Answers to S3 Resistance Homework.

1(a) this is a series circuit.

use

$$R_S = R_1 + R_2 + R_3$$
$$= 6 + 9 + 18$$
$$= \underline{33\,\Omega}$$

(b) this is a parallel circuit

use

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

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

you need a common denominator.

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

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

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

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

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

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

Start by finding the resistance of the parallel section:

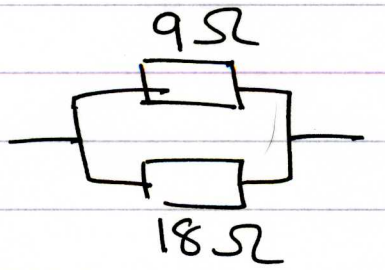
$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$$

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

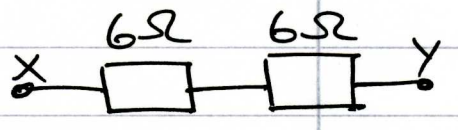
$$\frac{1}{R_p} = \frac{2}{18} + \frac{1}{18} = \frac{3}{18}$$

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

1(c) continued.

So we replace 

with 

and the circuit becomes 

The total resistance between X and Y is

$$R_s = R_1 + R_2$$
$$= 6 + 6$$
$$= \underline{12\,\Omega}$$

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

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

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

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

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

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