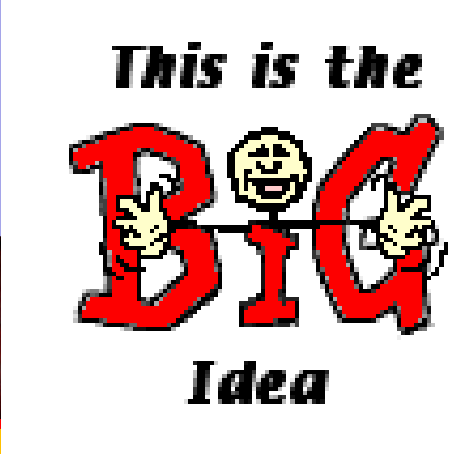


# PHYSICS

“In science, there is only physics; all the rest is stamp collecting.”

*-Ernest Rutherford*

- Our study of physics begins with the concepts of mechanics: **the study of motion.**
- We will first be concerned with **kinematics**, or how we **describe** motion.
- From there we will move on to the **causes** of motion, or **dynamics.**



- **Kinematics** is the branch concerned with the motions of objects without being concerned with the forces that cause the motion.
- **Dynamics**- is concerned with the forces that affect motion.

- Motion

- occurs when something changes position

## Measuring motion



- Distance

- How far something has moved

Measured in:

meters or kilometers

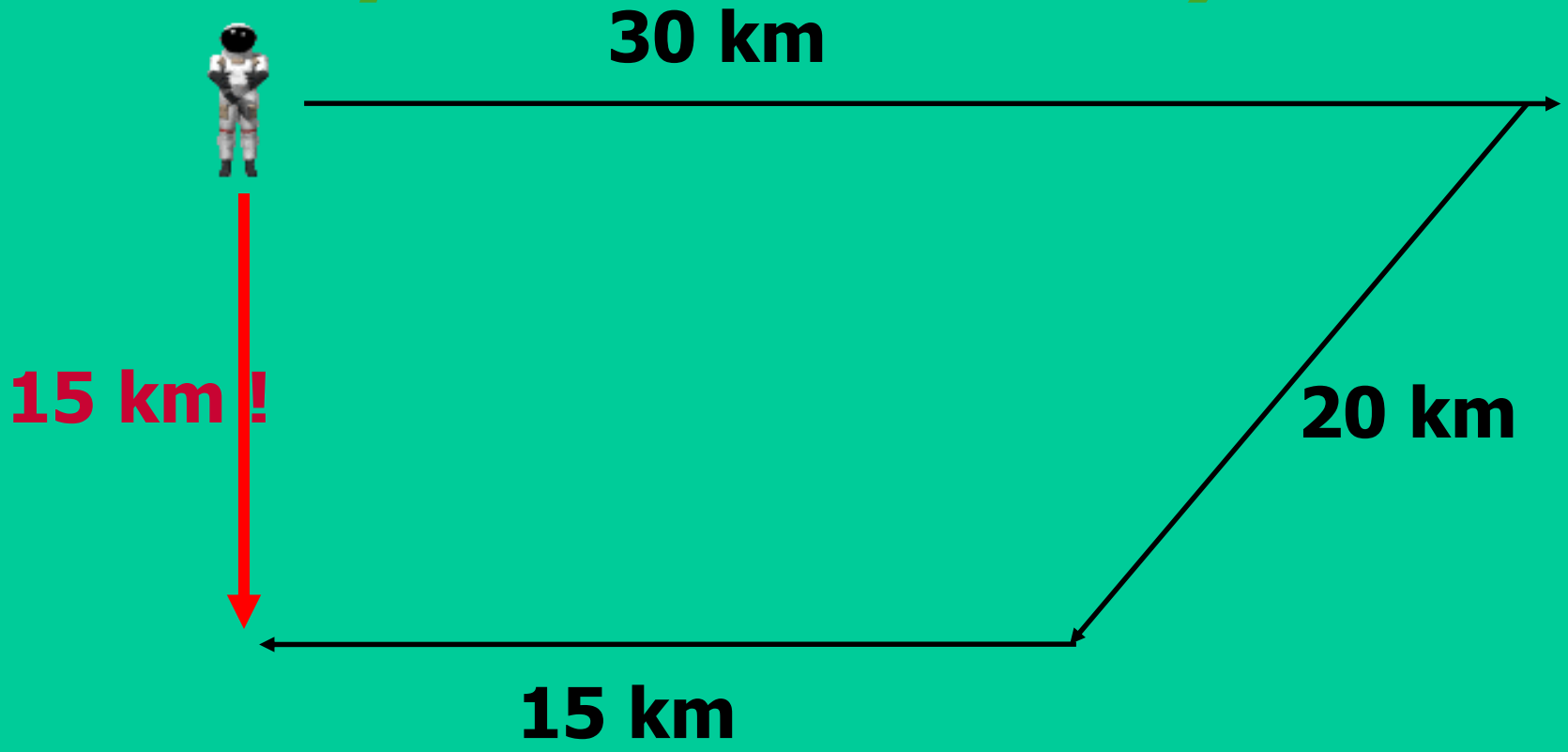
# Distance vs. Displacement



- Distance is how far an object has traveled
- Displacement is how far from the starting point an object actually moved
- Displacement does not equal distance traveled.

