Revision Notes for Mechanics 1

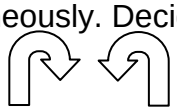
Motion at a constant acceleration

Learn these formulae:

$S = ut + \frac{1}{2}at^2$ $v = u + at$ $v^2 = u^2 + 2as$ $s = \frac{1}{2}(u + v)t$ $s = vt - \frac{1}{2}at^2$

For each question, write down what you want and what you've got then choose which formula to use.

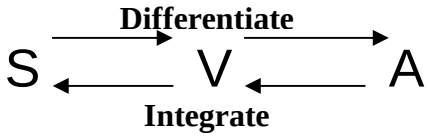
Pulleys

To find the acceleration, resolve using f=ma for each object separately then solve the 2 equations simultaneously. Decide which way you think the objects will move and resolve in that direction e.g.  so you get T - mg for one object and mg - T for the other.

For vehicles towing, same process applies so either resolve (f=ma) for each object and solve simultaneously or look at the whole system as one.

Variable Acceleration

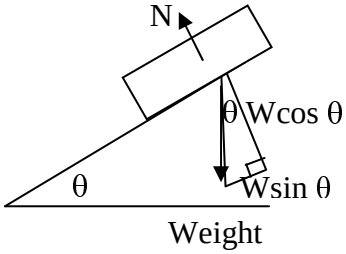
If the question has an expression for the displacement, velocity or acceleration, then need to differentiate or integrate to move between the 3 measurements.



Remember the constant when integrating and you will have enough information to find it.

Objects on a Slope

Resolve parallel and perpendicular to the slope using F=MA and F=μR if friction present. Remember if it is on the point of moving, it is limiting friction so friction is a maximum and the forces are balanced. This means you can find μ as friction is at a maximum.



Remember if an extra horizontal force is applied, the normal contact force will change as the new force is pushing into the slope as well so friction will change.

Momentum

Decide which direction you are taking as positive and stick to it.
Then find momentum before = momentum after. (momentum is conserved)
mu = mv

Remember to apply frictional force if there is one.

Projectiles

Use equations of constant acceleration from above as acceleration is only due to gravity. Decide which way is positive and stick to it. Usually use the direction it is projected in at first.

S = displacement so if it goes up and then comes down, s=0 on 2 occasions (e.g t=0 and when it comes back down.) You will probably use $s=ut + \frac{1}{2}at^2$ and solve for t.

Graphs

For displacement against time: Gradient = velocity
For velocity against time: Gradient = acceleration Area = displacement
To find the area can use the area of a trapezium: $\frac{\text{(Sum of the parallel sides)}}{2}$ x height.

Forces from a Point

Either: 1) Resolve vertically and horizontally then use Pythagoras to find the magnitude of the resultant and trig for the angle.
2) Use triangle law to combine 2 forces and find the resultant.