Mathematical Applications Dynamics

Controlling Speed

There are some places where markings are painted on road
surfaces in an attempt to control the behaviour of motorists.

For example, chevrons are painted on each lane on some stretches
of motorways. Motorists are advised to leave a gap of at least
two chevrons between themselves and the car ahead.

When a dual carriageway approaches a roundabout, yellow bands
are sometimes marked across the road. The gaps between the bands
decrease as the roundabout approaches, so that motorists have
an impression of travelling at high speeds if they fail to slow down.

In residential areas road humps are often used to restrict the speed
of vehicles.

Investigate how far apart the markings or humps should be placed in
each of these situations.

Road Chippings

A safe speed is usually recommended for cars travelling over
road surfaces that have been newly dressed with stone chippings.
Investigate this situation and recommend a speed that will help to
avoid damage to cars that are travelling behind others.

Note

To achieve a high mark for your chosen task, you will need to

- show initiative, structure your work logically and report it fluently
- use appropriate, efficient and concise methods (most being beyond Higher level GCSE) and include ICT where appropriate;
- consider how your initial data and assumptions affect your findings.

Include graphs where appropriate and use real data and observations where possible.

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Mathematical Applications Dynamics

Putting the shot
Investigate the angle at which a javelin thrower should throw the javelin in order for it to land as far as possible from him. Consider the cases of level and sloping ground.
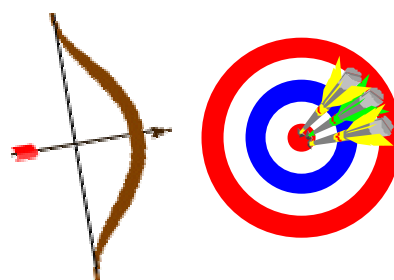
Alternatively consider throwing something else eg a discus.
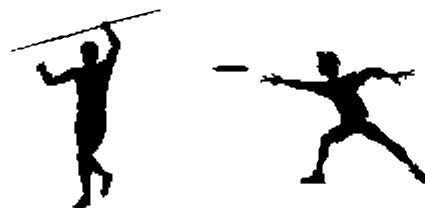
Target practice
Some games and sports involve throwing or firing a dart, arrow or bullet at a target.

Investigate the angle of projection the sportsman should use for varying speeds and distances.

Coefficient of Friction
Devise an experiment to find the coefficient of friction between two surfaces.
Compare values that you find with published values.

To achieve a high mark for your chosen task, you will need to
- show initiative, structure your work logically and report it fluently
- use appropriate, efficient and concise methods (most being beyond Higher level GCSE) and include ICT where appropriate;
- consider how your initial data and assumptions affect your findings.

Include graphs where appropriate and use real data and observations where possible.

Unit   Advanced Level, Mathematical Applications

Notes on Activity
These tasks are based on the content of the Dynamics FSMQ.   One of them could be included in a candidate's Mathematical Applications Coursework Portfolio. No hints are given in the tasks on Page 1 so that candidates have opportunities of showing initiative in developing their chosen task.

N.B. A completed Coursework Portfolio should include two tasks based on the content of different FSMQs. The two tasks must be marked separately and the two marks totalled to produce one final mark for the unit.

For each of the two tasks, the candidate should be given a mark, from 0 to 7, for each of three themes:
- Structuring and presenting work
- Using appropriate mathematics (and technology) and working accurately
- Interpreting mathematics

The marking grid below gives a description under each of these themes for work at various marks.

	Structuring and presenting work	*Using appropriate mathematics (and technology) and working accurately*	*Interpreting mathematics*
0 **1**	The portfolio task has substantial omissions and is poorly presented.	There is little evidence of using mathematics accurately at the appropriate level.	There is little evidence of relating mathematics to the situation(s) investigated or there are substantial errors in interpretation.
2 **3**	The portfolio task has been completed with only a little advice and is well presented so that it is easy to follow.	A significant proportion of the work is beyond GCSE and is substantially correct.	The candidate has interpreted the main mathematical findings in terms of the situation(s) investigated.
4 **5**	The candidate has worked independently *and* produced a portfolio task that is well-structured and reported with clarity.	A significant proportion of the work is beyond Higher Level GCSE and is substantially correct, using relevant mathematical techniques *and* ICT where appropriate	The candidate has used mathematics to correctly summarise and draw conclusions about the situation(s) investigated.
6 **7**	The candidate has shown initiative in developing their portfolio task *and* has structured it logically and has reported their work fluently.	The candidate has used appropriate, efficient and concise methods of working.	The candidate has considered, how their initial data, and assumptions where appropriate, affect their findings.