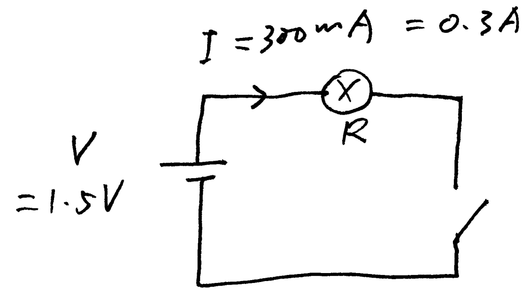
e.g. 25-~~4~~.



a). $R = ?$

$$R = \frac{V}{I}$$

$$= \frac{1.5V}{0.3A}$$

$$= 5\,\Omega.$$

b). Now $V = 1.2V$.

$I = ?$

$$I = \frac{V}{R}$$

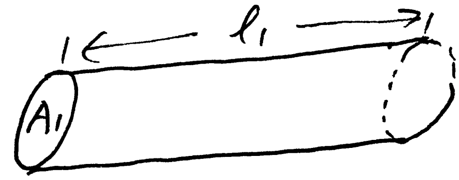
$$= \frac{1.2V}{5\Omega}$$

$$= 0.24A$$

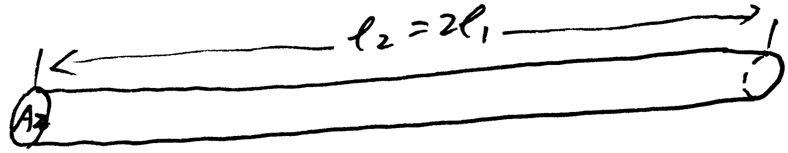
$$= 240\ mA$$

e.g. 25-6. Stretching a wire.

$$R_1 = \rho \frac{l_1}{A_1}$$



$$R_2 = \rho \frac{l_2}{A_2}.$$



Same volume : $l_1 A_1 = l_2 A_2$.

$$A_2 = \frac{l_1}{l_2} A_1 = \frac{l_1}{2l_1} A_1 = \frac{A_1}{2}.$$

$$R_2 = \rho \frac{2l_1}{A_1/2} = \rho \frac{4l_1}{A_1} = 4R_1$$

$\therefore$ The resistance is increased by a factor of 4.

2 effects: longer in length, smaller in area. } both reduce R.

e.g. 25-8.

what's the resistance of a 40-W light bulb ?

[It depends on the voltage specification].

Here, the light bulb is for 12 V.

$\therefore \quad P = 40\,W, \quad V = 12\,V. \quad R = ?$

$$P = \frac{V^2}{R}, \qquad R = \frac{V^2}{P} = \frac{12^2}{40} = 3.6\,\Omega.$$

what if the light bulb is for $V = 120\,V$?

$$R = \frac{V^2}{P} = \frac{120^2}{40} = 360\,\Omega.$$

e.g. 25-12. Extension cord.

$P = 1800\ W$.

$V = 120\ V$.

$P = IV$.

$$I = \frac{P}{V} = \frac{1800\ W}{120\ V} = 15\ A.$$

Extension cord: 11 A. — too small!

e.g. 25-13. Hair dryer.

$V = 120\ V$ $\quad P = 1000\ W$.

$= V_{rms}$.

a). R: $\quad P = I_{rms} V_{rms} = \dfrac{V_{rms}^2}{R}$

$$R = \frac{V_{rms}^2}{P} = \frac{120^2}{1000} = 14.4\ \Omega.$$

$$I_{rms} = \frac{P}{V_{rms}} = \frac{1000}{120} = 8.33\ A.$$

b). $\quad \bar{P} = \dfrac{V_{rms}^2}{R} = \dfrac{240^2}{1000} = 4000\ W.$

$$I_{rms} = \frac{V_{rms}}{R} = \frac{240\ V}{14.4\ \Omega} = 16.7\ A.$$