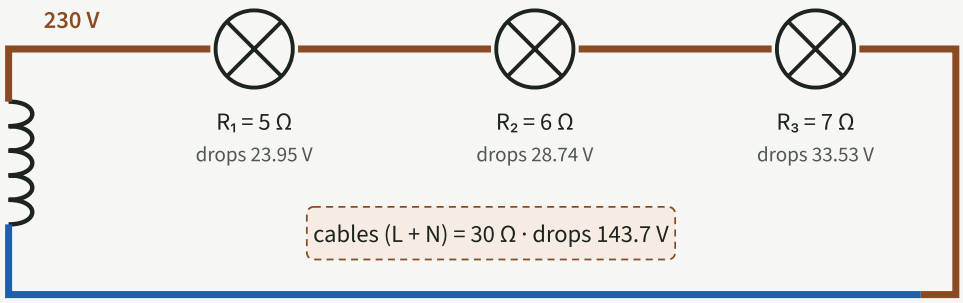
SERIES CIRCUITS

ONE BULB GOES, AND THEY ALL GO OUT. WHY?

In a series circuit the loads are connected **one after another in a single path**. There's only one route for the current. Fairy lights and old Christmas tree lights are the classic example: when one bulb goes, they all go out.

Electricians don't wire circuits in series. It isn't efficient, one fault kills everything, and if the loads are different they don't all get the same voltage, so they aren't all equally bright.



I = 4.79 A, the same everywhere in the loop

WORKED EXAMPLE

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Given: 230 V supply · cables (line + neutral) = 30 Ω
       lamps = 5 Ω, 6 Ω, 7 Ω

1) Total resistance (add everything, cables included)
   Rt = 30 + 5 + 6 + 7 = 48 Ω

2) Total current (Ohm's law)
   I = V ÷ Rt = 230 ÷ 48 = 4.79 A

3) Voltage dropped across each part (V = I × R)
   Lamp 1:  4.79 × 5  =  23.95 V
   Lamp 2:  4.79 × 6  =  28.74 V
   Lamp 3:  4.79 × 7  =  33.53 V   → lamps total 86.22 V
   Cables:  4.79 × 30 = 143.70 V

   Check: 86.22 + 143.70 = 229.92 ≈ 230 V ✓  (Kirchhoff's voltage law)
```

Picture the voltage being used up

230 V arrives at the first lamp. Suppose it's 10 Ω with 4 A flowing: it uses 4 × 10 = 40 V, leaving 190 V for the rest. A 20 Ω lamp next would use 80 V. Each load takes its share, and the shares always add back up to the supply. If they don't, there's a fault somewhere.

Series rules Current is **constant**: the same everywhere.
Voltage is **dropped across each load**, and the drops add up to the supply voltage.

$R_t = R_1 + R_2 + R_3 \ldots$ $V_t = V_1 + V_2 + V_3 \ldots$

Rt = total resistance · Vt = total (supply) voltage

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