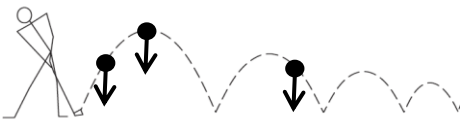
Things to remember in the last hour before the exam: Level 1 Mechanics

(This is not a revision sheet – you've done that by now - it's a list of things you might want to remind yourself about …)

1. Speed (velocity)units ms^{-1} $v = \frac{\Delta d}{\Delta t}$ Acceleration units ms^{-2} $a = \frac{\Delta v}{\Delta t}$
2. Distance-time graph
   - Acceleration ⌒ or deceleration ⌒
   - Straight line / constant speed ; calculate gradient (rise/run)
   - Constant speed means forces are balanced. $F_{net} = 0$.
   - Horizontal line — stopped/stationary/at rest. Forces are balanced. $F_{net} = 0$.
3. Speed time graph
   - Straight line upwards / constant acceleration ; calculate gradient (rise/run)
   - Horizontal line — constant speed. Forces are balanced. $F_{net} = 0$.
   - Straight line downwards \ constant deceleration ; calculate gradient (rise/run): minus sign before value shows deceleration
   - Area under speed-time graph = distance travelled. (add up ▬ and ◣). Calculate the triangle area using ½ base x height!
4. Acceleration occurs when
   - Force is applied to a stationary object: $F_{net} = ma$ net means "overall" force
   - Force is applied to an object at travelling at constant speed: $F_{net} = ma$
5. When an object like a ball is in the air, there is only ONE force acting on it – downwards – its WEIGHT force – even if you are throwing it up or dropping it or hitting it to a friend. (Air resistance can be ignored here).



6. Falling/dropped objects. Before they fall/drop/jump vertical forces are balanced. As they drop weight force > air resistance so object accelerates. The more it accelerates, the greater air resistance becomes until weight force = air resistance. Then object falls at constant speed (terminal velocity) as forces are balanced.
7. Parachutes can save your life…. When you open the 'chute you don't suddenly fly upwards – you just decelerate. The huge surface area of the open parachute increases air resistance so you land with a much smaller terminal velocity than if it failed to open.
8. Mass is amount of matter something has and is measured in kg. Your mass is the same in NZ, France, on the moon and in deep space!
9. Your weight is measured in N and on Earth it is 10x your mass. E.g. a 60 kg student weighs 600N.
10. Pressure $P = \frac{F}{A}$ units Nm^{-2} or Pa (if area in m^2). If area is in cm^2 then pressure is in $N\ cm^{-2}$. e.g. hammer a nail into wood: large force exerted over small area (nail tip) means large pressure – nail goes into wood easily. Skiing: Your weight (force) exerted over a large area means pressure is small – you glide over snow instead of sinking in. For the same force, if area ↓ pressure ↑. For the same force, if area ↑ pressure ↓.

Look at question context – a runner runs on one foot at a time, and a skier normally has 2 skiis on the ground, a car has 4 tyres, a bike two.... Etc ☺ Studs when playing sport increase the pressure exerted into the soft ground so you get better grip and won't slip over.

11. Gravitational potential energy – measured in J. $\Delta E_P = mg\Delta h$ where g is 10. Is the energy you give something you lift up, or the energy you gain when you go up in a lift or up a ski lift. The height h is the vertical height. It also theoretically equals the work done to lift that object, go up in that lift or be carried on the ski lift but....in the real world... you need to use more energy / do more work because of energy "lost" as hear in your muscles, as sound energy etc.

12. Kinetic energy: $E_K = \frac{1}{2}mv^2$ - measured in J. Movement energy. It is ½ x m x v^2, only the v gets squared! Use CALCULATOR! If something is dropped, like a ball, all its E_P is converted to E_K just before it hits the ground. Air resistance isn't really significant here. Since $mgh = ½ mv^2$ and so $v=\sqrt{2gh}$. If you are skiing down a mountain, or rolling down a hill on a bike, then not all E_P will be converted to E_K as there would be significant air resistance (drag), friction with ground, conversion to sound and heat energy. If E_P at top isn't equal to E_K at bottom then the difference in energy was the "lost" energy. If asked to calculate the average frictional force, calculate energy difference ÷ distance.

13. Work done is change in energy. Work is measured in J. $W = Fd$ If an object is lifted vertically the work done on it equals the E_P it gains. BUT..... if you struggle and struggle and just can't lift that object then NO WORK IS DONE (because the force has not moved the object any distance). W = F x 0 so W = 0 Also because it hasn't gained any E_P then no work has been done.

    Ramps (inclined planes) make things easier because a ramp allows the same work to be over a greater distance, and so less force is needed. W = F x d (W the same so if d↑ F↓).

14. Power is measured in Js^{-1} or W. $P = \frac{W}{t}$ Power is the rate at which work is done. If you lift something and take 1 minute and you lift the same thing and take 2 minutes, you were more powerful the first time. A heavy man climbing a rope slower than a light man could still be more powerful... you'd need to calculate the work done by each (W = F x d) and divide by the time it took each, in s.

15. Force diagrams. Size of arrows = size of force, so if 2 forces are balanced draw the arrows the same size! Force arrows should come from the centre of mass of the object.