

UNL2207 - The Nature of Natural Law: Tutorial 1

Visualising Kinematics & the Relativity of Motion

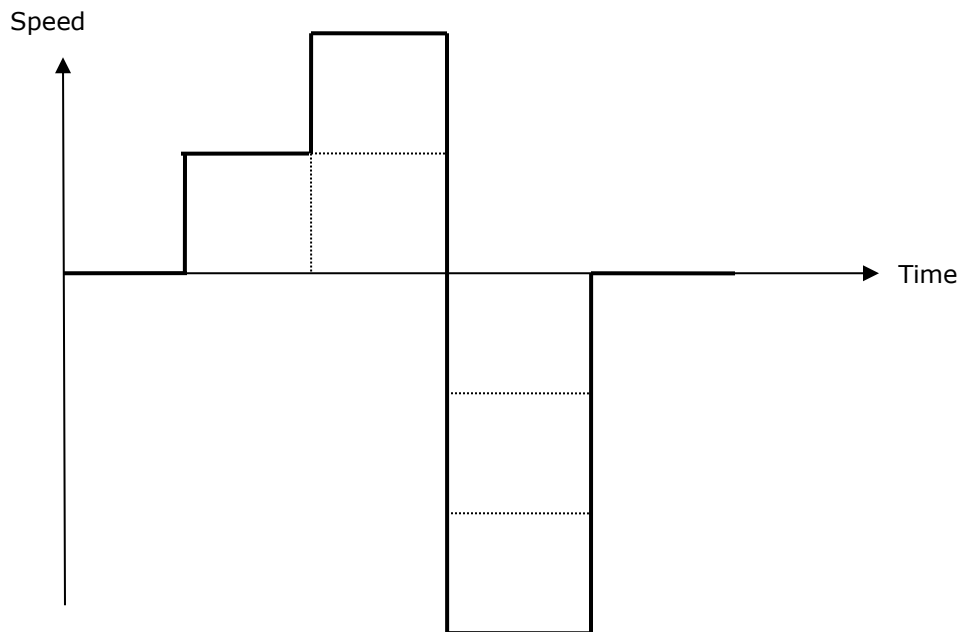
1) Suppose you are going for a long bicycle ride. You cycle one hour at 5 kilometers per hour. Then three hours at 4 kilometers per hour and then two hours at seven kilometers per hour. How many kilometers did you ride?

- a) five b) twelve c) fourteen d) thirty-one e) thirty-six

2) A motor bike starts from rest and accelerates to 60 km/h in 10 seconds. How far does it travel during those 10 seconds?

3) Another motorcycle has a faulty speedometer. At maximum acceleration from rest it travels 1/10 of a kilometer in 10 seconds. What speed did it actually get up to in those ten seconds?

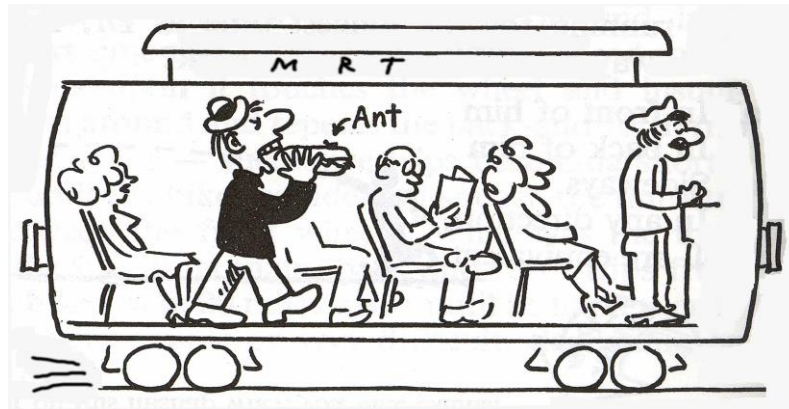
4) An object moves along a straight line. Look at this speed versus time graph – can you tell how far away from the starting point the moving object ended up?



5) You exercise your dog, Collie, on a 15 minute walk by throwing a stick that Collie chases and retrieves. To keep Collie running for the longest possible *time* as you walk, which way should you throw the stick?

- a) in front of you b) backwards as you walk c) sideways d) in any direction, as all are equivalent

6) A MRT carriage is approaching the Somerset station at 1m/s . A person in the carriage is facing forward and walks forward with a speed of 20 cm/s relative to the seats in the carriage. The person also happens to be eating a hot-dog which is entering his mouth at the rate of 4 cm/s .



An ant on the hot-dog is running to the end of the hot-dog, away from the person's mouth. The distance between the ant and the end of the hot-dog towards which it is running, is diminishing at the rate of 2cm/s . Can you figure out how fast the ant is approaching Somerset station?

7) Two cyclists each travel at a uniform (ie constant) speed of 10 km/h toward one another. At the moment when they are 20 km apart, a fly flies from the front wheel of one bike at a uniform speed of 25 km/h directly to the wheel of the other bike. It touches the wheel and turns around (in a negligibly short amount of time) and returns at the same speed to the first bicycle, whereupon it turns around (again instantaneously) and repeats the back and forth trip over and over again – successive trips becoming shorter and shorter until the bicycles collide and squash the hapless fly between their front wheels. What was the total distance that the fly travelled between the time that the bicycles were 20 km apart until they collided? (NB. This is either a very simple or a very complicated problem depending on your approach!)

- a) 20 km b) 25 km c) 50 km d) more than 50 km e) the problem cannot be solved with only the information given

Short Written Assignment

After reading *On the Nature of Scientific Theory* by G. Holton (Chap. 3, Physics: the Human Adventure); examine some one theory discussed in other courses and with which you are thoroughly familiar – for example Adam Smith's theory of economics, Darwin's theory of natural selection, Gregor Mendel's theory of heredity, the Marxian theory of society, Freud's theory of the subconscious, Keynesian economic theory, or 'modern monetary theory' in macroeconomics etc.

Based on the theory you have selected, write a 1-2 page (A4, single space typed) paper that differentiates clearly between the evidential *data* available to the theorist on the one hand and the *hypotheses* used by him to explain the data on the other.