Unit 11 – Higher Knowledge Organiser
MULTIPLICATIVE REASONING

Growth and Decay:

You can calculate an amount after n years' compound interest using the formula

$$\text{amount} = \text{initial amount} \times \left(\frac{100 + \text{interest rate}}{100}\right)^n$$

Communication Hint:

Compound interest the interest earned each year is added to money in the account which earns interest the next year

Communication Hint:

Depreciate means to decrease in value

Communication Hint:

Annual means yearly

Kinematics:

These are kinematics formulae:

$v = u + at$

$s = ut + \frac{1}{2}at^2$

$v^2 = u^2 + 2as$

where a is constant acceleration, u is initial velocity, v is final velocity, s is displacement from the position when $t = 0$ and t is time taken.

In exam questions you will need to decide which equation to use.

Velocity is speed in a given direction, possible units are m/s.

Initial velocity is speed in a given direction at the start of the motion.

Acceleration is the rate of change of velocity, i.e. a measure of how the velocity changes with time, possible units are m/s².

You **must** remember what each letter stands for but you will be given the formulas

Compound measures:

Compound measures combine measures of two different quantities. Speed is a measure of distance travelled and time taken. It can be measured in metres per second (m/s), kilometres per hour (km/h) or miles per hour (mph).

$$\text{Average speed} = \frac{\text{distance}}{\text{time}} \text{ or } S = \frac{D}{T}$$

Example 2

A man walks at an average speed of 5.4 km/h. What is his average speed in m/s?

5.4 km/h → 5400 m/h (Convert to km/h to m/h × 1000)

5400 m/h → 90 m/min (Convert m/h to m/min ÷ 60)

90 m/min → 1.5 m/s (Convert m/min to m/s ÷ 60)

Density is the **mass** of substance in g contained in a certain **volume** in cm³ and is often measured in grams per cubic centimetre (g/cm³).

$$\text{Density} = \frac{\text{mass}}{\text{volume}} \text{ or } D = \frac{M}{V}$$

Pressure is a compound measure. It is the **force** in newtons applied over an **area** in cm² or m². It is usually measured in newtons (N) per square metre (N/m²) or per square centimetre (N/cm²).

$$\text{Pressure} = \frac{\text{force}}{\text{area}} \text{ or } P = \frac{F}{A}$$

Direct and Inverse Proportion:

When x and y are in direct proportion

- $y = kx$, where k is the gradient of the graph of y against x
- $\frac{y}{x} = k$, a constant.

When x and y are in inverse proportion then

- $x \times y$ = a constant
- $xy = k$, so $y = \frac{k}{x}$

When x and y are in inverse proportion, y is proportional to $\frac{1}{x}$. As one doubles (×2) the other halves (÷2).