Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Interpreting Velocity vs. Time Graphs**

Recall:

$Slope=\frac{rise}{run}=\frac{y\_{2}-y\_{1}}{x\_{2}-x\_{1}}$ and when the y-axis is distance and the x-axis is time, then:

 $Slope=\frac{d\_{2}-d\_{1}}{t\_{2}-t\_{1}}=velocity,$ meaning that the slope represents the velocity

Now let’s consider a velocity versus time graph. In this case, velocity is on the y-axis and time is on the x-axis so

 $Slope=\frac{v\_{2}-v\_{1}}{t\_{2}-t\_{1}}$

Does this look familiar? This is the same calculation for acceleration!

∴ the slope of a velocity versus time graph is equal to the acceleration.

|  |  |  |
| --- | --- | --- |
| **Term:** | **Looks like:** | **Means:** |
| **Positive acceleration** |  |  |
| **Negative acceleration** |  |  |
| **Zero acceleration** |  |  |

Which of these two objects has a greater acceleration? How do you know?



So to summarize, velocity is the slope of a displacement vs. time graph, and acceleration is the slope of a velocity vs. time graph. This means if we are given a displacement vs. time graph, we can sketch a velocity vs. time graph, and from this, we can sketch an acceleration vs. time graph.

Slope

Slope

**Displacement Velocity Acceleration**



But that’s not all we can with graphs! Recall:

$\rightharpoonaccent{a}=\frac{\rightharpoonaccent{v}}{t}$ which we can rearrange to look like: $\rightharpoonaccent{v}=\rightharpoonaccent{a}∙t$

If we are looking at an acceleration vs. time graph where the y-axis is acceleration and the x-axis is time, multiplying these two values together will give us velocity. Also recall that multiplying a height (y-coordinate) by a width (x-coordinate) gives you area.

∴ The area under the curve of an acceleration vs. time graph is equal to the velocity

Similarly, on a velocity vs. time graph, multiplying the y-value (velocity) times the x-value (time) gives you displacement:

$\rightharpoonaccent{v}=\frac{\rightharpoonaccent{d}}{t}$ rearranged looks like, $\rightharpoonaccent{d}=\rightharpoonaccent{v}∙t$

∴ The area under the curve of a velocity vs. time graph is equal to displacement

Slope

Slope

**Displacement Velocity Acceleration**

Area

Area