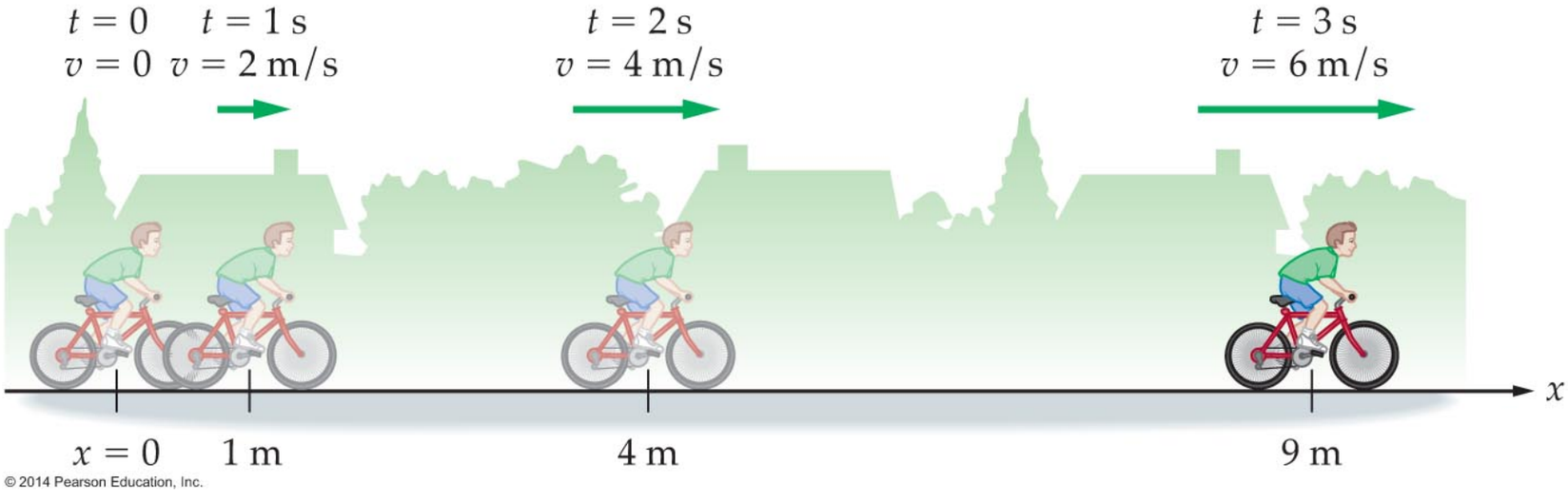
Acceleration: **any** change in velocity.

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{change in time}}$$



Several of the figures in this chapter are taken from Pearson Physics by Walker.
Used with permission

$$a = \frac{\Delta v}{t} = \frac{vf - vi}{t}$$

a = acceleration
v = velocity
t = time
vf = final velocity
vi = initial velocity

$a = \Delta v / \Delta t$

$a = vf - vi / t$

a = acceleration

v = velocity

t = time

vf = final velocity

vi = initial velocity

1. A car moving at 30 ft/s accelerates uniformly to 40 ft/s in 8 seconds. Calculate the acceleration of the car.

1 B. A car starts at rest and accelerates at 2 m/sec^2 for 4 seconds. How fast will it be moving at the end of that time?

Text Page 76: A chameleon extends its tongue to capture a tasty insect. The tongue accelerates at 33 m/s^2 for .12 seconds. What is the speed of the tongue when it grabs the insect?

2. A student enters the parking lot at 30 miles/hr (which is 44 ft/s). He sees Mr. Mahoney and slows down to 1 ft/s in 2 seconds. Find his acceleration (in ft/s^2).

3. A Porsche turbo can go from rest to 60 mi/hr in 4 seconds. Find the acceleration of the car in ft/s^2.

4. An object is dropped from rest and accelerates downward at 9.81 m/s^2. How fast will it be moving after falling for 8 seconds?

5. Igor was driving his hearse Northward at 42 m/s when he remembered that he had forgotten his shovel. He hit the brakes, bringing the hearse to a dead stop. If he accelerated at -16 m/s^2, how long did it take him to stop?

6. A skateboarder is moving at a constant velocity of 1.75 m/s when he starts up an incline that causes him to slow down at a constant acceleration of -.20 m/s^2. How much time passes from when he begins to slow down until he begins to move back down the incline?

7. A car which is moving at 10 ft/s begins to accelerate at 2.7 ft/s^2. How long will it take the car to reach a speed of 18.3 ft/s?

8. A car is traveling at 10 m/s and accelerates at a constant rate until it reaches 30 m/s. What is the average speed of the car?

If the car was accelerating for 8 seconds, what was the magnitude of the acceleration?

What distance did it cover while accelerating?

An object starts at rest and accelerates at 3m/sec^2 for 15 seconds. How far does it move in the 15 seconds?