*His distance is 65 km but...*

*His Displacement is only 15 km.*

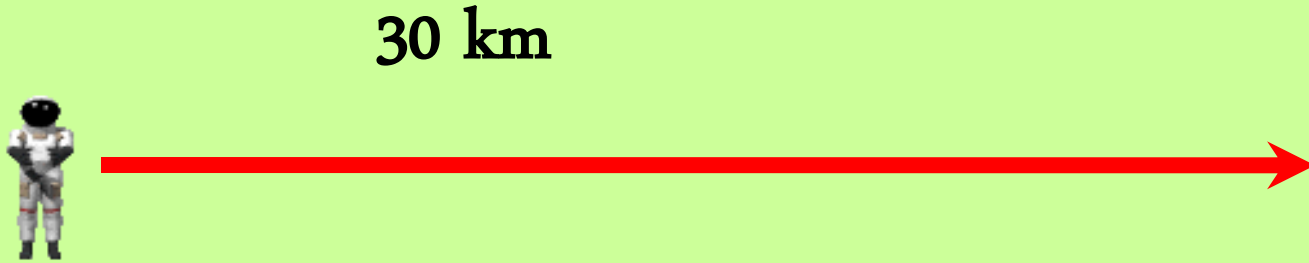


How fast something  
moves is **SPEED**

Speed is the **distance** an object  
travels in a certain period of  
**time.**

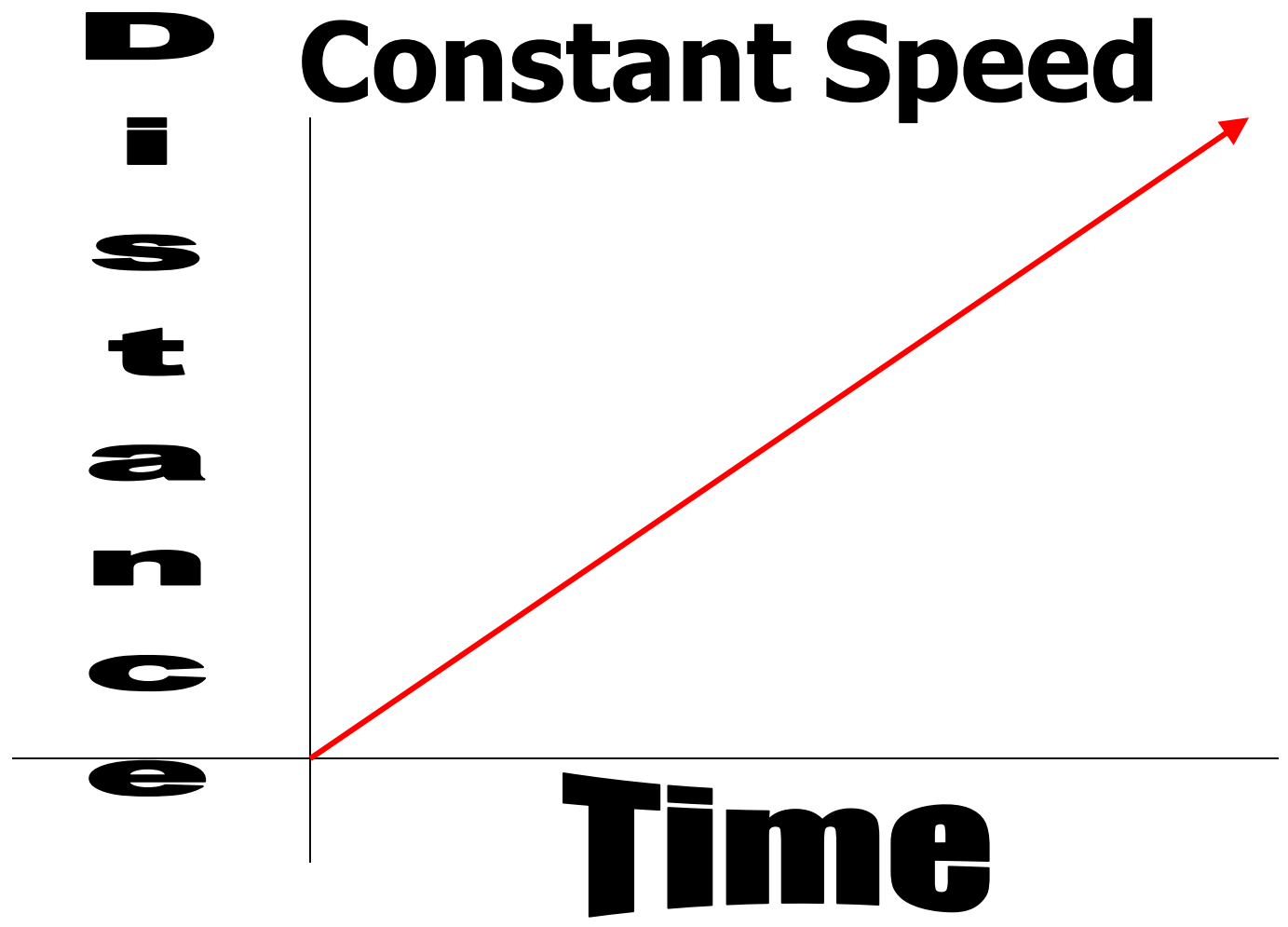


