How to solve problems involving uniform acceleration problems.

1. Most of the problems on motion with uniform acceleration can be solved using 'suvat' formulas (if direction of the motion doesn't change):

$$\boldsymbol{v = u + at}$$

$$\boldsymbol{s = \frac{v + u}{2} t}$$

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

$$\boldsymbol{v^2 = u^2 + 2as,}$$

where u is initial velocity, v is the final velocity, a is acceleration, s is distance (as direction of the motion stays the same distance is equal to the magnitude of the displacement), t is the time.

Each of the formulas connect 4 out of 5 variables and you just need to list known variables (you will have 3 of them) together with unknown and identify which formula connect unknown variable with known. Sometimes you might need to use 5th formula (which is not on the formula sheet):

$$\boldsymbol{s = vt - \frac{at^2}{2}}$$

2. If direction of the motion along straight line changes you need to choose an origin and direction of the axis. Then write down equation of the motion:

$$\boldsymbol{x = x_0 + ut + \frac{at^2}{2}},$$

where x is position at the time t, x_0 is initial position (may be 0), u is initial velocity (if it is directed in the positive direction of the chosen axis it is positive, if in the opposite direction – negative), a is acceleration (if it is directed in the positive direction of the chosen axis it is positive, if in the opposite direction – negative). Displacement can be found as:

$$\boldsymbol{s = x - x_0}$$

You might also need to use ‘suvat’ formulas as well.

If problem is related to the object thrown vertically up and returning to the initial position (air resistance is disregarded) motion is perfectly symmetrical, i.e. time up equal time down, initial speed equal final speed.

3. If you need to solve problem with the motion of the 2 objects, you need to write down equation of the motion of each of them and usually equalize their positions.

4. To solve problems involving graphs of the motion (extremely unlikely on the final exam) you

need to remember that for velocity – time graph acceleration is the gradient of the graph and displacement is the area (signed) between the graph and time axis. For acceleration – time graphs area (signed) between the graph and time axis equal to the change in the velocity. For position – time graph velocity is the gradient.