Displacement Graphs

IB PHYSICS | MOTION

What is Motion?

An object's change in __position__ relative to a reference point.

Relative to the earth:
Moving 17,500 mph

Relative to the shuttle:
Not moving

Distance vs. Displacement

Distance	How far travelled
Displacement	How far from origin

Distance and Displacement in 2D

Distance as the Crow Flies : 1170.297

Distance by Land Transport : 1525.995

This road journey will take 21 Hours, 11 Minutes

You can **link to this result : How Far is it Between Minnetonka High School - The Cove, Minnetonka and Niagra Falls, Canada**

https://www.freemaptools.com/how-far-is-it-between-minnetonka-high-school---the-cove_-minnetonka-and-niagra-falls_-ca

Map Showing the Distance Between Minnetonka High School - The Cove, Minnetonka and Niagra Falls, Canada
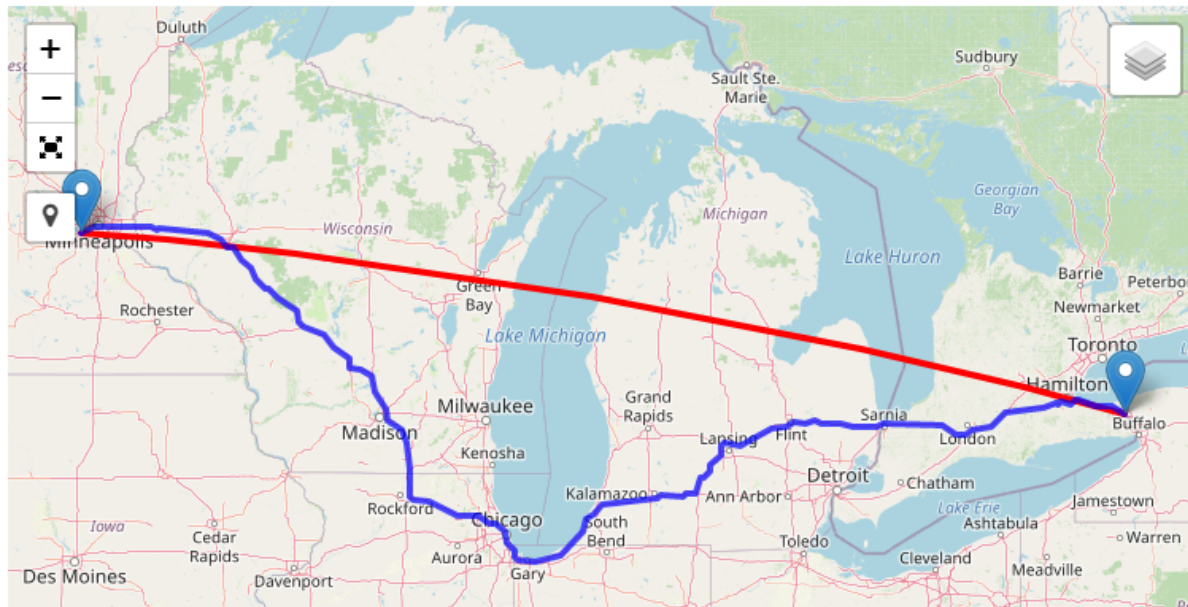
Try this | Distance and Displacement

You walked 5 km East, turned around and walked 2 km West, turned around again and walked another 4 km East. What is your distance? What is your displacement?
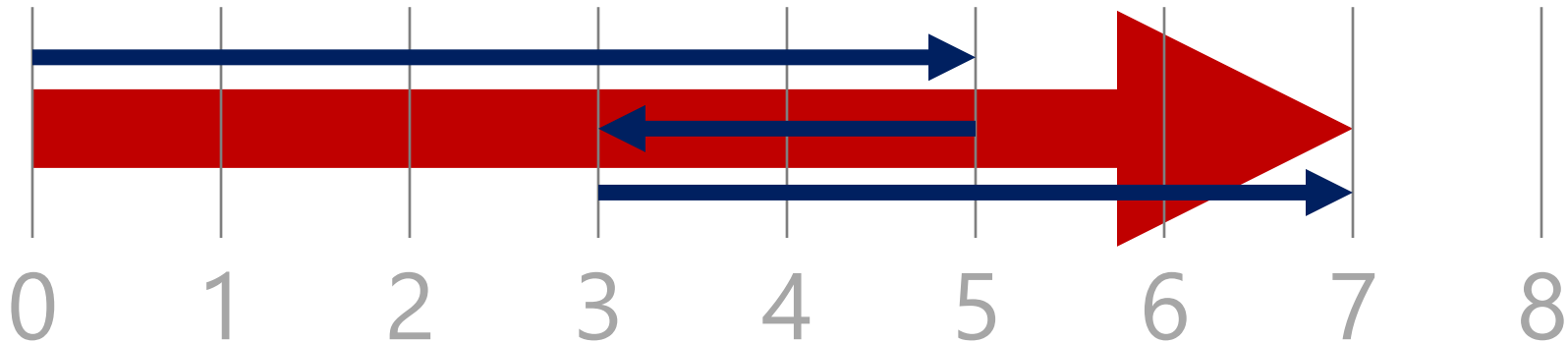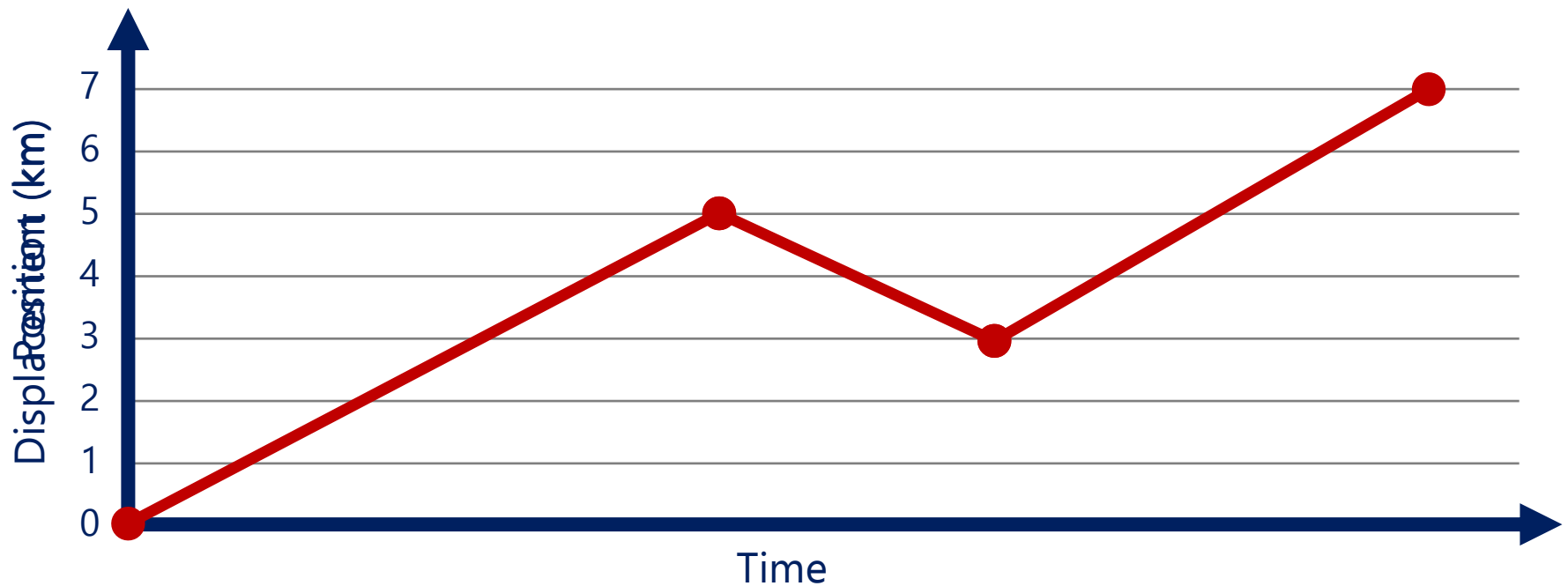

