Q = charge (amount of negativeness)

$Q = It$

Q: Charge in A·h (ampere-hours)

I: current in A (amps)

t: time in hours

① $Q_{initial} = 90\ A \cdot h$

$Q_{used\ up} = It$

$= (15A)(5.5h)$

$= 82.5\ A \cdot h$

$Q_{left} = 90\ A \cdot h - 82.5\ A \cdot h$

$= 7.5\ A \cdot h$

$3s \div 3600 = 0.00083\ h$

$Q_{needed\ for\ 1\ start\text{-}up} = It$

$= (400A)(.00083h)$

$= 0.33\ A \cdot h$

Yes the car will start

$Q_{needed} < Q_{left}$

Ohm's Law

$V = IR$

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

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

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

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

① $V = 6V$

$I = 0.33A$

$R = ?$

$$R = \frac{V}{I} = \frac{6V}{0.33A} = 18.18\,\Omega$$

② $V = 120V$

$I = ?$

$R = 300\,\Omega$

$$I = \frac{V}{R} = \frac{120V}{300\,\Omega} = 0.4A$$

$1000mA = 1A$

$mA \rightarrow A$

$\div 1000$

③ $V = 9V$

$I = 0.5A$

$R = ?$

$R = \frac{V}{I} = \frac{9V}{0.5A}$

$= \boxed{18\,\Omega}$

④ $I = 1.7A$

$R = 71\,\Omega$

$V = ?$

$V = IR$

$= (1.7A)(71\,\Omega)$

$= \boxed{120.7V}$

⑤ $V = 240V$

$R = 113\,\Omega$

$I = ?$

$I = \frac{V}{R} = \frac{240V}{113\,\Omega} = \boxed{2.12\,A}$

⑥ $V = 12V$

$I = 2.5A$

$R = ?$

$R = \frac{V}{I} = \frac{12V}{2.5A} = \boxed{4.8\,\Omega}$

(7) $V = 240\,V$

$R = 135\,\Omega$

$I = ?$

$I = \frac{V}{R} = \frac{240\,V}{135\,\Omega} = \boxed{1.78\,A}$

(8) $R = 40\,\Omega$

$I = 15\,A$

$V = ?$

$V = IR$

$= (15\,A)(40\,\Omega)$

$= \boxed{600\,V}$

(9) $I = 9\,mA = 0.009\,A$

$\div 1000$

$V = 3\,V$

$R = \frac{V}{I} = \frac{3\,V}{0.009\,A} = 333.33\,\Omega$

(10) $R = 9\,\Omega$

$I = 450\,mA = 0.45\,A$

$V = IR = (0.45\,A)(9\,\Omega) = 4.05\,V$

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

$R = 6\,\Omega$

$\times 2$ $I = \frac{V}{R}$ $\times 2$

a) 12 V $I = 2A$

b) 24 V $I = 4A$

c) 36 V $I = 6A$

d) 48 V $I = 8A$

e) 6 V $I = 1A$

f) 3 V $I = 0.5A$

V is directly proportional to I.

$\uparrow V\ 2x \therefore \uparrow I\ 2x$ | $\downarrow V\ \frac{1}{2}x \therefore \downarrow I\ \frac{1}{2}x$

$\uparrow V\ 3x \therefore \uparrow I\ 3x$ | $\downarrow V\ \frac{1}{3}x \therefore \downarrow I\ \frac{1}{3}x$

$\uparrow V\ 10x \therefore \uparrow I\ 10x$ | $\downarrow V\ \frac{1}{5}x \therefore \downarrow V\ \frac{1}{5}x$

e.g. Start with V = 15 V, then switch to V of 21 V.

(B) Before V = 15 V (A) After V = 21 V

$\frac{A}{B} = \frac{21}{15} \overset{\div 3}{\underset{\div 3}{}} = \frac{7}{5}$ $V \uparrow \frac{7}{5}x \therefore I \uparrow \frac{7}{5}x$

If a Voltage is changed from (B) 12V → 20V (A), by how many times will the current change?

$\frac{A}{B} = \frac{20}{12} \overset{\div 4}{\underset{\div 4}{}} = \frac{5}{3}$

$12 \times \frac{5}{3} = 20$

$V \uparrow \frac{5}{3}x$

$I \uparrow \frac{5}{3}x$

If V is changed from (B) 32V to (A) 24V, how would I be affected?