# What is his rate of speed?

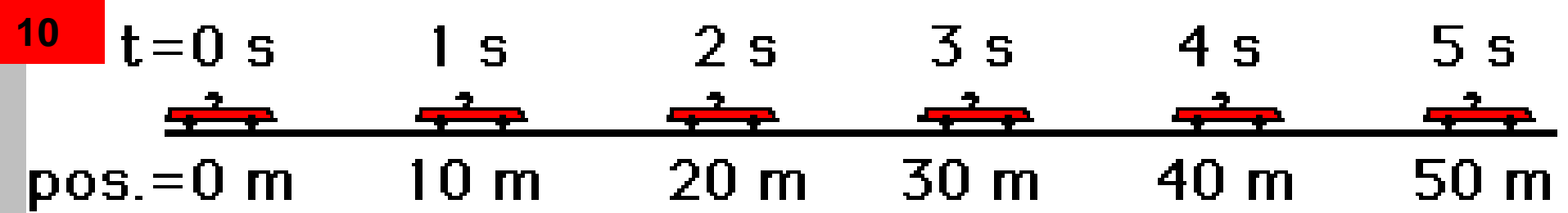


- Time= 30 min
- What is his rate of speed?
- Speed = distance/time
- 1km per min
- 1km/min

# Graphing Speed





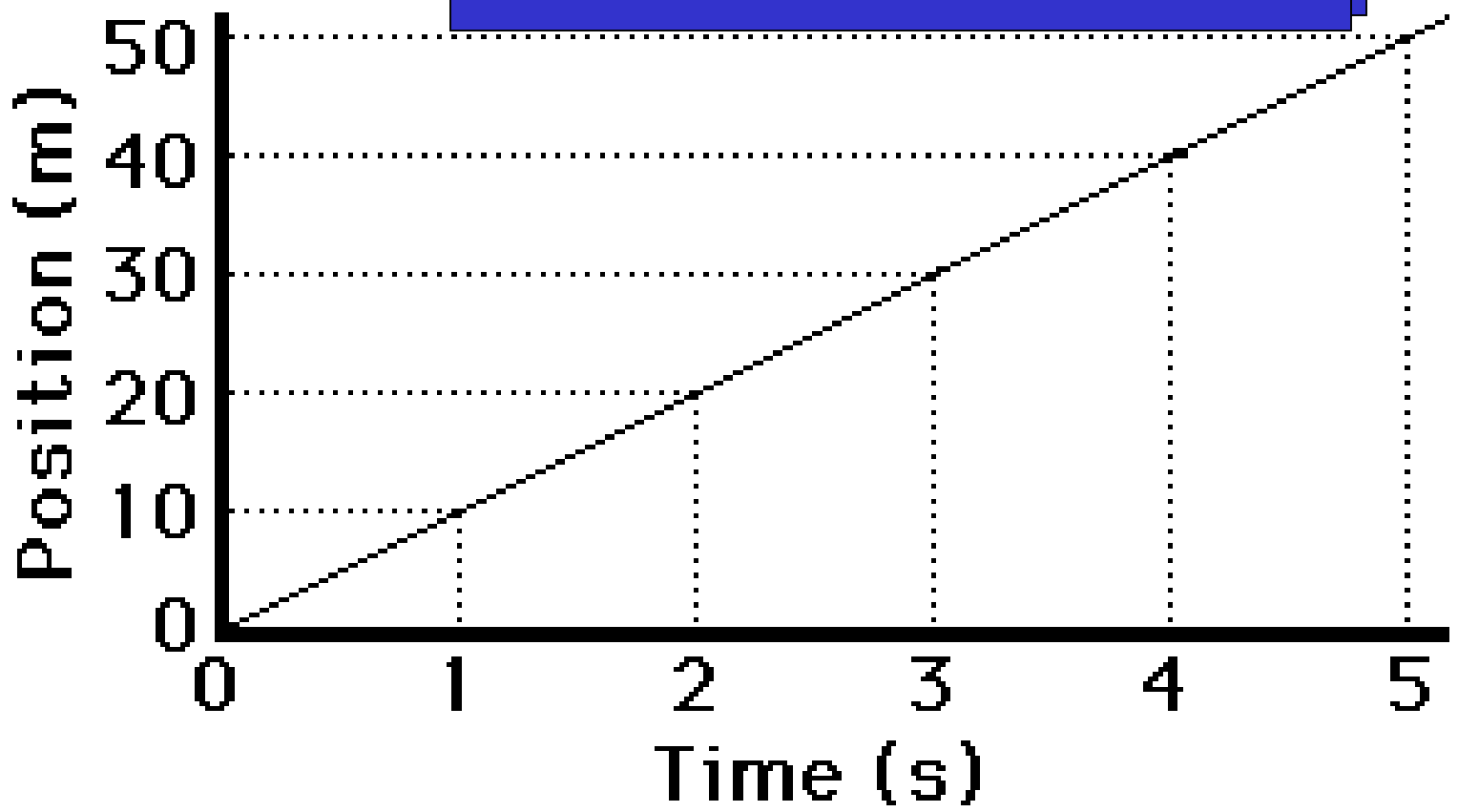


CONSTANT SPEED

But what if I don't understand slope?