5 + 2 + 4

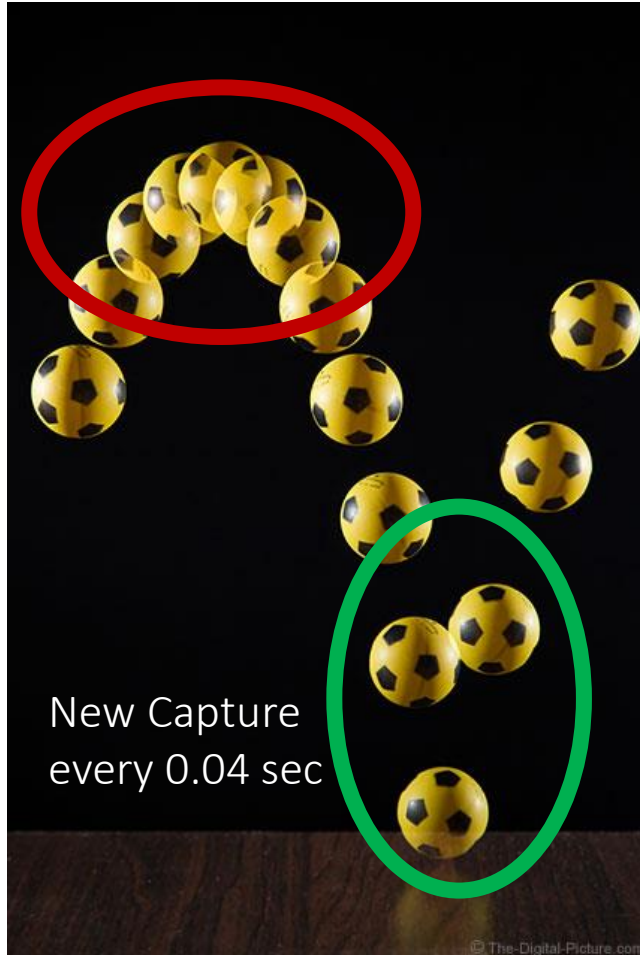|	
Distance	11 km
Displacement	7 km

Graphing Displacement

You walked 5 km East, turned around and walked 2 km West, turned around again and walked another 4 miles km. What is your distance? What is your displacement?

Stroboscopic Photographs

New Capture every 0.04 sec

In a stroboscopic photograph, a new snapshot is captured every ____ seconds and combined to show the motion over a period of time.

Circle the part of the motion where this soccer ball is moving the FASTEST

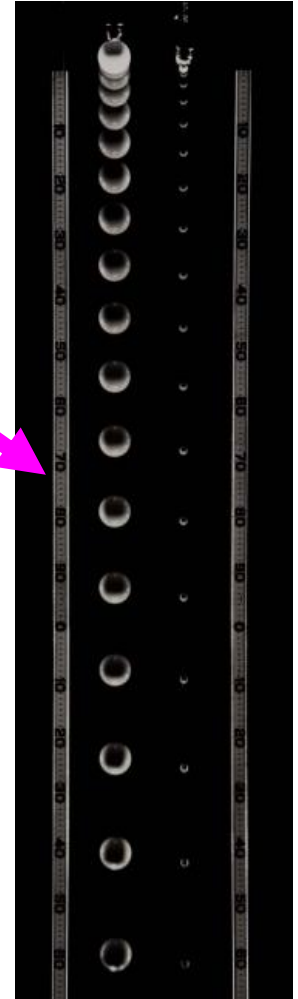Circle the part of the motion where this soccer ball is moving the SLOWEST

Stroboscopic Photographs

Constant Velocity   or   Accelerating?

How do you know?

More spacing between pictures = moving faster

Predict the Motion…

Which cart do you think has the best chance of reaching the 10-meter location first?

Time	0.0 s	1.0 s	2.0 s	3.0 s
Cart A	0.0 m			
Cart B	2.0 m			
Cart C	3.0 m			

Predict the Motion...

Now which cart do you think has the best chance of reaching the 10-meter location first?

| Time	0.0 s	1.0 s	2.0 s	3.0 s
Cart A	0.0 m	4.0 m		
Cart B	2.0 m	4.0 m		
Cart C	3.0 m	4.0 m		

What new information do you have about the carts now that you didn't before?

Predict the Motion…

Now which cart do you think has the best chance of reaching the 10-meter location first?

Time	0.0 s	1.0 s	2.0 s	3.0 s
Cart A	0.0 m	4.0 m	7.0 m	??
Cart B	2.0 m	4.0 m	6.0 m	??
Cart C	3.0 m	4.0 m	6.0 m	??

What patterns do you see? Can you use these to predict the next position?

