L1 MECHANICS
CHEAT SHEET

STUDY TIME

ABOUT THE STANDARD

- Mechanics throws a lot of different concepts at you, but really it can be broken down into three main topics:
  - **Motion:** distance, velocity, acceleration
  - **Forces:** forces, mass and pressure
  - **Energy:** work, power, gravitational potential energy and kinetic energy.
- The exam will be a mixture of calculation- and graph-based questions and conceptual/writing- based questions.
- If you take on the strategies we're about to discuss, you'll be able to come out on top.

EXAM STRATEGY

- Interpreting graphs is a big part of this standard; in particular, distance-time and speed-time graphs. When you are interpreting these graphs, **make sure you are always referring to specific numbers**. For example, instead of saying "John sped up during the start of his journey" it's much better to say "John's velocity increased from $14ms^{-1}$ to $20ms^{-1}$ between between 5s and 11s of the journey, an acceleration of $1ms^{-2}$."
  - As part of this, you should also practice doing the graph based calculations, such as finding the average speed on a distance-time graph, or the distance on a speed-time graph by finding the area under the graph.
- **Understand the formula sheet inside out - the units, what each letter means, how to find each letter**. Also, think about cause and effect - e.g. with P = F/A, if force increases, pressure will increase, but if surface area increases, then pressure will go down.
- On that note, **a common mistake is not remembering the difference between the formulas for pressure and power**, as they both have the letter P in it. Make sure you know the difference.
- **Excellence calculation questions often have you use multiple formulas in one question**. Therefore, it's important to write down all the things you have, and the things you are needing/wanting to find out.
  - For example, if you had mass, acceleration and distance, but you needed to find Work, then you could see that what's missing in W = Fd is Force, and then to get that you could use F = ma.
- **Concept/writing based questions seem tricky, but a counter-intuitive tip is to always write down the relevant formulas, even if they say calculations aren't needed!** From there, you could explain what happens based on all of the letters in the formula.
  - For example, if you were trying to explain why pressure had decreased, then you could write down P = F/A and say something like as "Bruce is now sitting on the horse, which increases the downwards force on the horse. As net force (F) increases, and surface area (A) stays the same, then this will mean the pressure (P) will increase"
- Another common question asks you to differentiate between mass and weight. Remember that mass is the **amount of matter in an object (in kg)** whereas **weight is the downwards force due to gravity (in N)**.
- This illustrates the **importance of knowing the basic definitions of concepts** in this standard.

- For example, understanding the basic definition of a force helps us remember that any change in acceleration is due to a force.

- Know the **difference and the relationship between Gravitational Potential Energy and Kinetic Energy**. When a ball is stationary above the ground, it's all potential energy, but as the ball is dropped and falls, the energy start to be converted into Kinetic energy until right before the ball drops, where it is all kinetic energy.
- **For excellence, they may ask you why the actual value of kinetic energy doesn't match the theoretical one that you would expect**. Remember that energy can be lost as other forms of energy usually heat due to friction - e.g. holding onto a rope, or air resistance.
- **Lastly, for questions around pressure, you may be asked to calculate the surface area**. For example, if the question was talking about a rectangular box in the sand, the surface area of the part touching the sand would be base x height and would be in m^2.
    - **Sometimes they may try to confuse you by giving you multiple objects**. For example, in the 2016 exam, they gave you hooves/legs of a horse, where each hoof had the surface area of $44cm^2$. Since there are 4 hooves, then you would multiply this number by 4 to get the total surface area.

OVERALL

- Everything comes back down to motion, forces, energy. Make sure you really keep this in your mind.
- We've covered some important strategies and things to remember, but we haven't covered everything.
- As we said at the start of this video, we really recommend going through the last 3-4 years of exam papers, and also using the StudyTime Walkthrough Guide and Checklist to really check and consolidate your knowledge and feel 100% prepared!