$V \downarrow \frac{3}{4}x$

$\therefore$

$I \downarrow \frac{3}{4}x$

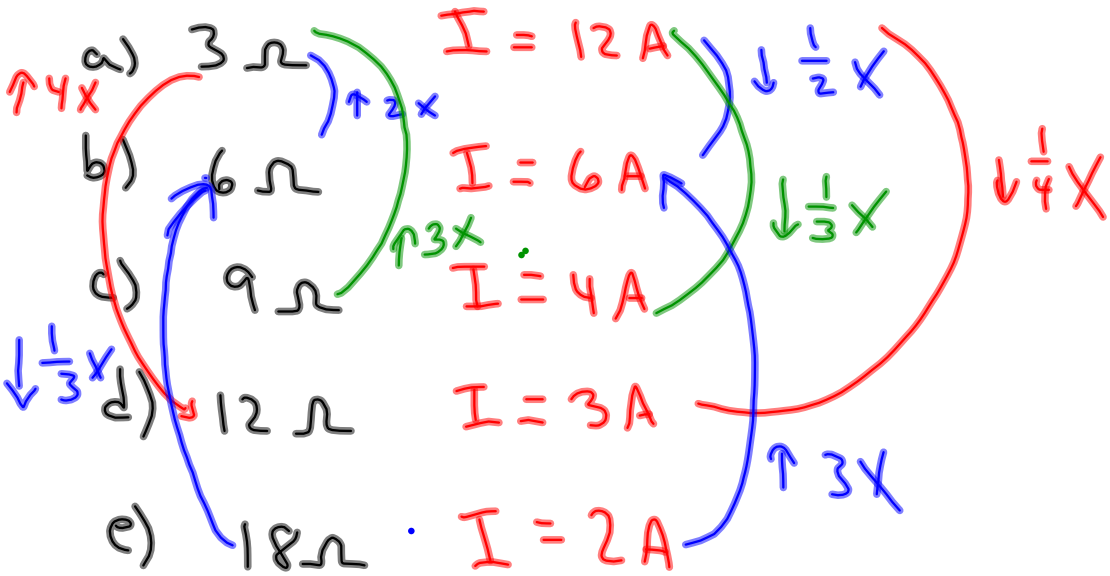
$\frac{A}{B} = \frac{24}{32} \overset{\div 8}{\underset{\div 8}{}} \left(\frac{3}{4}\right)$

$32 \times \frac{3}{4} = \frac{96}{4}$

$= 24$

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

$V = 36\,V$

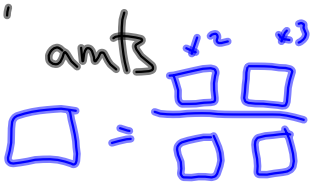


R & I are indirectly proportional.

↑R : ↓I

↓R : ↑I

By "flip" amts



$I = \frac{V}{R}$ $\frac{V}{R}$ $\frac{1}{2 \cdot 2}$ $\frac{1}{4}$ $\frac{1}{6}$ $\frac{1}{8}$

If R is changed from 15 Ω to 36 Ω, how will I be affected?

(A) 36 ÷3 (B)
(B) 15 ÷3

(A) (B)

12/5

$I = \frac{V}{R}$ (1)

$R \uparrow \frac{12}{5} X \therefore I \downarrow \frac{5}{12} X$

(1)

(B)

If R is changed from 120 Ω to 34 Ω, how is I affected.

(A)

$I = \frac{V}{R}$ $R \downarrow \frac{17}{60} x \therefore I \uparrow \frac{60}{17} X$

$\frac{34 \div 2}{120 \div 2} = \frac{17}{60}$ (A) (B)

(11) B 12V ⟶ A 9V

$\frac{A}{B} = \frac{9 \div 3}{12 \div 3} = \frac{3}{4}$

$I = \frac{V}{R}$ 1 mark

$V \downarrow \frac{3}{4}x \therefore I \downarrow \frac{3}{4}x$

1 mark 1 mark

(12) B 9V → A 12V $I = \frac{V}{R}$

$\frac{A}{B} = \frac{12 \div 3}{9 \div 3} = \frac{4}{3}$

$V \uparrow \frac{4}{3}x \therefore I \uparrow \frac{4}{3}x$

1 1

(13) B 6V → A 9V

$\frac{A}{B} = \frac{9}{6} \begin{matrix} \div 3 \\ \div 3 \end{matrix} = \frac{3}{2}$

2 marks

① $I = \frac{V}{R}$ $V \uparrow \frac{3}{2} X \therefore I \uparrow \frac{3}{2} X$

(14) B 12V → A 6V $I = \frac{V}{R}$

$\frac{A}{B} = \frac{6}{12} \begin{matrix} \div 6 \\ \div 6 \end{matrix} = \frac{1}{2}$ $V \downarrow \frac{1}{2} X \therefore I \downarrow \frac{1}{2} X$

(15) B 9V → A 6V

$\frac{A}{B} = \frac{6}{9} \begin{matrix} \div 3 \\ \div 3 \end{matrix} = \frac{2}{3}$ $I = \frac{V}{R}$

$V \downarrow \frac{2}{3} X \therefore I \downarrow \frac{2}{3} X$

(16) $3V \rightarrow 9V$

$V \uparrow 3x \therefore$ $I = \frac{V}{R}$, $I \uparrow 3x$

(17) $I = \frac{V}{R}$

$R \uparrow \frac{3}{1} x \therefore I \downarrow \frac{1}{3} x$

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

$R \uparrow 2X \therefore I \downarrow \frac{1}{2} X$

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

$R \downarrow \frac{1}{2} X \therefore I \uparrow 2X$

20) B $20\Omega \rightarrow$ A 30Ω

$\frac{A}{B} = \frac{30}{20} = \frac{3}{2}$

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

$R \uparrow \frac{3}{2} X \therefore I \downarrow \frac{2}{3} X$