

# Answers to S3 Resistance Homework.

1(a) this is a series circuit.

use

$$\begin{aligned} R_s &= R_1 + R_2 + R_3 \\ &= 6 + 9 + 18 \\ &= \underline{33 \Omega} \end{aligned}$$

(b) this is a parallel circuit

use

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

$$\frac{1}{R_p} = \frac{1}{6} + \frac{1}{9} + \frac{1}{18}$$

$$\frac{1}{R_p} = \frac{3}{18} + \frac{2}{18} + \frac{1}{18}$$

$$\frac{1}{R_p} = \frac{6}{18}$$

$$\frac{R_p}{1} = \frac{18}{6}$$

$$\underline{R_p = 3 \Omega}$$

you need a common denominator.

now you can invert both sides or cross-multiply to find  $R_p$ .

(c) this is a mixed circuit (has series & parallel sections).

Start by finding the resistance of the parallel section:

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$$

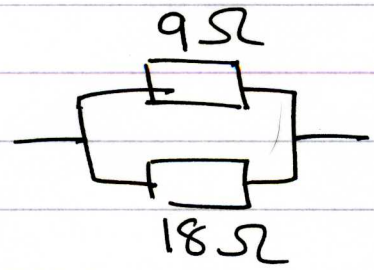
$$\frac{1}{R_p} = \frac{2}{18} + \frac{1}{18} = \frac{3}{18}$$

$$\frac{1}{R_p} = \frac{1}{9} + \frac{1}{18}$$

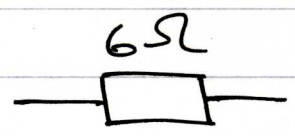
$$\frac{R_p}{1} = \frac{18}{3} \rightarrow R_p = 6 \Omega$$

1(c) continued.

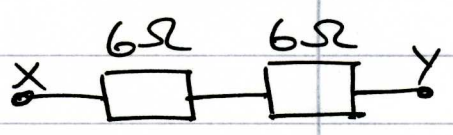
So we replace



with



and the circuit becomes



The total resistance between X and Y is

$$\begin{aligned}
 R_s &= R_1 + R_2 \\
 &= 6 + 6 \\
 &= \underline{12\Omega}
 \end{aligned}$$

(d) Again, start by replacing the parallel section by a single resistor,  $R_p$ .

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R_p} = \frac{1}{6} + \frac{1}{18}$$

$$\frac{1}{R_p} = \frac{3}{18} + \frac{1}{18}$$

$$\frac{1}{R_p} = \frac{4}{18}$$

$$\frac{R_p}{1} = \frac{18}{4} \rightarrow R_p = 4.5\Omega$$