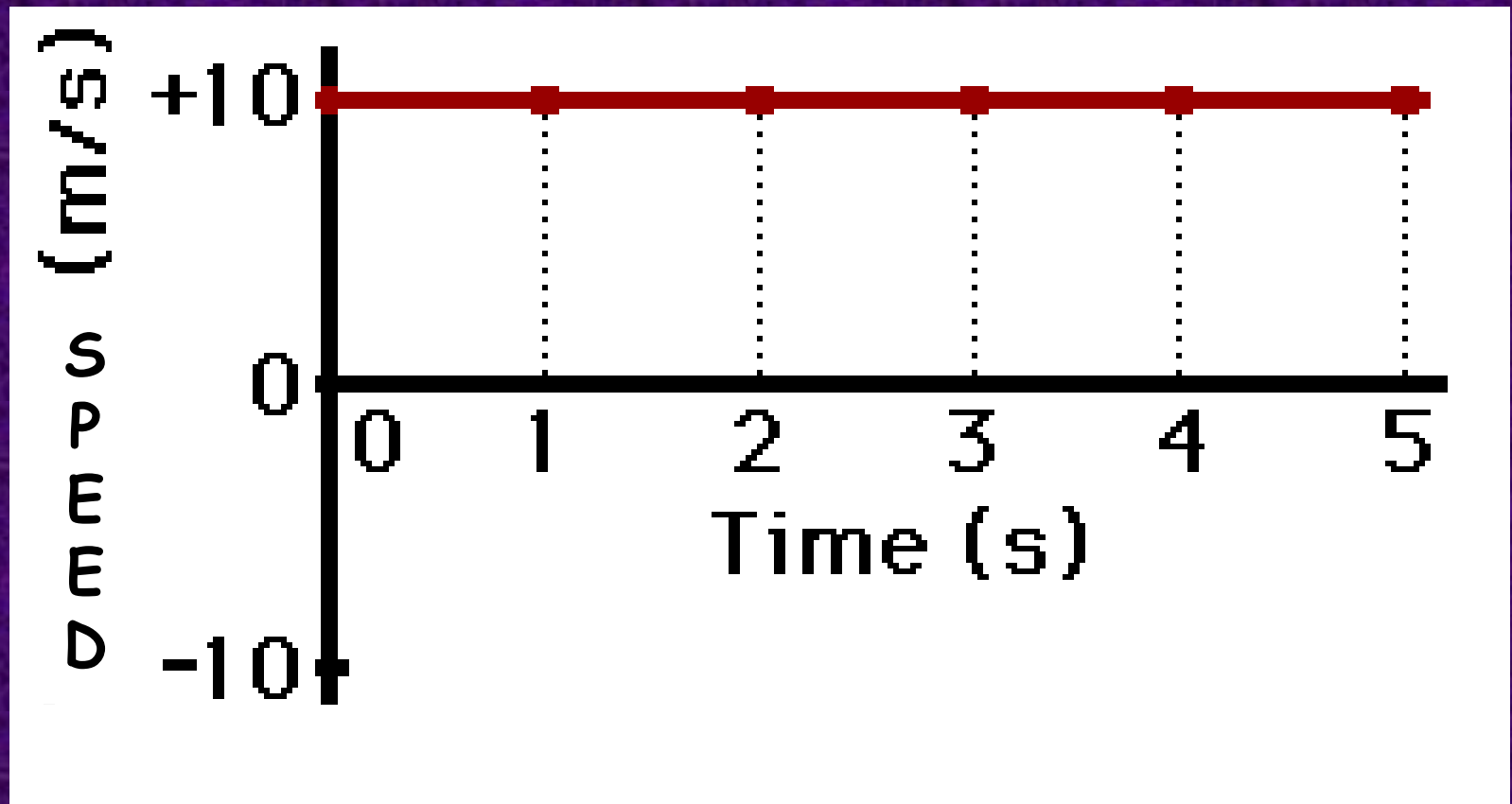


slope =



10 m/s

# What's Happening Here?



Velocity is  
Speed with  
a direction.



# *Velocity*

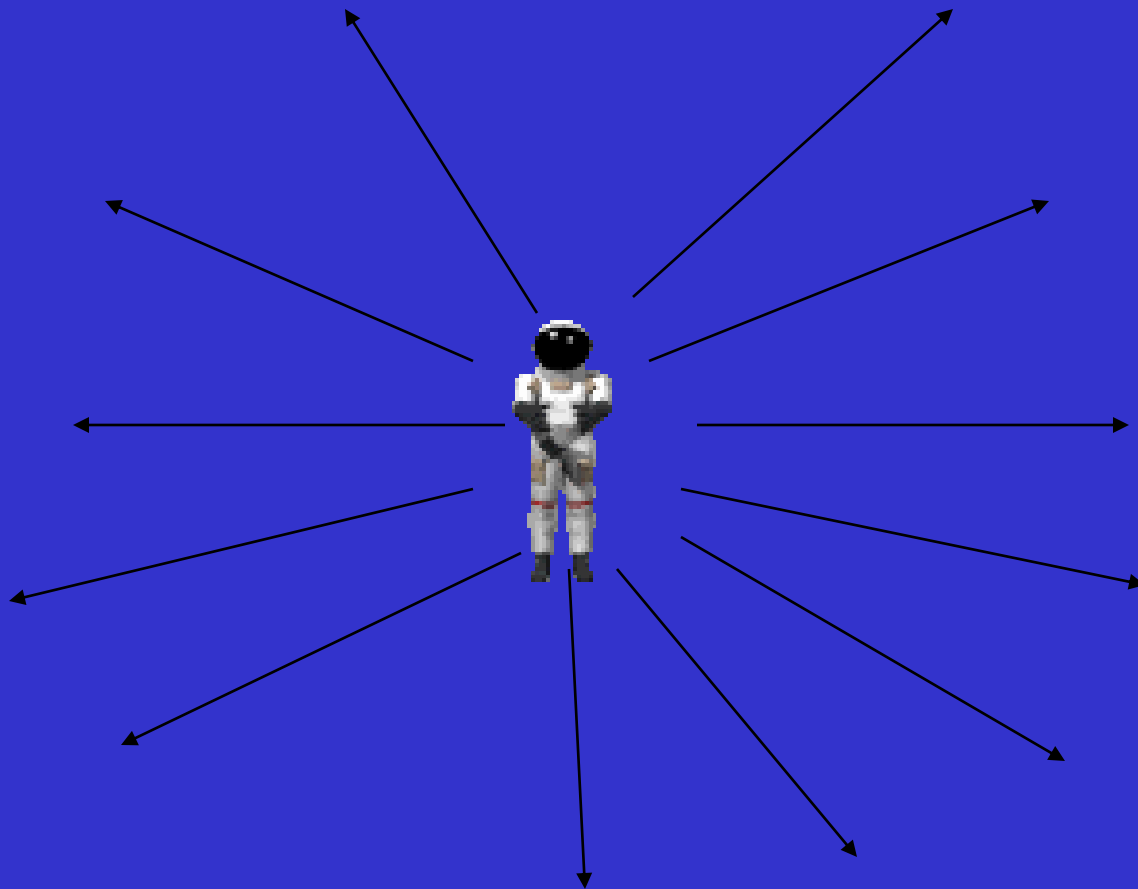
- In order to completely describe the motion of an object we need to include not only the speed of the object, but also
- *the direction !*

