Reminders:
1. Use subscripts for similar quantities belonging to different components, e.g. R_1, R_2.
2. Write down the **basic formulae** before substitution.
   - Component: $V = IR$
   - Entire circuit: e.m.f. $= I_{main} R_{eff}$
3. Show all key mathematical steps clearly.
4. **Redraw & rearrange** circuit components and wiring to **simplify** circuit diagrams
   - Note short-circuits, switches open/closed, junctions, etc.
5. Evaluate your final answer!

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1 (a) Find resistance of the two resistors in parallel:
$1/(1/10) + (1/10) = 5.0\ \Omega$
Hence total resistance $= R_T = 3.0 + 5.0 = 8.0\ \Omega$

(b) $I = V / R = 0.50$ A

(c) $Q = I t = 0.50$ C

2 (a) $I = 1.0$ A
(b) $I = 0.50$ A

3 (a) Find resistance of the two resistors 12 Ω and 6.0 Ω in parallel:
$1/(1/12) + (1/6.0) = 4.0\ \Omega$
Find resistance of the two resistors 3.0 Ω and 6.0 Ω in parallel:
$1/(1/3.0) + (1/6.0) = 2.0\ \Omega$

Find resistance of the two resistors 4.0 Ω and 2.0 Ω in
(b) $I = 12 / (4.0 + 2.0) = 2.0$ A
(c) $I = 12 / (4.0 + 3.0) = 1.7$ A
(d) $I = 12 / (6.0 + 3.0) = 1.3$ A

4 (a) $V_X = 12/2 = 6$ V, $V_y = 0$ V

(b) 0.60 A

5 (a) $R = 5 + ¾ = 5.75\ \Omega = 5.8\ \Omega$

(b) 1.04 A

6 5.0 V

7　(a)　2.4 A (b)

　　　　1.62 Ω

　　(c)　The current flowing through the 5 Ω resistor is unchanged (still 2.4 A) as the
　　　　voltage across the 5 Ω is unchanged at 12 V even with the addition of the 2 Ω
　　　　resistor.

8　(a)　0.40 A

　　(b)　0 A　　Current in 4 Ω resistor

9　**Note**: May use potential divider method, treat resistance wire as 2 variable
　　resistors in series as the jockey moves!

- The p.d. across the wire is proportional to its resistance when current
  through it is constant.

- When S is at A, voltmeter reading is zero as the resistance across it is zero.

- As S moves from A towards B, the p.d. across the length of wire AS
  increases with increasing resistance. Hence the voltmeter reading V
  increases.

- When S is at B, the voltmeter reading is 4.0 V as the voltmeter is
  across the maximum length of the resistance wire AB.

10   (a)   Let resistance of each lamp be r.
L$_2$ and L$_3$ are in parallel, so effective resistance is found t
Ratio of resistance of L$_1$:   L$_2$ and L$_3$ (in parallel)
= r : r/2
= 2 : 1

So ratio of p.d.s is also 2 :   1= 4V : 2V
V$_{L2}$ = V$_{L3}$ = 2.0 V; Lamps L$_2$ and L$_3$ will be equally dim as the p.d.
across each of them is lower than the rated value of 3.0 V.

V$_{L1}$ = 4.0 V; Lamp L$_1$ will be brighter than normal as the p.d across
it is higher than the rated value of 3.0 V.

Note:
- Rating of 3.0 V means when a p.d. of 3.0 V is applied across the lamp, it has normal brightness.
- Redraw the circuit and simplify if it helps you to understand the circuit better.
- Brightness not directly proportional to current or p.d.: **NOT twice as bright**!

(b)   The two lamps are in series.

V$_{L1}$ = V$_{L3}$ = 3.0 V; Lamp L$_3$ and lamp L$_1$ will both be operating at normal brightness as the p.d. across each of them is equal to the rated value of 3.0 V.

Note:
- When a lamp is removed, the wires next to it are NOT reconnected unless stated!

(c)   The two lamps are in parallel.

V$_{L2}$ = V$_{L3}$ = 6.0 V; Lamps L$_2$ and L$_3$ will both be very bright (and likely to fuse) as the p.d. across each of them is doubled the rated value of 3.0 V.

11   (a)   V = 6.0 V,   I = V / R$_{total}$ =
(b)   V = 3.0 V,   same I = 0.020 A
(c)   V = 0.0 V,   same I = 0.020 A

Note: Brightness of lamp is not directly proportional to V or I^2