Y9 Lesson 1 Activities

This worksheet introduces the idea of modelling the processes in the atmosphere by using maths. This involves predicting the movement of clouds across the UK and the properties of rain drops which will inevitably fall from these clouds.

<u>Clouds and the UK</u>

1) A cloud travels a distance of 60km from Leeds to Manchester in 50 minutes, find:
   a) The speed of the cloud in km/h and m/s.
   b) The time at which the cloud the cloud reaches Liverpool, which is located 50km from Manchester, given that the cloud is over Leeds at 12:00 and Leeds, Manchester and Liverpool lie on a straight line.

2) A cloud is moving at 25km/h in a straight line, find:
   a) The distance between Basingstoke and Reading in km, given that the cloud travelled between the two locations in 42 minutes.
   b) The distance travelled by the cloud in m in 100 seconds.

3) A cloud is moving for 20 minutes, find:
   a) The distance travelled in km if the speed of the cloud is 15km/h.
   b) The speed of the cloud in m/s if the cloud travels 10km.

<u>Rain Drops</u>

4) Consider a rain drop falling from rest from the base of a cloud.
   a) Given the acceleration **a = 9.8 m/s^2**, find the speed of the rain drop when it hits the ground if it takes 50s for the rain drop to reach the ground.
   b) Find the time taken for another rain drop, also falling from rest, to reach the ground surface given that it's final speed was 60km/h.

5) Due to updrafts in large *cumulonimbus* clouds, rain drops will fall at a terminal velocity when falling through these clouds, before accelerating in the air beneath. Given that a rain drop falls at a constant speed through a *cumulonimbus* cloud which is 3000m tall in 500 seconds, find:
   a) The speed **u** of the rain drop as it falls through the cloud.
   b) Using **u** as the initial speed of a rain drop, suppose it hits the ground with a final speed of **40 m/s**, find the time taken for the rain drop to fall from the cloud to the ground surface.
   c) Now suppose the cloud is in the atmosphere of Jupiter, where the acceleration due to gravity is **a = 24.8 m/s^2**. Using the same initial and final conditions as in part b); find the time taken for the rain drop to fall from the cloud to the ground surface on Jupiter.