If I told you that the moon man moved 40 km does that tell you where he is?

No.

You need to know the direction.

15





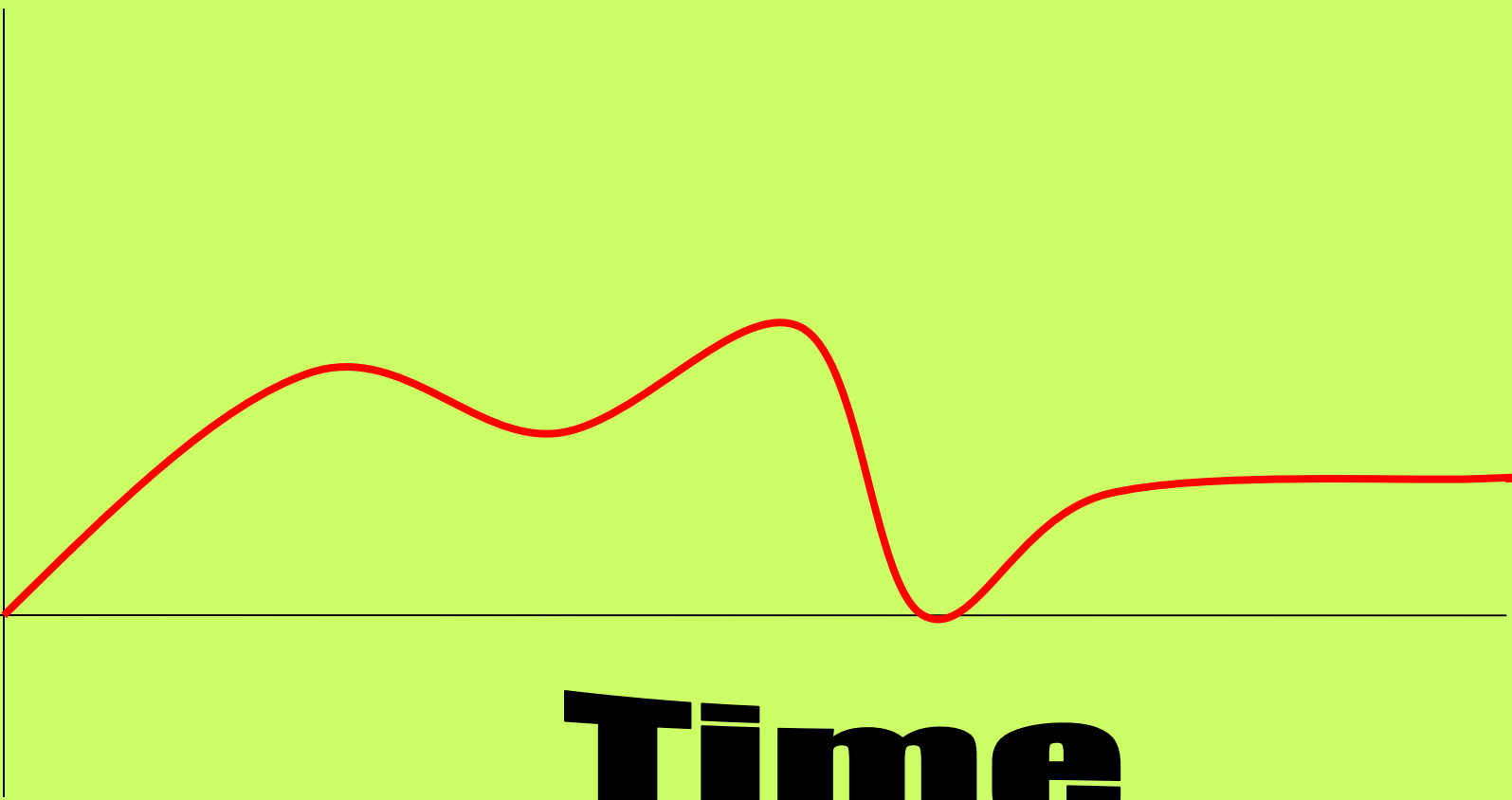
When describing velocity, you need to state the direction.

