MYP 4 Sciences – Inquiry on Motion Graphs

Unit 1 : Travelling through Space and Time

Criterion A: Knowing and Understanding

Criterion B : Processing and Evaluating

ATL addressed : Critical thinking >Gather and organize relevant information to formulate an argument

> Draw reasonable conclusions and generalizations.

Motion Graphs   { Source Credits : Author: Simon Lees 2017 1.}

In this activity students will be exploring motion graphs with the "Moving Man" PhET simulation. Open the simulation by clicking on the link: https://phet.colorado.edu/en/simulation/legacy/moving-man

 [Additional help required? Watch YouTube: https://youtu.be/Hlua6ybbpVM]

 Learning Objectives :

By the end of these activities it is hoped that students will have an acquired the following skills:

• Following explicit instructions to gain acquired knowledge

• Explore how changing various variables affect the graphs of distance; displacement; velocity and acceleration.

• Using gradient calculations to determine velocity and acceleration.

• Using area to calculate distance from a velocity - time graph.

 1.Comparing displacement and constant velocity.

Instructions:

- Click on the CHARTS tab at the top of the screen, green circle.

- Move the man by dragging him to the far LEFT.

You will notice that the blue arrow, blue circle, moves down.

- In the velocity box, red circle, type 2.

- Press PLAY, yellow circle, and allow the program to run until the man gets to the end of the track and then STOP the animation.

- Take a screenshot of the graphs and paste a print out in the notebook.

Now answer the following questions in the notebook.

• What is the total distance travelled?
_____

• If 0m is home what is the man's displacement?
_____

• What can be said about the man's velocity and how do you know?
_____

• How does this compare to the blue distance - time line?
_____

_____

• If the velocity is constant what do you notice about the acceleration line, green line?
_____

• Use the blue distance - time line and calculate the gradient by dividing the RISE ÷ RUN. (Note: the time of the journey is shown in the top blue area)
_____

 • What does this number relate to?
_____

• Produce a generic equation from the graph that combine velocity distance and time.
_____

- CLEAR and RESET ALL

- Now do exactly the same thing but move the man to the other end, the RIGHT side.

 - Place **-2** in the velocity box. - Press PLAY.

- Screen shot the screen

• What do you notice about these graphs compared to the first set?
_____
_____

• Use the blue distance v time line and calculate the gradient by dividing the RISE ÷ RUN. (Note: the time of the journey is shown in the top blue area as the line is going down the distance must be negative) _____

• What then do you think the negative on **-2** tells us?

_____

2. **What is the relationship when acceleration is not 0?** –

Move the man to the LEFT by pulling the blue arrow to the bottom, blue circle.

- In the box of acceleration, green circle, type in 1 for 1m/s/s. –

Press PLAY and STOP before the mane hits the wall. - Take a screenshot and place in the area below.

• What is the total distance travelled?

_____

• Compare and contrast the three curves.

_____
_____
_____
_____

• Use the red velocity - time line and calculate the gradient by dividing the RISE ÷ RUN. (Note: the time of the journey is shown in the top blue area as the line is going down the distance must be negative)

_____

This is virtually the same as the acceleration.

• Calculate the area under the velocity v time graph

_____

• What does the area under the velocity v time graph represent?

_____

- Now do exactly the same thing but move the man to the other end, the RIGHT side. –

Place **-2** in the acceleration box. –

Press PLAY.

- Screen shot the screen and place in the space provided.

• What do you notice about these graphs compared to the first set?

_____
_____

• Pull the red arrow to the base of the velocity line to determine the maximum velocity reached. Use the time then to determine the distance by calculating the area.

_____

SUMMARY

• Complete the table below to summarise what you have found. • If the value of either the displacement, velocity or acceleration is negative what does this mean?

_____

 SUMMARY GRAPH

Summary	GRAPH		
	Distance Vs Time	Velocity Vs time	Acceleration Vs Time
Constant velocity			
Constant acceleration			
Area under the curve			

If the value of either the displacement, velocity or acceleration is negative what does this mean?