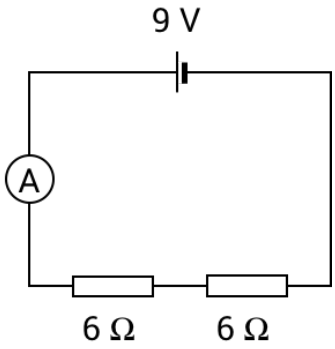
0 1

A 9 V cell is connected to two 6 Ω resistors in series, as shown below.



0 1 . 1

Show that the ammeter reading is 0.75 A.

Total circuit resistance = 6 + 6 = 12 Ω
I = V ÷ R = 9 ÷ 12 = **0.75 A**

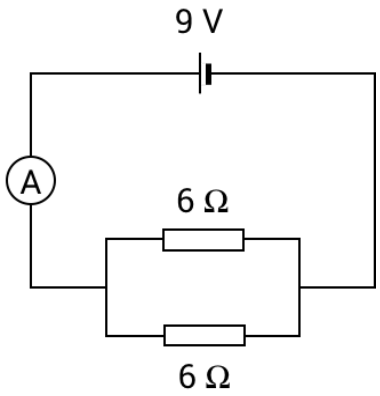
0 1 . 2

Calculate the potential difference (p.d.) across **one** of the 6 Ω resistors.

V = I R = 0.75 × 6 = **4.5 V**

0 1 . 3

The resistors are then connected in parallel.
The new reading on the ammeter is now 3 A.



Calculate the current flowing through **each** resistor.

P.d. across each resistor = 9 V
I = V ÷ R = 9 ÷ 6 = **1.5 A**

OR equal currents through each 6 Ω resistor, so I = 3 ÷ 2 = **1.5 A**

0 1 . 4

What is the *equivalent resistance* of the parallel 6 Ω resistors? In other words, if they were replaced by a single resistor which maintained the current at 3 A, what would its resistance be?

R = V ÷ I = 9 ÷ 3 = **3 Ω**

0 1 . 5

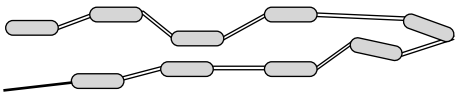
Explain why placing the resistors in **parallel** in this circuit had the effect of **increasing** the circuit current.

When the resistors are placed in parallel, each charge (electron) only has to pass through one 6 Ω resistor each time it travels round the circuit [1]. This means that the circuit resistance is lower, which causes the current to increase.

OR this increases the p.d across each bulb [1] which in turn increases the current flowing through each bulb (I = V ÷ R) [1].

0 2

An old set of decorative lights is made from nine identical lamps which are connected in series, as shown below.



Under normal operating conditions, the lamps draw a current of 2.5 A from a 230 V mains electricity supply.

0 2 . 1

Calculate the resistance of **each** of the lamps.

Resistance of all **nine** lamps = V ÷ I = 230 ÷ 2.5 = 92 Ω
Resistance of each lamp = 92 ÷ 9 = **10.2 Ω** (1 d.p.)

0 2 . 2

Most modern decorative lamps are wired in parallel. Write down one advantage of connecting such lamps in parallel rather than in series.

If one bulb fails (blows), the other eight will still work [1] OR
this increases the brightness of each bulb [1].