2.1 Investigating motion using a ticker tape timer

**Aim:** Understand how to interpret ticker tape timer data.

**Equipment:**
- Ticker tape timer
- Ticker tape
- Slope (should be as frictionless as possible)
- 30 cm rule
- Scissors
- Glue

**Introduction**
The ticker tape timer produces marks or dots at regular intervals on its special tape that is sensitive to pressure. It takes its timing from the mains frequency and therefore prints 50 dots per second. It allows us to measure precisely short intervals of time corresponding to short distances travelled.

Time interval between 2 dots = 1/50 seconds.

The time interval between 10 dots is called a tentick length. A tentick length corresponds to 0.2 seconds.

**Theory**
1. The speed is given by the gradient of a distance-time graph.
2. The acceleration is given by the gradient of a velocity-time graph.
3. When an object moves at constant speed its acceleration is zero.
Method
1 Hold one end of the tape and pull it through the timer quite quickly but with a constant speed.
2 Cut, using scissors, the tape into eight tentick lengths labelling the lengths as you cut them.
3 Glue the first four lengths onto the results sheet below, building a distance versus time graph.
   a Is the slope a straight line?
   b What does the slope represent?
   c Calculate the slope of the line.
      Slope = __________ = __________ cm/s
4 Glue the second four lengths onto the result sheet below building a velocity versus time graph.
   d What does the slope of the graph represent in this case?
   e How, from this plot, can you determine whether or not you were able to pull the tape through the ticker tape timer at a constant speed?

Result sheet

Distance-time graph

Velocity-time graph