Alexandra High School

Aim: to understand and analyse the motion of a trolley accelerating down an inclined slope

Method: The accelerating trolley pulled a ticker tape through a timer set at 50Hz.
- 10 dot intervals were marked off and labelled A – F. The time interval is thus 0,2 s.
- The total distance (position, x) values to these points were measured and appear as column 3 in the table below.

A	B	C	D	E	F
t=0s	0.2	0.4	0.6	0.8	1.0

- Analyse the tape to determine its displacement, velocity and acceleration at each time.
- Complete the table showing the working out of one of each of the calculations.
- Plot the displacement and velocity versus time graphs overleaf.
- Answer the questions about the graphs that follow overleaf. Do these on a separate page and staple to the back of this worksheet if you run out of space.
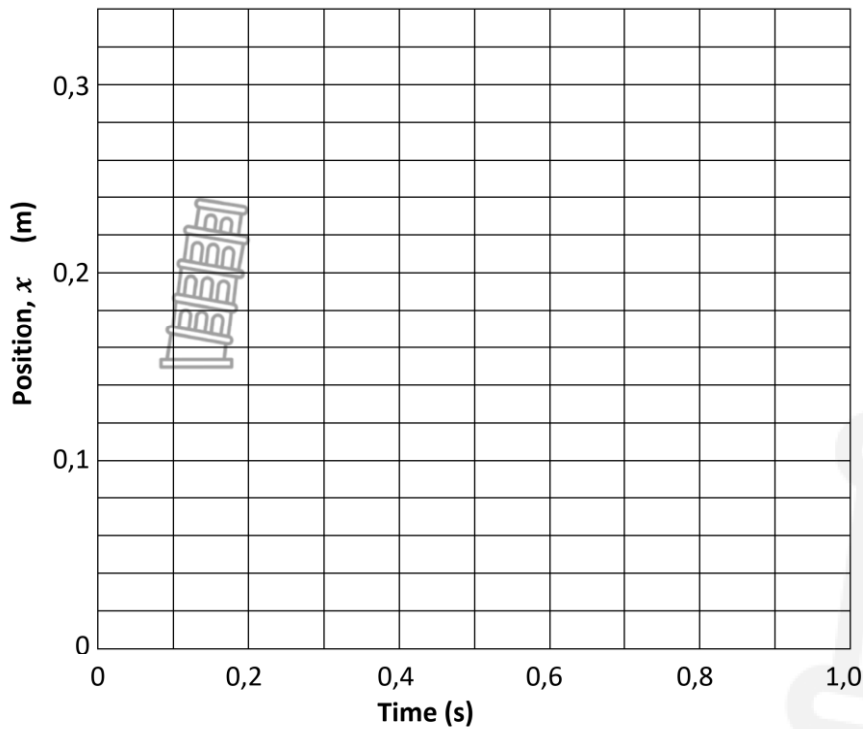
Results:

1	2	3	4	5	6	7
	Time (s)	Position x (m)	intervals Δx (m)	V_{ave} (m.s^{-1})	Time for V_{inst} (s)	Accel (m.s^{-2})
A	0,0	0,0			0,1	
B	0,2	0.028	*	*		*
C	0,4	0.074			0,3	
D	0,6	0.137			0,5	
E	0,8	0.219			0,7	
F	1,0	0.317			0,9	Ave
		total distances	interval distances	$v = \dfrac{\Delta x}{\Delta t}$		$a = \dfrac{\Delta v}{\Delta t}$

* Show the calculations (with formula) for of the values in the blocks with the *

(15)

Position vs Time (column 3 vs 2) Draw the best curve

Position, x (m)

0,3

0,2

0,1

0

0   0,2   0,4   0,6   0,8   1,0

Time (s)

1. Label the y-axis, plot the points using a suitable scale & draw best curve fit. (6)
2.1 Draw a tangent to the curve at time 0.5 seconds. (1)
2.2 Determine the gradient of the tangent. Show working out and points used. (2)
2.3 What does this gradient represent? (1)
2.4 Compare it to the appropriate point on the velocity vs time graph (1)

Velocity vs time (column 5 vs 6) Draw best straight line

velocity (m.s^{-1})

0,5

0,4

0,3

0,2

0,1

0

0   0,1   0,3   0,5   0,7   0,9

Time (s)
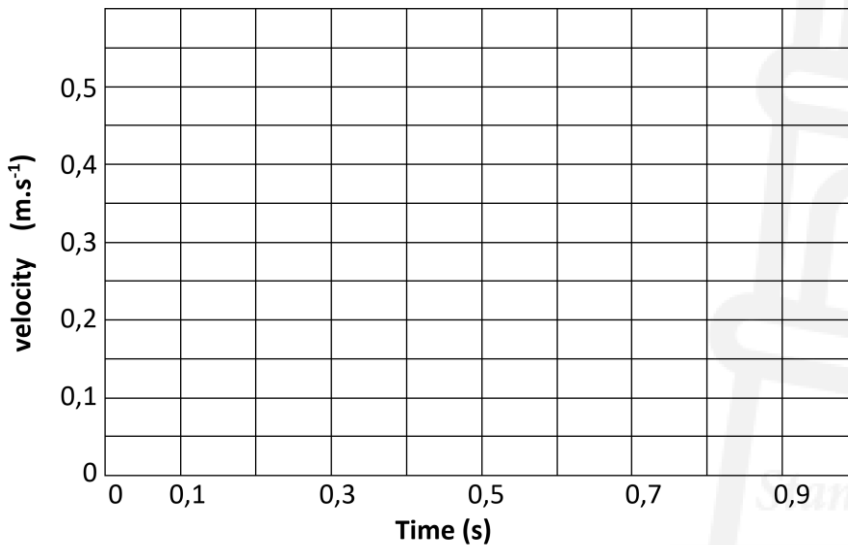
3. Label the y-axis, plot the points using a suitable scale & draw best straight line. (6)

4.1 Does it extrapolate through the origin? (1)
4.2 If not, what is the value of the y-intercept? (1)
4.3 What does the y-intercept represent? (1)

5.1 Determine the gradient of the straight line. Show the points used & the calculation. (3)
5.2 What does the gradient represent? (1)
5.3 Compare it to the appropriate value(s) in the table. (1)