 Simple harmonic motion activity



The purpose of this activity is for students to experience simple harmonic motion; to understand when they are moving fastest and when they are accelerating and decelerating; and to establish how this is represented on a Cartesian plane as a function.

Task

1. A selected student, student A, is to start running from the cone placed at a displacement of -10 metres towards the other cones. They are to run in a loop around the end cones until they have completed 3 full loops.
2. When the student passes the cone at 0 metres, another student, student B, starts the timer. Every time student A passes a cone, student B records the time. It may be easier for students may like to video record this activity and determine the times afterwards.
3. Record the times in a table similar to the one below

| Time, t | Displacement, d |
| --- | --- |
|  | 0 |
|  | 10 |
|  | 0 |
|  | -10 |
|  | 0 |
|  | 10 |
|  | 0 |
|  | -10 |
|  | 0 |
|  | 10 |
|  | 0 |
|  | -10 |
|  | 0 |

1. Use DESMOS or a similar graphing application, to plot the points in the table above. An example is shown below



***Please note that the headings in the table above have been changed from the defaults of*** $x\_{1}$ ***and*** $y\_{1}$ ***to time,*** $t$***, and displacement,*** $d$***.***

1. Discuss which curve would fit the data best. Lead students towards sine or cosine models and discuss appropriate values for the amplitude and time period (or frequency).
2. Develop a model to describe the motion by entering $d\~10sin⁡(\frac{2πt}{T})$



1. Key questions to ask at this stage are
	1. When was student A running fastest? And how is this represented on the graph?
	2. When was student A accelerating? And how is this represented on the graph?
	3. When was student A decelerating? And how is this represented on the graph?
2. Consider running the activity again but starting the timer when student A reaches the 10 metre cone. How does this affect the model? Consider starting the timer at other positions.

[***The DESMOS activity referenced above can be found here***](https://www.desmos.com/calculator/sktnbhcu42)