- Ex. 40 km/hr east

# Sometimes speed changes

## Changing Speed

**v**  
**e**  
**-**  
**o**  
**c**  
**i**  
**t**  
**y**



**Time**



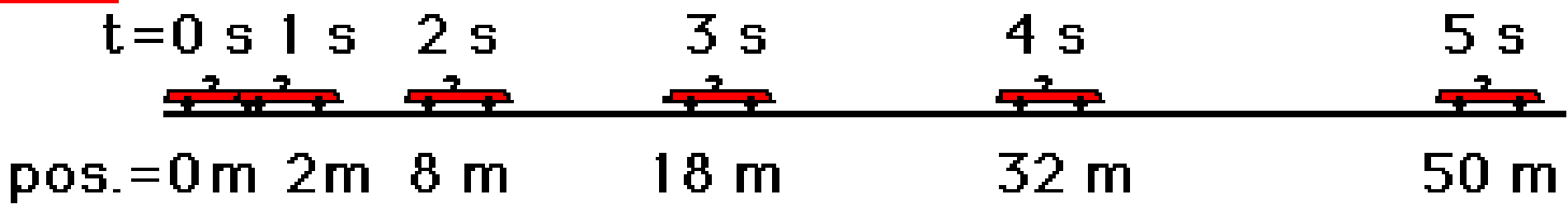
# *Acceleration*



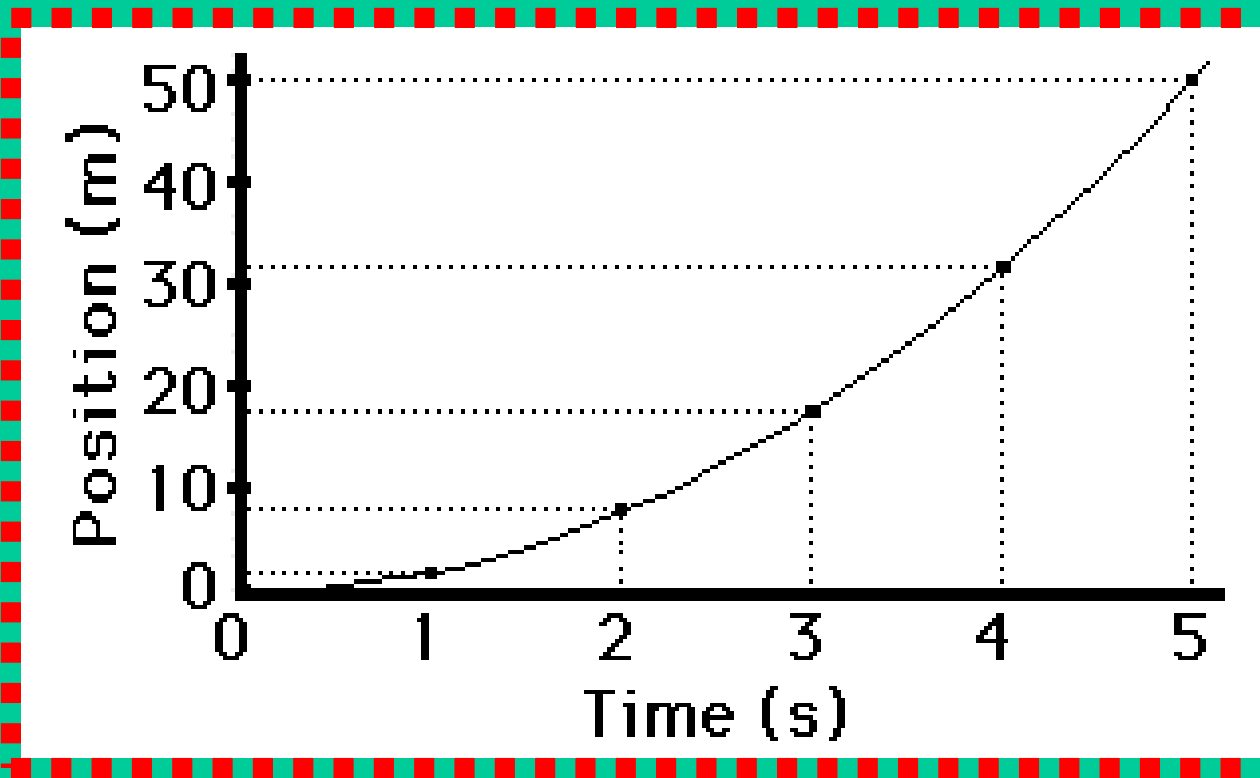
- Changing Speed
  - How fast the speed is changing.
- Units:  $m/s^2$ 
  - Velocity per sec
  - m/sec per sec