Predict the Motion…
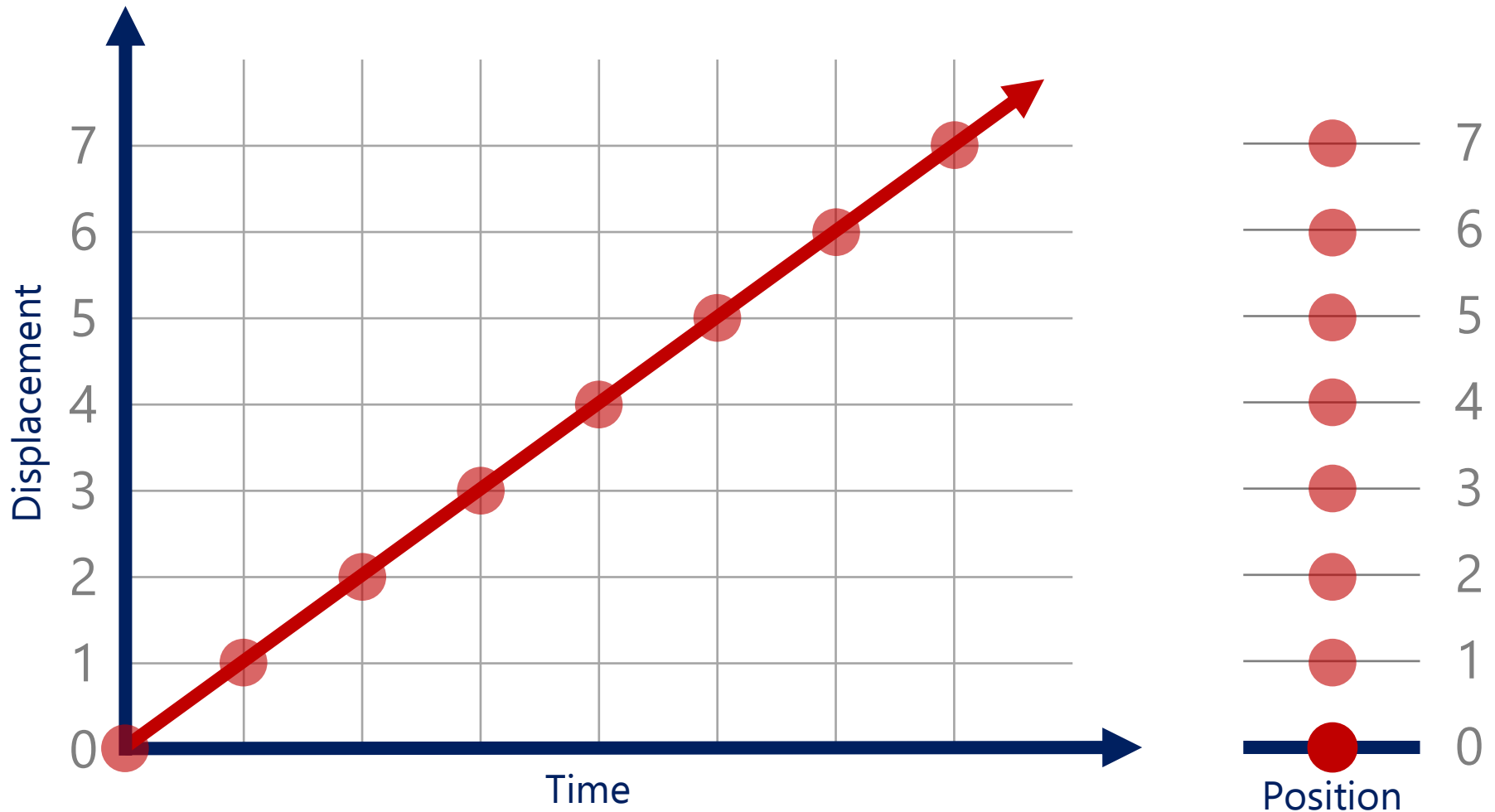
It's more than just position, you need multiple frames to see motion