Important Formulae:

$v_{av} = d/t$ >$d = vt$

$a = \Delta v/\Delta t = (vf-vi)/t$

solved for vf

$vf = vi+at$

If acceleration is constant

$vav = (vf + vi) /2$

When they are all put together:

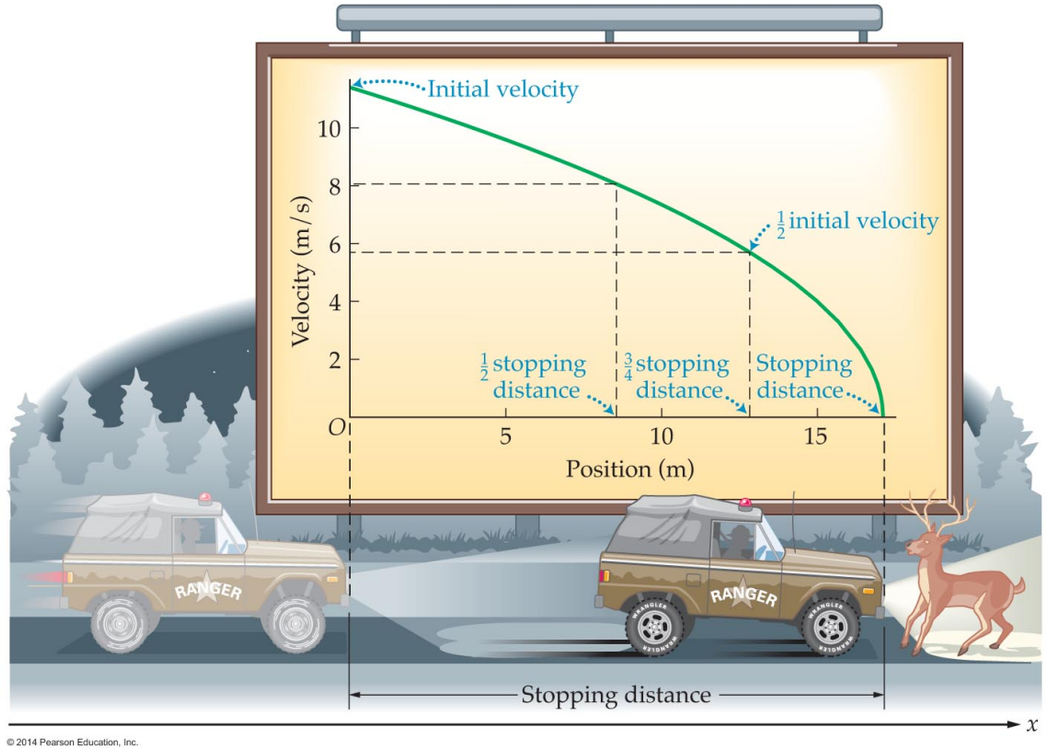
$d = vit + (1/2)at^2$

Or for x location:

$X = xi + vit + (1/2)at^2$

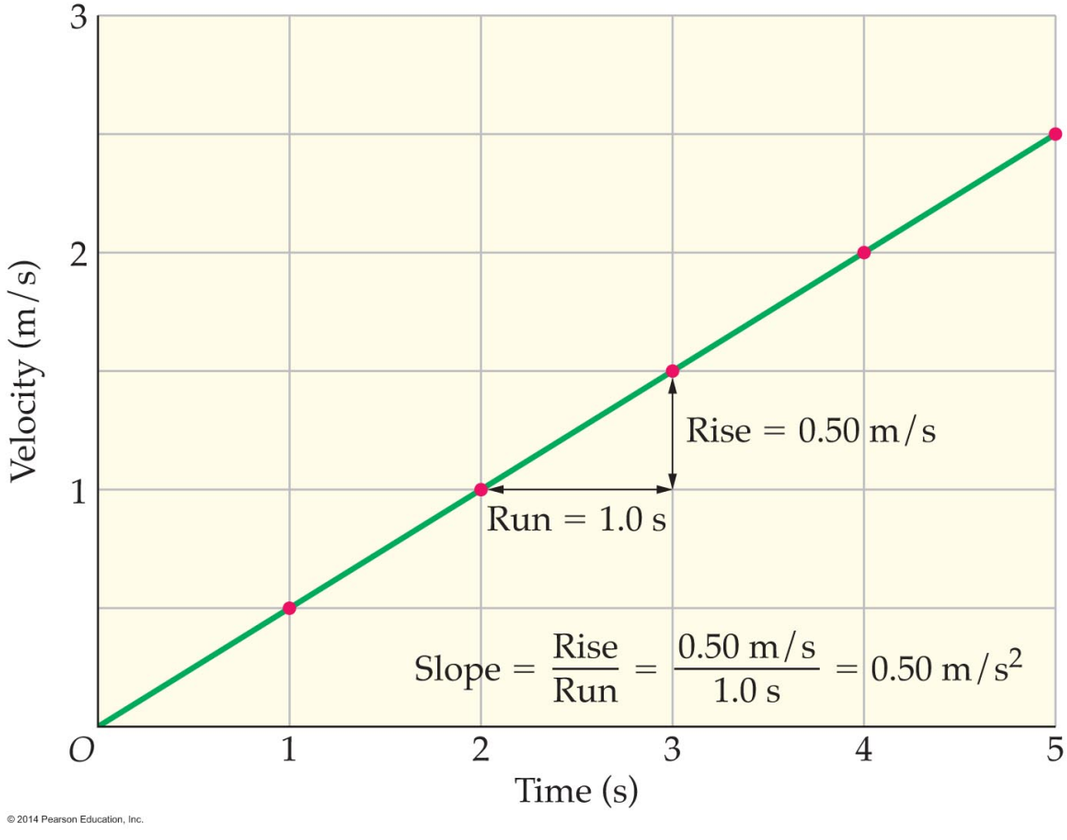
Another relation

$Vf^2 = Vi^2 + 2a\Delta X$



This problem is from page 89 in the textbook:
A park ranger driving on a back country road suddenly sees a deer “frozen” in the headlights 20.0 meters ahead.
The ranger, who is driving at 11.4 m/s, immediately applies the brakes and slows down with an acceleration of magnitude 3.80 m/s^2. How much distance is required for the ranger’s vehicle to come to rest?

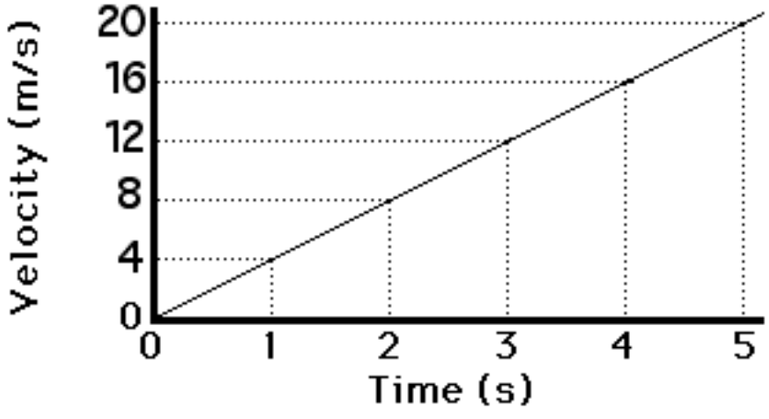
Graphical representation of motion

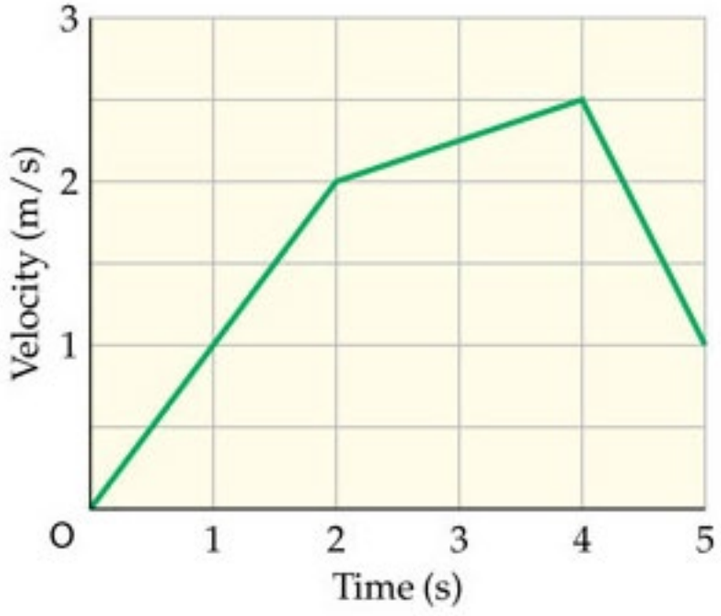


https://www.youtube.com/watch?v=5C5_dOEyAfk

Graphs:
Velocity - time graph

SLOPE of V-t graph
= Δ v /Δ t
=acceleration (!)





What is the distance covered in each interval?
0-2 sec
2-4 sec
4-5 sec

Distance covered= area under the graph
$d = v\,t$

Free Fall:
Acceleration of gravity =
9.81 m/s^2
=32 ft/s^2

1. An object falls freely from rest.
 a. How fast will it be moving after falling for 2.3 seconds?

b. What is its average speed?

c. How far did it fall?

FREE FALL
Acceleration = 9.81 m/s^2

FREE FALL FROM REST
Acceleration = 9.81 m/s^2
And Vi = 0