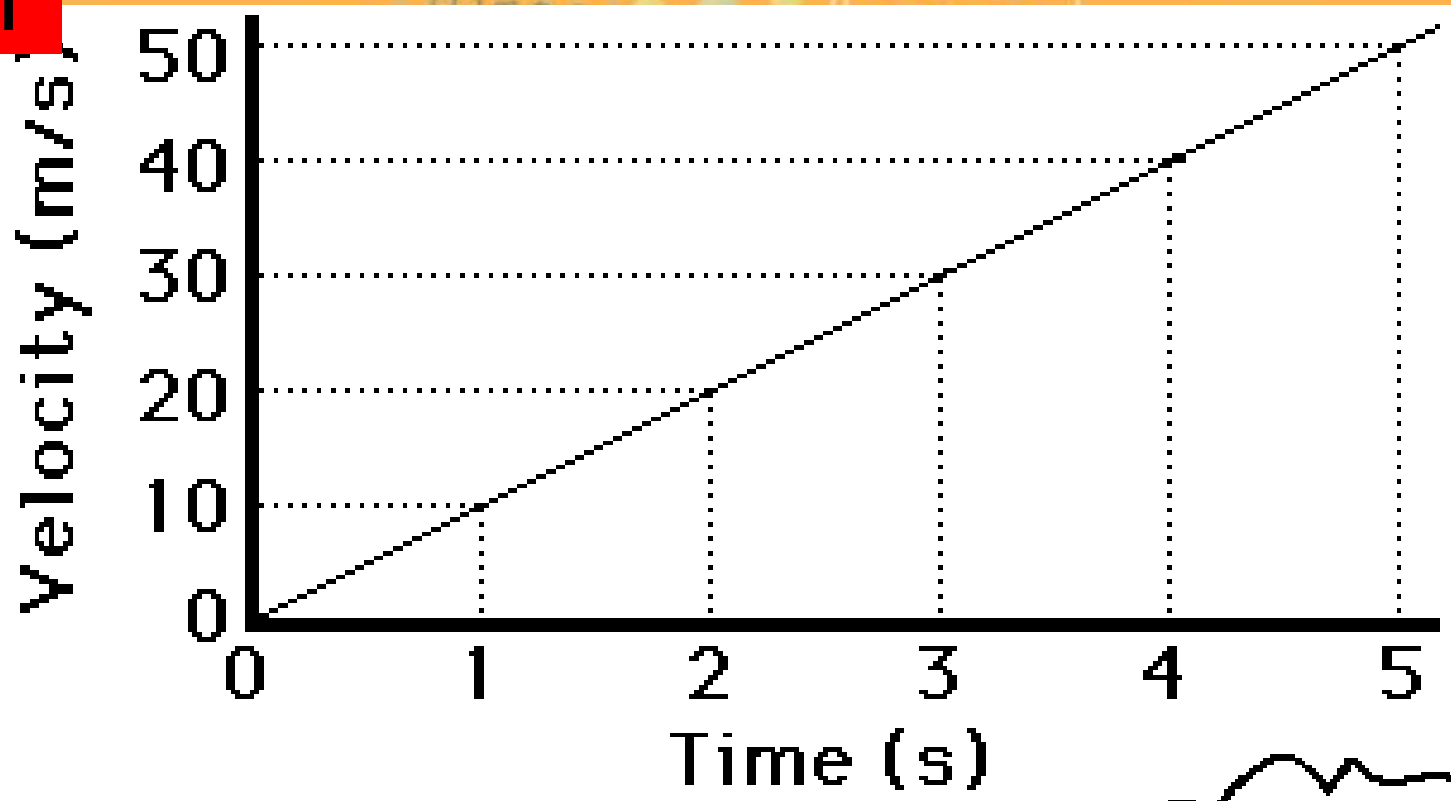
19 EX: If the acceleration is  $10\text{m/s}^2$

- The object is increasing its speed by 10 m/s every sec.!
- How fast is it going after 5 sec.?



- Acceleration: Changing Speed
- Covering more distance every second





10 m/s<sup>2</sup>

Notice that the slope of a velocity-time graph represents the accel'n of the object.

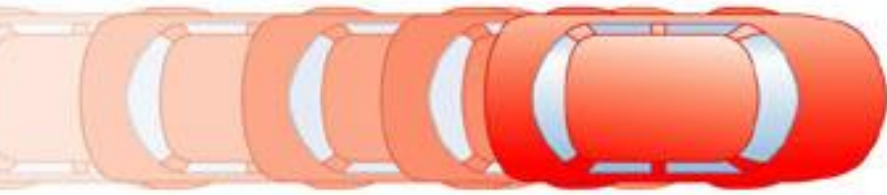


# Acceleration



- Can be positive or negative.
- Neg. Acc. Shows that the object is slowing down.
- **ACCELERATION IS IN THE OPPOSITE DIRECTION FROM THE VELOCITY!**

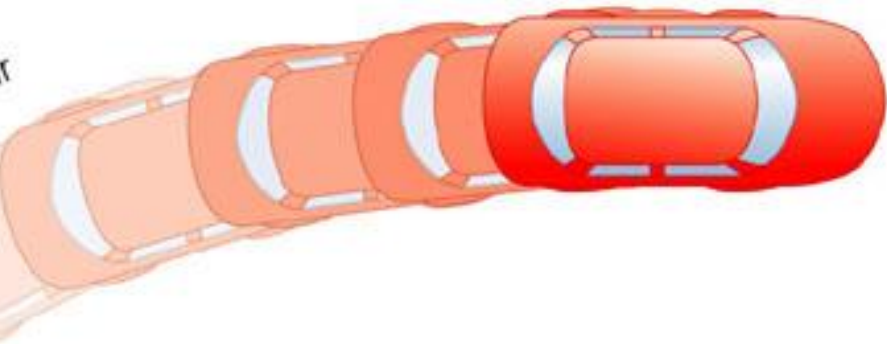
60 km/hr



## Cases of Acceleration

We say that this car is accelerating because its velocity is increasing.