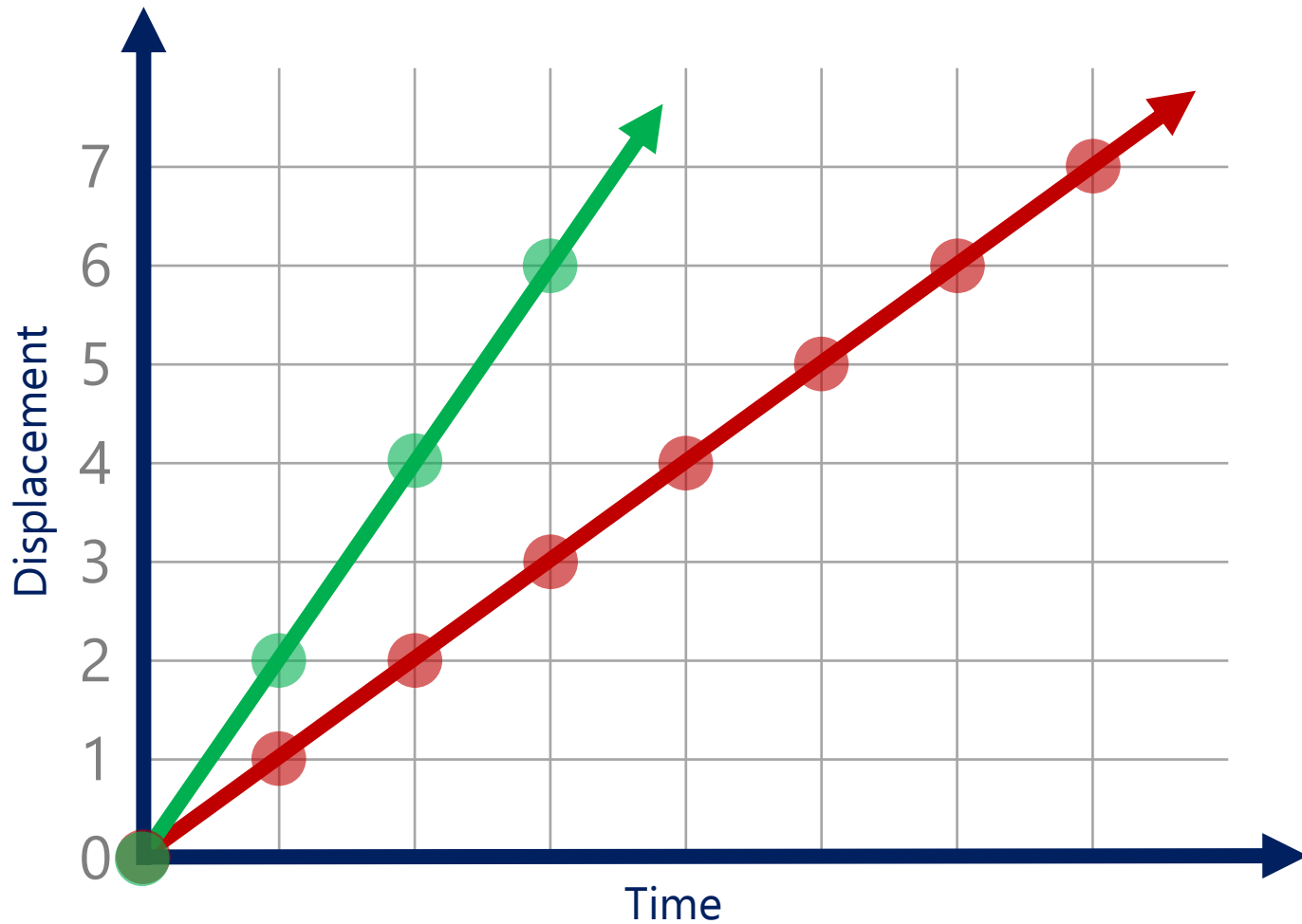| Time	0.0 s	1.0 s	2.0 s	3.0 s
Cart A	0.0 m	4.0 m	7.0 m	9.0 m
Cart B	2.0 m	4.0 m	6.0 m	8.0 m
Cart C	3.0 m	4.0 m	6.0 m	9.0 m
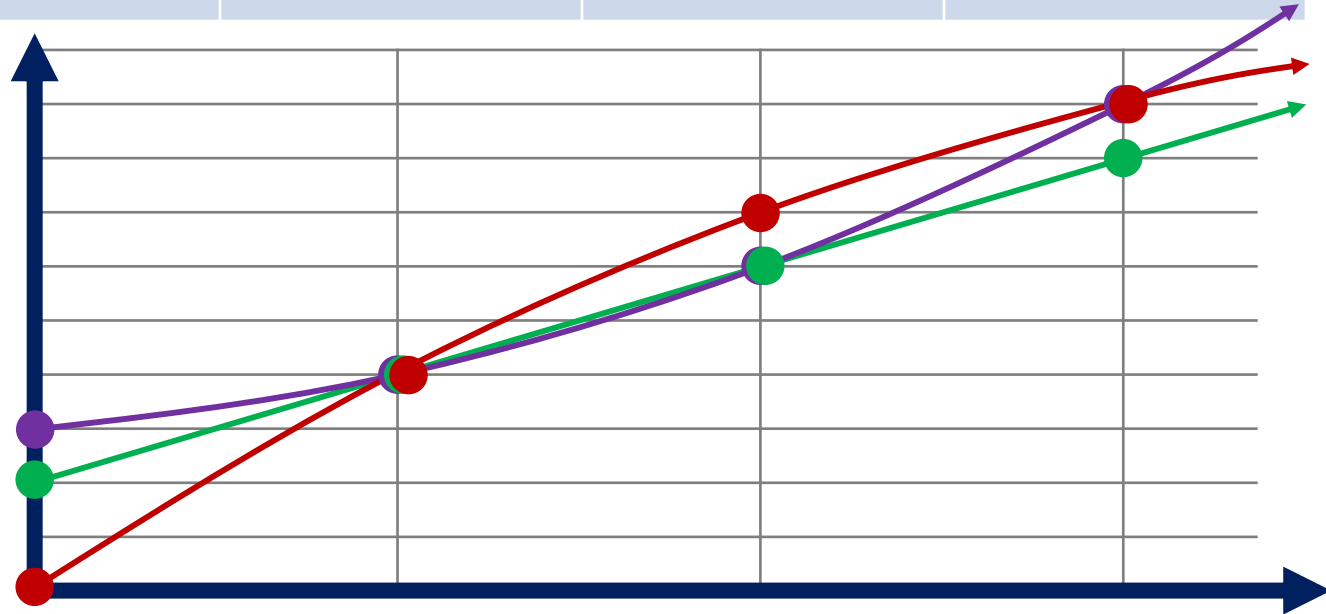
