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**c)** Calculate the voltage across the 250  $\Omega$  resistor.

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**10 8  $\Omega$  and 12  $\Omega$  resistors are in parallel on a 6 V supply.**

**a)** Calculate the total resistance.

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**b)** Calculate the total current.

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**11 A 50  $\Omega$  resistor is in series with two 100  $\Omega$  resistors in parallel. The supply is 10 V.**

**a)** Calculate the total resistance.

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**b)** Calculate the current.

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**c)** Calculate the current through one of the 100  $\Omega$  resistors.

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**12 A student needs 25  $\Omega$  but only has two 50  $\Omega$  resistors.**

**a)** Draw a circuit to give 25  $\Omega$ .

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**b)** Prove your answer with a calculation.

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**13 A 24 V supply is connected to a 3 k $\Omega$  resistor. Calculate the current in mA.**

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**14 1 k $\Omega$  and 2 k $\Omega$  resistors are in parallel on a 9 V supply.**

**a)** Calculate the total resistance.

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**b)** Calculate the total current.

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**15 30  $\Omega$  and 60  $\Omega$  resistors in parallel are in series with a 10  $\Omega$  resistor on a 12 V supply.**

**a)** Calculate the total resistance.

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**b)** Calculate the current.

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**c)** Calculate the voltage across the 10  $\Omega$  resistor.

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**d)** Calculate the current through the 30  $\Omega$  resistor.

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**16 R<sub>1</sub> = 470  $\Omega$  and R<sub>2</sub> = 1.5 k $\Omega$  are in series on a 9 V supply.**

**a)** Calculate the total resistance.

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**b)** Calculate the current.

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**17 Two heaters (20  $\Omega$  and 30  $\Omega$ ) are in parallel on a 12 V battery.**

**a)** Calculate the total resistance.

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**b)** Calculate the total current.

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**c)** Calculate the current through the 20  $\Omega$  heater.

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**18 A circuit has a total resistance of 40  $\Omega$ : a 10  $\Omega$  resistor in series with a parallel section. Calculate the resistance of the parallel section.**

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**19** 2 k $\Omega$ , 5 k $\Omega$  and 10 k $\Omega$  resistors are in parallel on a 10 V supply.

a) Calculate the total resistance.

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b) Calculate the total current.

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c) Calculate the current through the 2 k $\Omega$  resistor.

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**20** A 6 V supply feeds a 15  $\Omega$  resistor in series with two 30  $\Omega$  resistors in parallel.

a) Calculate the total resistance.

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b) Calculate the current.

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c) Calculate the voltage across the parallel section.

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d) Calculate the current through one 30  $\Omega$  resistor.

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## 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.

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