

# Aztec Butterfly

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## Investigation Week 15

Displacement - a description of position in the case of our Butterfly, measured in m.

Velocity - the rate of change of displacement with respect to time (the derivative of displacement/time graph), in the case of our Butterfly, measured in m/min. It describes how the displacement changes, it is the speed of the butterfly. Positive velocity is moving away from the initial position, negative velocity is moving towards the initial position.

Acceleration - the rate of change of velocity with respect to time (the derivative of the velocity /time graph), in the case of our Butterfly, measured in m/min squared. It describes how the velocity changes. Positive acceleration will be speeding up, negative acceleration will be slowing down, it could be towards or away from the initial position.

Jerk - the rate of change of acceleration with respect to time (the derivative of the acceleration/time graph), in the case of our Butterfly, measure in m/s cubed. It describes how the acceleration changes. This is important in engineering and manufacturing, an important consideration because a high jerk value means the acceleration has changed quickly affecting the force on a being. Too high a jerk can result in serious injury or death - an important consideration in rollercoaster's for example. A jerk value of 22 m/s cubed is considered a maximum safe value for humans.

Write 4 written statements, one for displacement, velocity, acceleration and jerk with regards to our butterfly that demonstrate your understanding of the 1st, 2nd and 3rd derivatives of displacement. Include some values of max/mins you already calculated in last weeks investigation, remember to relate to the context. Include a conversion into km/h for the maximum speed of the butterfly - do you think is this reasonable?

SM - make sure you include an identification of whether you think the jerk value is reasonable and safe for the butterfly.

Write a final statement that describes whether my initial equation for the movement of a butterfly is a realistic equation or not.