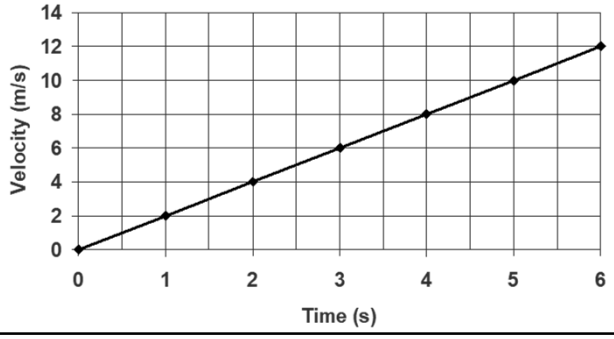
Constant Acceleration Equations

1

We already know….

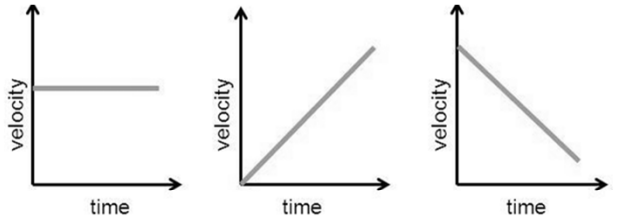
- **Constant or uniform acceleration is acceleration that does not change over time. The velocity-time graph of a constant acceleration is a <u>straight line.</u>**



2

Velocity-Time Graphs

Describe in words the motion depicted in each graph



3

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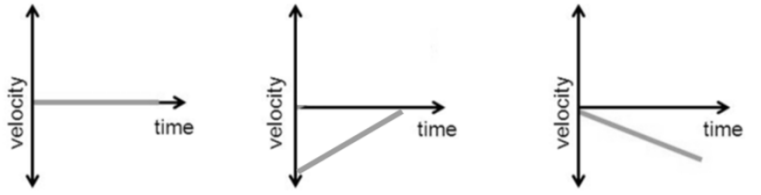
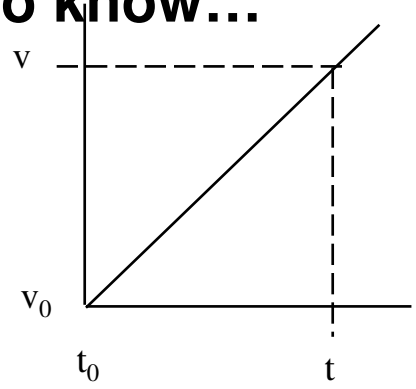


4

We also know…

- $\boldsymbol{slope = acceleration}$
- $\boldsymbol{slope = \frac{\Delta y}{\Delta x} = \frac{\Delta v}{\Delta t}}$
- $\boldsymbol{acceleration = \frac{\Delta v}{\Delta t}}$
- $\boldsymbol{a = \frac{v - v_0}{\Delta t}}$
- **Solve for v**



Slope = acceleration

5

The Variables

$v = final\ (ending)\ velocity$
$v_o = initial\ (starting)\ velocity$
$a = acceleration$
$t = time$
$\Delta x = displacement$ (change in position)

6

The Equations

- **When acceleration is constant, we can find other information about the object's motion using the following equations:**

$$v = v_o + at \qquad v^2 = v_0^2 + 2a\Delta x$$

$$\Delta x = v_o t + \frac{1}{2} a t^2$$

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Problem Solving Techniques

1. **Read the problem carefully.**
2. **Identify given quantities.**
3. **Identify unknown quantities.**
4. **Choose an equation(s).**
5. **Substitute given quantities into the equation.**
6. **Solve for the unknown variable.**
7. **Check if your answer is reasonable.**

8

Using Constant Acceleration

- **A race car accelerates from rest at 7.5m/s^2 for 4.5s. How fast will it be going at the end of that time?**

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Practice Problem #1

- **A jet plane traveling at 88 m/s lands on a runway and comes to rest in 11s.**
  - **Calculate the uniform acceleration.**
  - **Calculate the distance it travels.**

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Practice Problem #2

- **A car accelerates from 0 m/s to 26.8 m/s (60 mi/hr). It travels 75.1 meters during its acceleration.**
  - **What is the acceleration of the car?**
  - **How long does it take to accelerate to 60 mi/hr?**

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