An object not moving
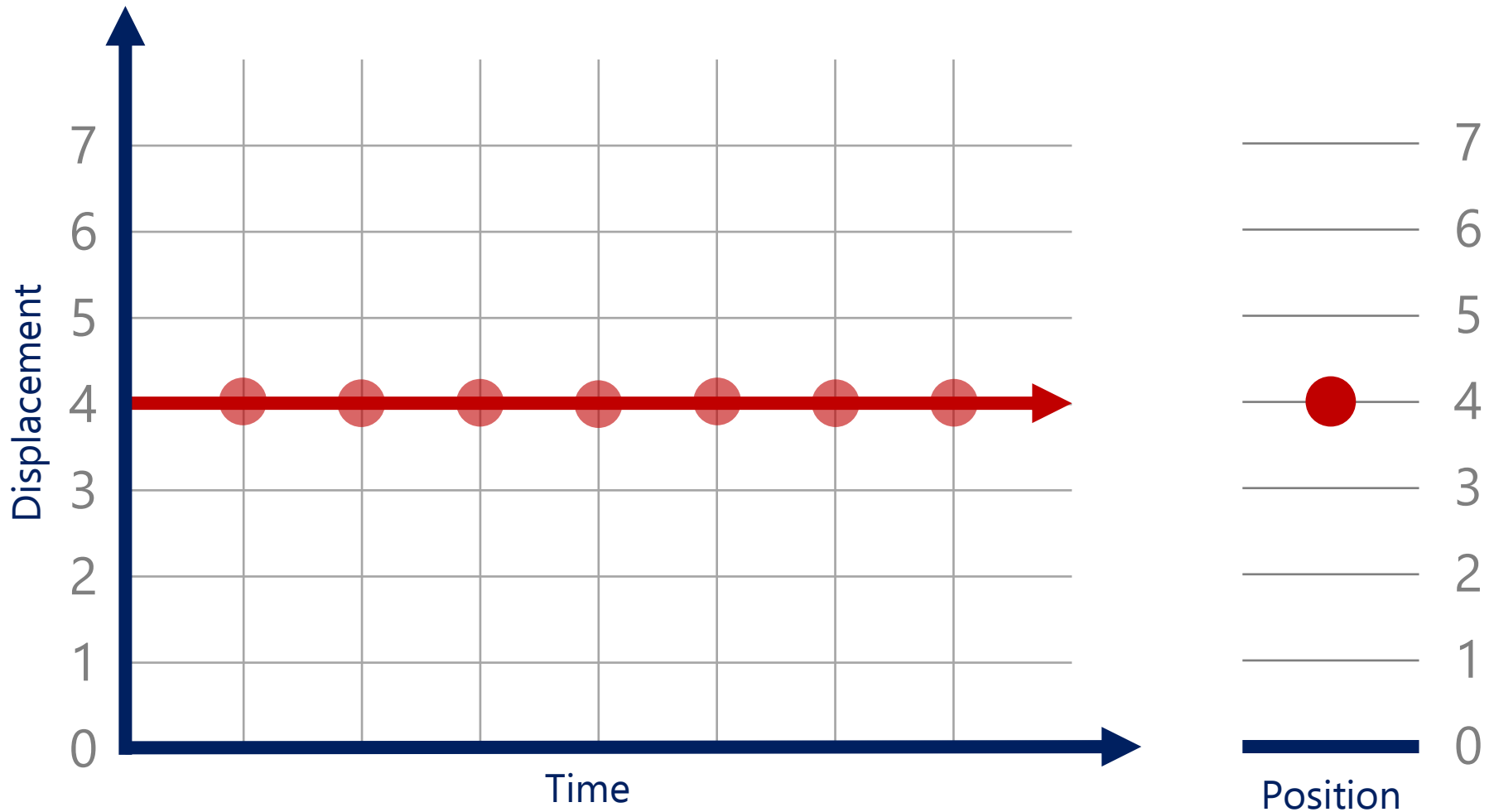
An object moving forward
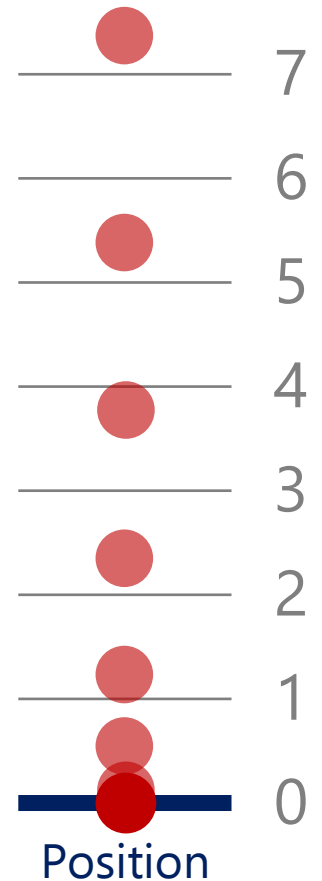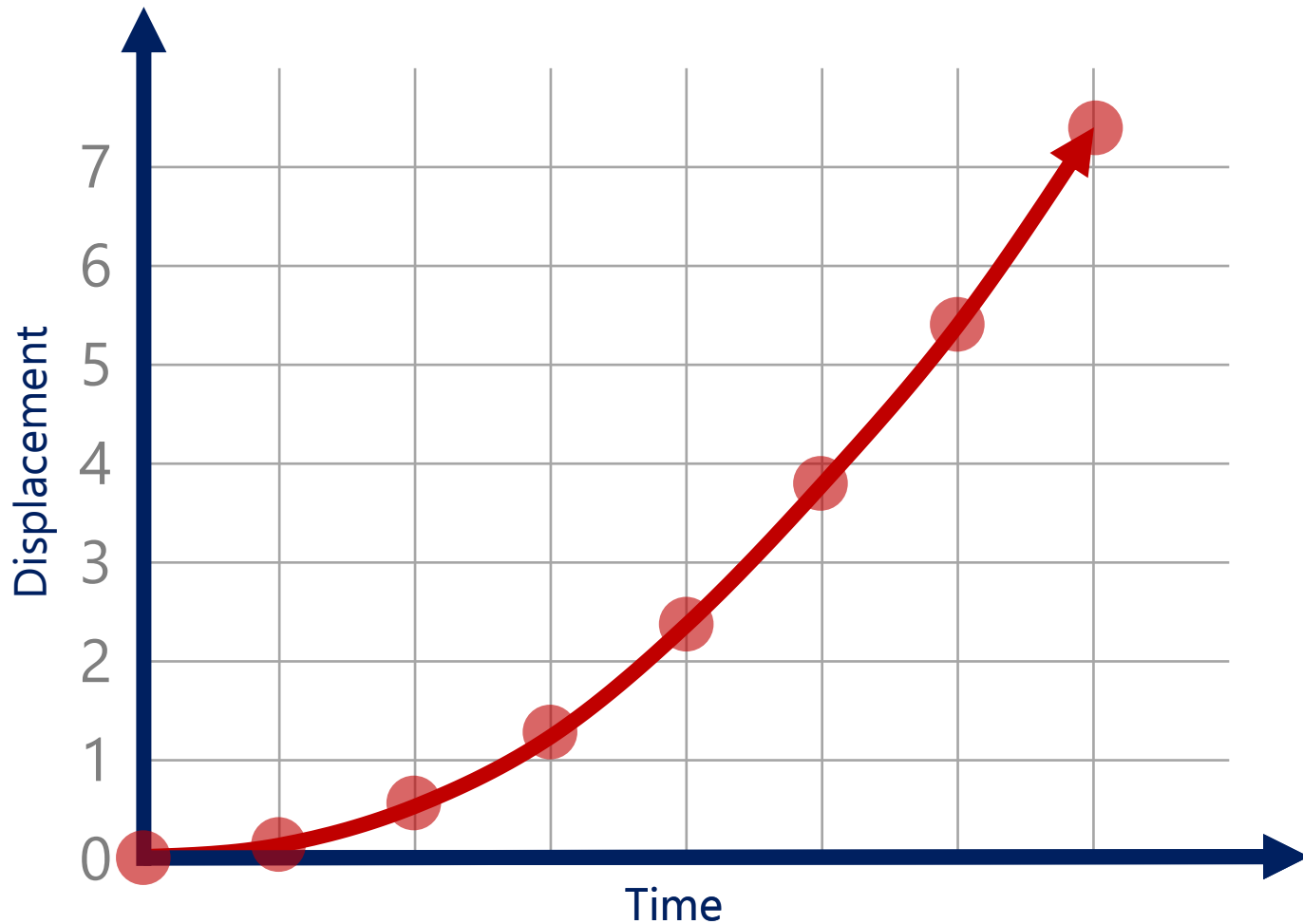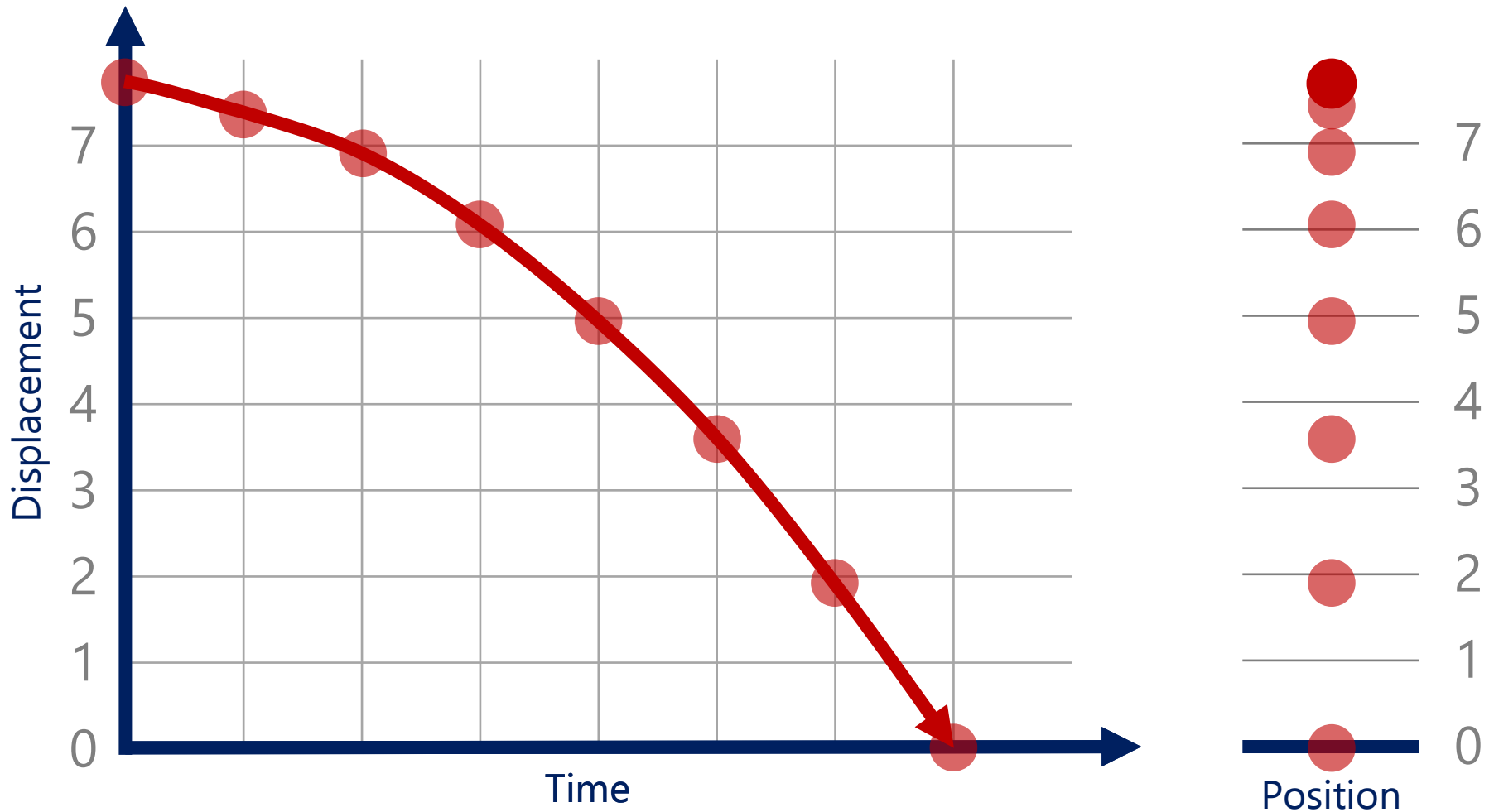