ES	TECHNOLOGY	Knowledge & understanding	Needs	Resources	Processes
	TECHNOLOGY	Skills in designing & making	Preparing	Carrying out	Reviewing
	SCIENCE	K & U - Energy and forces	Properties of energy	Conversion of energy *gravity, kinetic energy*	Forces *friction*

The marble only takes a couple of seconds to fall the 19 cm or so from top to base. Does it always take just a few seconds to fall 19cm? or is there some way we can extend that time?
If we built, very accurately, a smooth ramp that was 50 metres long with one end 19cm higher than the other, would the marble roll from one end to the other?
If the marble were replaced by water would that run down such a gentle slope?
If the answer is yes, then would it take longer than a couple of seconds?

The answers to these questions might be relevant to this design challenge.
You are to design and make a structure from the top of which a marble may be released and which will keep the marble in motion for the longest possible time.

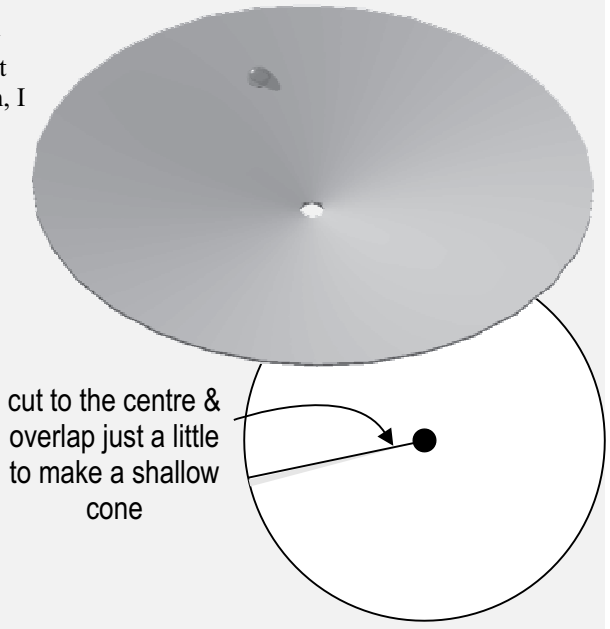
Of course there has to be some rules. You can make up the rules as long as the same rules apply to everyone concerned. Here are some examples.

- The 'fall' from the highest point of the structure to the lowest must be no more that 50cm.
- The point at which the marble ceases to fall should be no further than 50cm from the point of release (this is to prevent designs that fill the room!).
- Use only card and/or paper plus suitable adhesives.
- If the marble should stop, it must be able to restart without anyone intervening. *This might seem a little 'impossible' and it probably is, but there could be a device created which stopped the marble for some length of time and then released it. I don't know what, but. . . .*

Running along a track which repeatedly doubles back on itself seems the obvious approach but there is another fascinating possibility.
If you were to make a very shallow dish with a hole at the bottom only just big enough for the marble to pass through; and if you arranged that the marble fell into that dish in such a way that it rolled round that dish, I believe that the marble could be in motion for quite a time before it found the hole.

And if it then fell into another dish . . . . . ?
Got the idea?

You can make a shallow cone to use as the dish. (A parabolic dish would be ideal but far too difficult to construct.)
Cut a disc of card, then cut from anywhere on the edge to the exact centre. Remove a small disc from the centre, large enough to let a marble through. Overlap the cut edges, no more than 1cm and glue. That's your cone. It will almost certainly need a supporting ring underneath, and maybe a wall around the edge to stop the marble falling off,
and then you'll need a delivery chute.. .



AND WHAT ABOUT THE ROMANS?
It isn't difficult to find a technology activity to fit into a 'Romans' topic but that hasn't stopped teachers asking us for ideas for an aqueduct. The problem with aqueducts is water! If you could have an aqueduct without water you'd be laughing.
So, why not?
Creating a channel with a continuous fall from one end to the other - the principle of an aqueduct, is what we've just been describing. The fact that a marble replaces the water shouldn't be a real problem. I appreciate that the 'shallow dish' above might make you think of water going down the plug-hole but the channel-shaped ramps on the tower could work.

Look at the Cantilever Bridge project. If each child, or a small group, were given two heights for their 'roadway'(channel), a high end and a low end making each section of roadway slope, they could be joined together to make a really long 'aqueduct' marble track.
We have done this (and every other project) and in reality it's best to make each section adjustable (maybe the channel could rest on a rubber band that could slide up and down). That way you prevent 'rogue' sections that don't fit anywhere.