The directly and inversely propotional relationships described in **Ohm's Law** can be shown by rearranging the equation that links potential difference, current and resistance, $V = IR$.

To make I the subject:

$$V = IR$$

To get I on its own, we need to divide by R as I and R are multiplied together. As we divide by R on one side, we must do the same to the other side.

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

$R \div R = 1$ (anything divided by itself is 1), so that cancels out. Swapping the sides around, we get:

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

Current is the dependent variable, the outcome. The current can only be varied by changing either the potential difference or resistance.

Varying potential difference:

Using the equation above and some very simple numbers, we can demonstrate that current is directly proportional to potential difference. If the potential difference is 1V and the resistance is 1Ω:

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

$$I = \frac{1}{1}$$

$$I = 1A$$

Keeping resistance the same (1Ω) but doubling potential difference to 2V, we will see that current doubles:

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

$$I = \frac{2}{1}$$

$$I = 2A$$

Varying resistance:

Using the equation above and some very simple numbers, we can demonstrate that current is inversely proportional to resistance. If the potential difference is 1V and the resistance is 1Ω:

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

$$I = \frac{1}{1}$$

$$I = 1A$$

Keeping potential difference the same (1V) but doubling resistance to 2Ω, we will see that current halves:

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

$$I = \frac{1}{2}$$

$$I = 0.5A$$

The directly and inversely relationships described in **Newton's Second Law** can be shown by rearranging this equation that links force, mass and acceleration, $F = ma$.

To make a the subject:

$$F = ma$$

To get a on its own, we need to divide by m as m and a are multiplied together. As we divide by m on one side, we must do the same to the other side.

$$\frac{F}{m} = \frac{ma}{m}$$

$m \div m$ = 1 (anything divided by itself is 1), so that cancels out. Swapping the sides around, we get:

$$a = \frac{F}{m}$$

Acceleration is the dependent variable, the outcome. The acceleration can only be varied by changing either the resultant force or the mass.

Varying resultant force:

Using the equation above and some very simple numbers, we can demonstrate that acceleration is directly proportional to resultant force. If the resultant force is 1N and the mass is 1kg:

$$a = \frac{F}{m}$$

$$a = \frac{1}{1}$$

$$a = 1m/s^2$$

Keeping mass the same (1kg) but doubling resultant force to 2N, we will see that acceleration doubles:

$$a = \frac{F}{m}$$

$$a = \frac{2}{1}$$

$$a = 2m/s^2$$

Varying mass:

Using the equation above and some very simple numbers, we can demonstrate that acceleration is inversely proportional to mass. If the resultant force is 1N and the resistance is 1kg:

$$a = \frac{F}{m}$$

$$a = \frac{1}{1}$$

$$a = 1m/s^2$$

Keeping resultant force the same (1N) but doubling mass to 2kg, we will see that acceleration halves:

$$a = \frac{F}{m}$$

$$a = \frac{1}{2}$$

$$a = 0.5m/s^2$$

The directly and inversely relationships described in **Hooke's Law** can be shown by rearranging this equation that links force, mass and acceleration, $F = ke$.

To make e the subject:

$$F = ke$$

To get e on its own, we need to divide by k as k and e are multiplied together. As we divide by k on one side, we must do the same to the other side.

$$\frac{F}{k} = \frac{ke}{k}$$

$k \div k$ = 1 (anything divided by itself is 1), so that cancels out. Swapping the sides around, we get:

$$e = \frac{F}{k}$$

Extension is the dependent variable, the outcome. The extension can only be varied by changing either the force applied or the spring constant.

Varying force:

Using the equation above and some very simple numbers, we can demonstrate that extension is directly proportional to force. If the force is 1N and the spring constant is 1N/m:

$$e = \frac{F}{k}$$

$$e = \frac{1}{1}$$

$$e = 1m$$

Keeping spring constant the same (1N/m) but doubling force to 2N, we will see that extension doubles:

$$e = \frac{F}{k}$$

$$e = \frac{2}{1}$$

$$e = 2m$$

Varying spring constant:

Using the equation above and some very simple numbers, we can demonstrate that extension is inversely proportional to spring constant. If the force is 1N and the spring constant is 1N/m:

$$e = \frac{F}{k}$$

$$e = \frac{1}{1}$$

$$e = 1m$$

Keeping force the same (1N) but doubling spring constant to 2N/m, we will see that current halves:

$$e = \frac{F}{k}$$

$$e = \frac{1}{2}$$

$$e = 0.5m$$