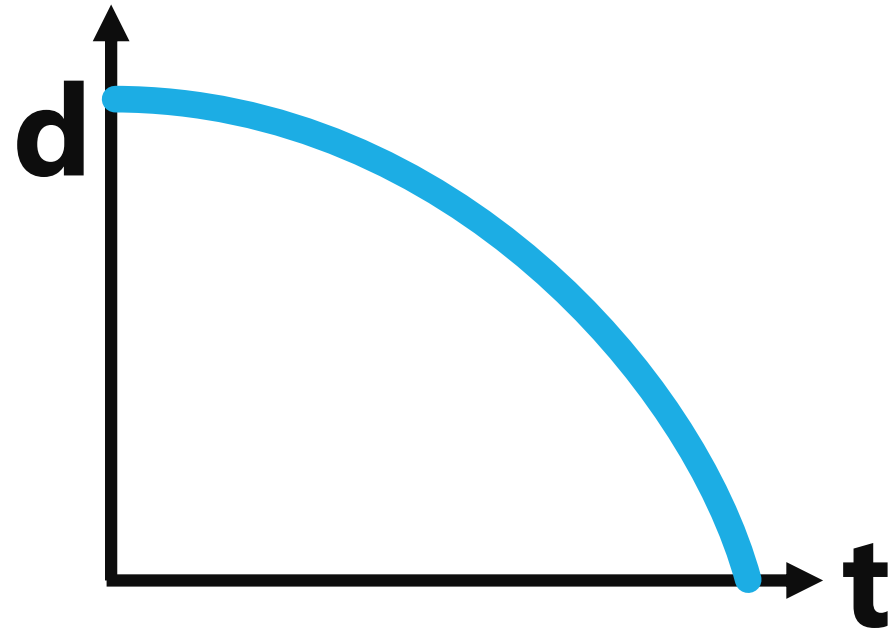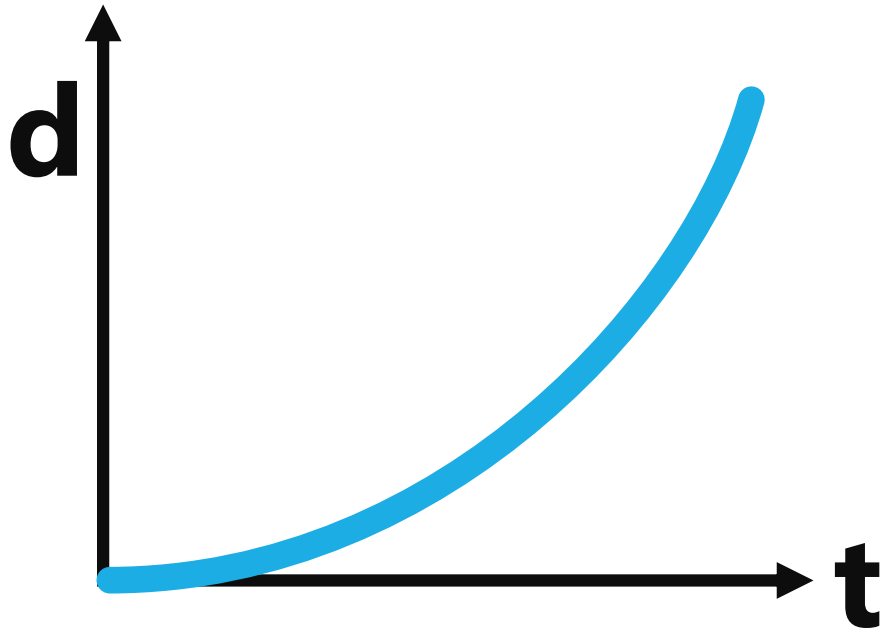
An object moving backward
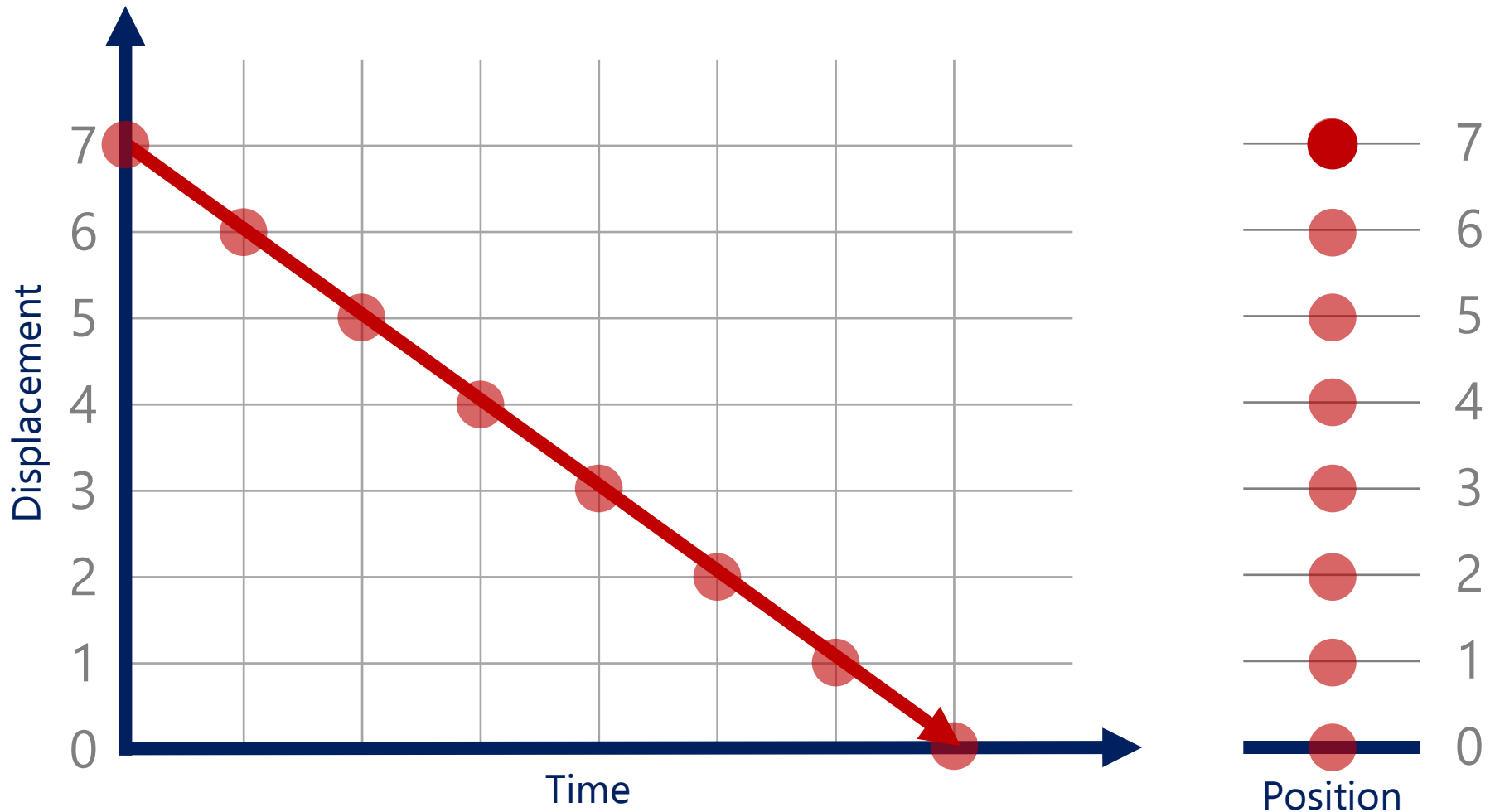
Showing Velocity
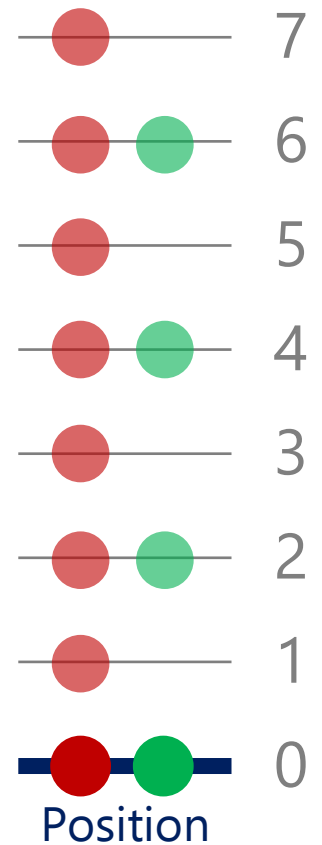
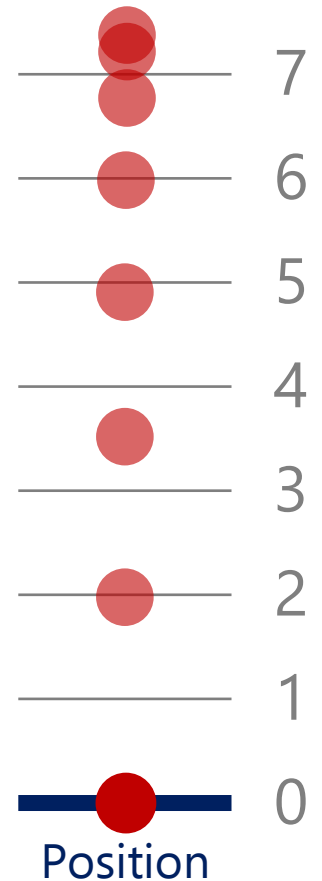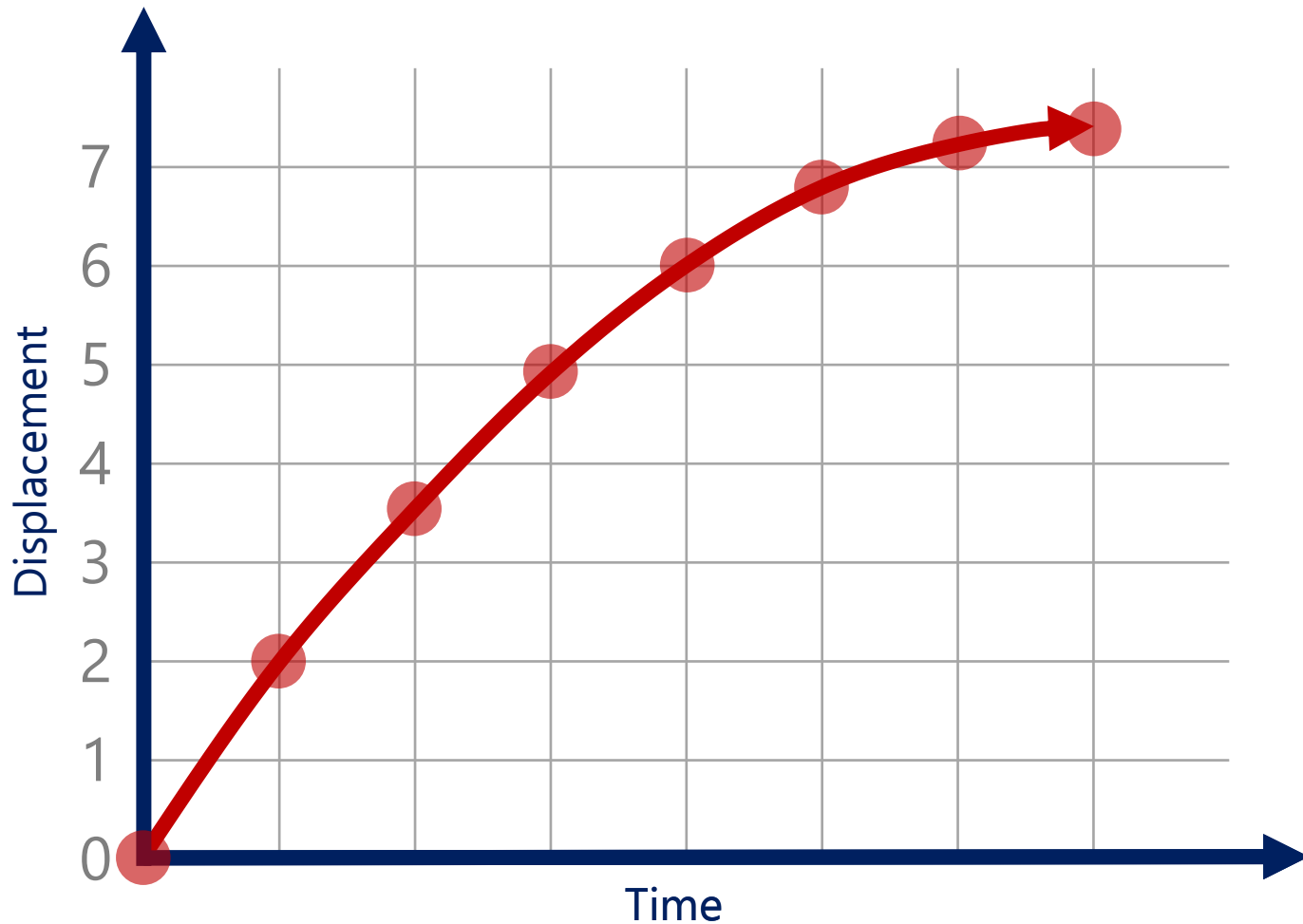# Speeding Up (moving positive)
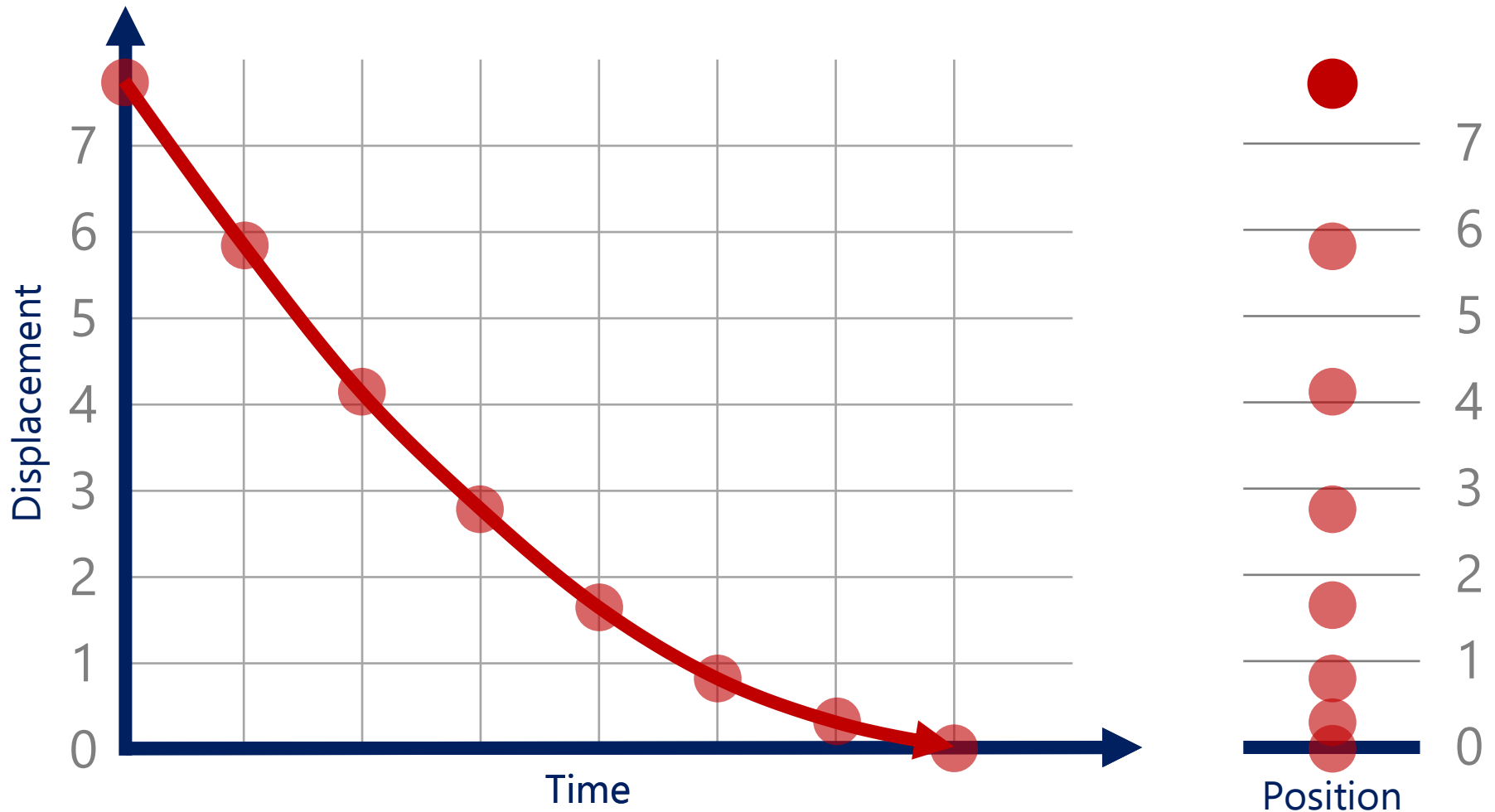
Speeding Up (moving negative)

How are these Similar?

Getting faster because the graph is getting steeper (farther spacing)
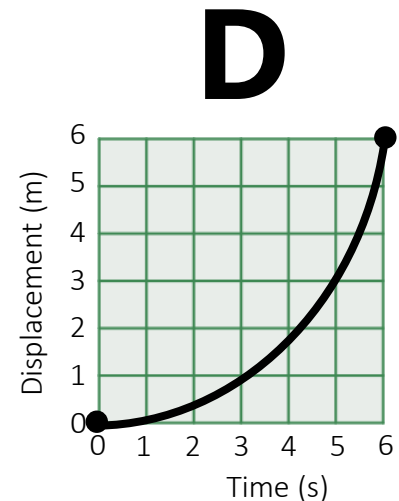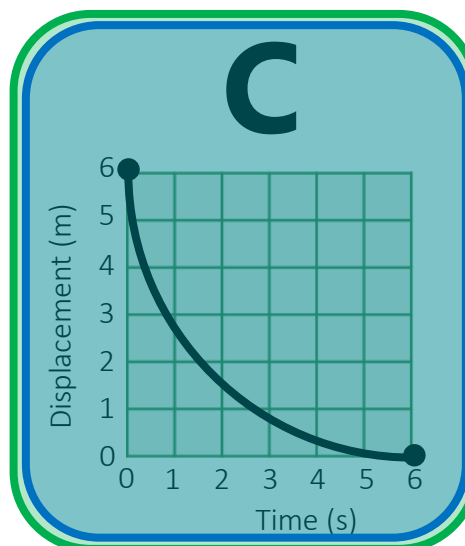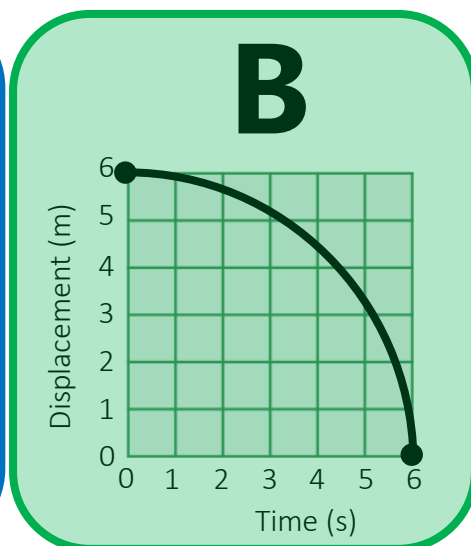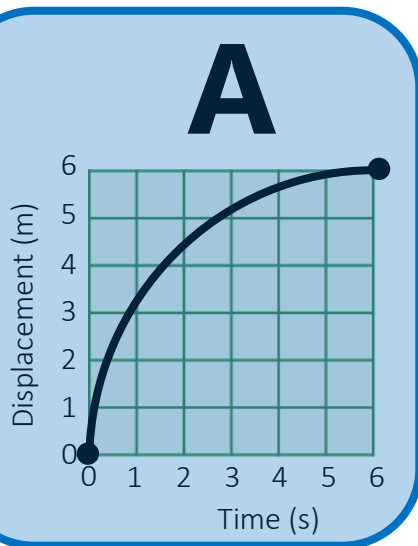
Slowing Down (moving positive)

Slowing Down (moving negative)

Displacement vs Time Graphs

Which graph(s) represent an object moving in the negative direction?

Which graph(s) represent an object slowing down?

Lesson Takeaways

- ❑ I can describe the difference between distance and displacement

- ❑ I can calculate distance and displacement for 1D motion

- ❑ I can plot constant velocity on a displacement vs time graph

- ❑ I can plot changing velocity on a displacement vs time graph

- ❑ I can use a displacement vs time graph to identify if an object is moving in the positive or negative direction as well as if it is speeding up or slowing down