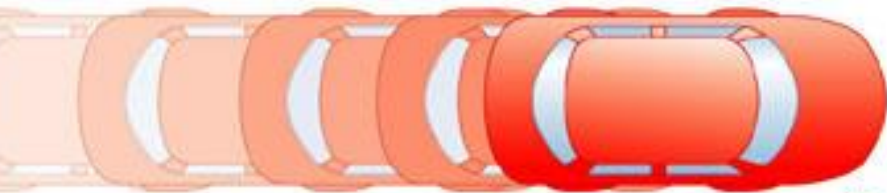
60 km/hr



We say that this car is accelerating because its direction is changing as it turns, which means its velocity is changing even though its speed stays constant.

30 km/hr

0 km/hr



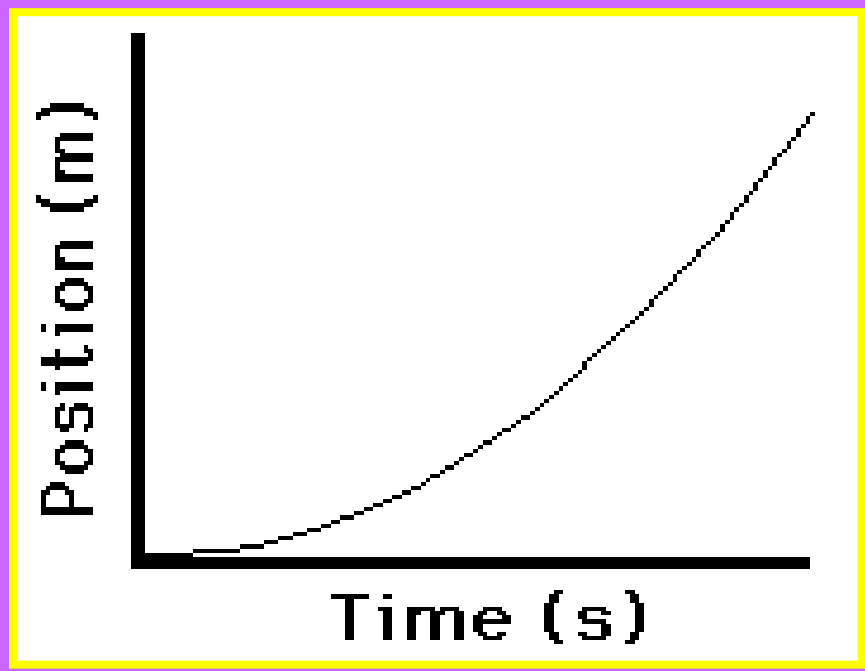
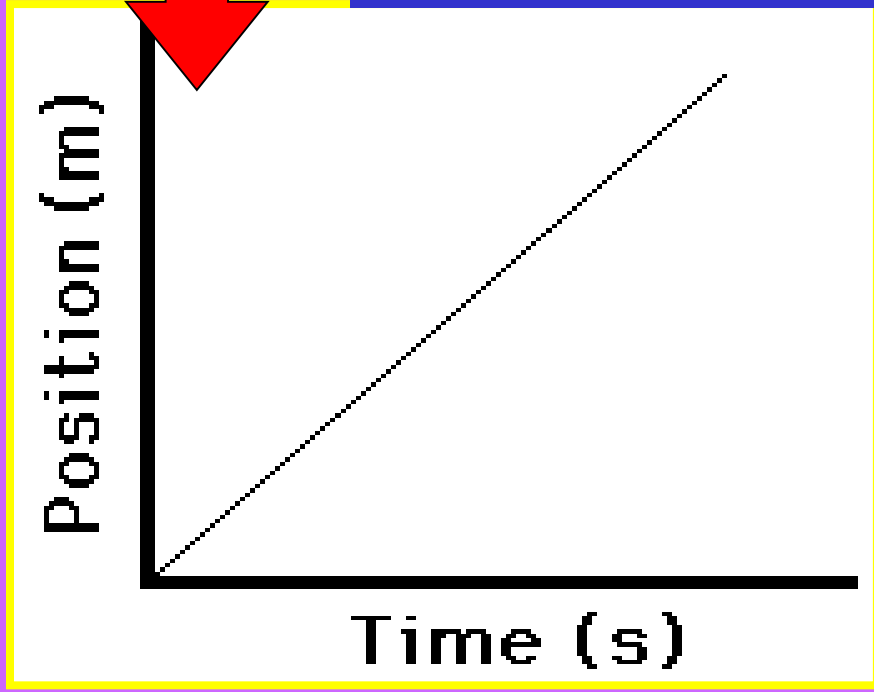
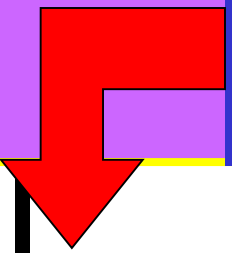
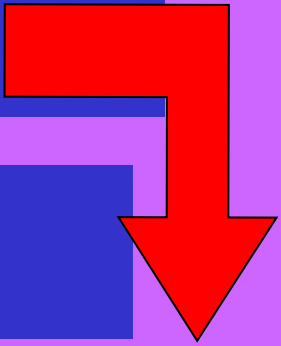
We say that this car is accelerating because its velocity is decreasing. Decreasing velocity is still acceleration, although it is a negative acceleration.



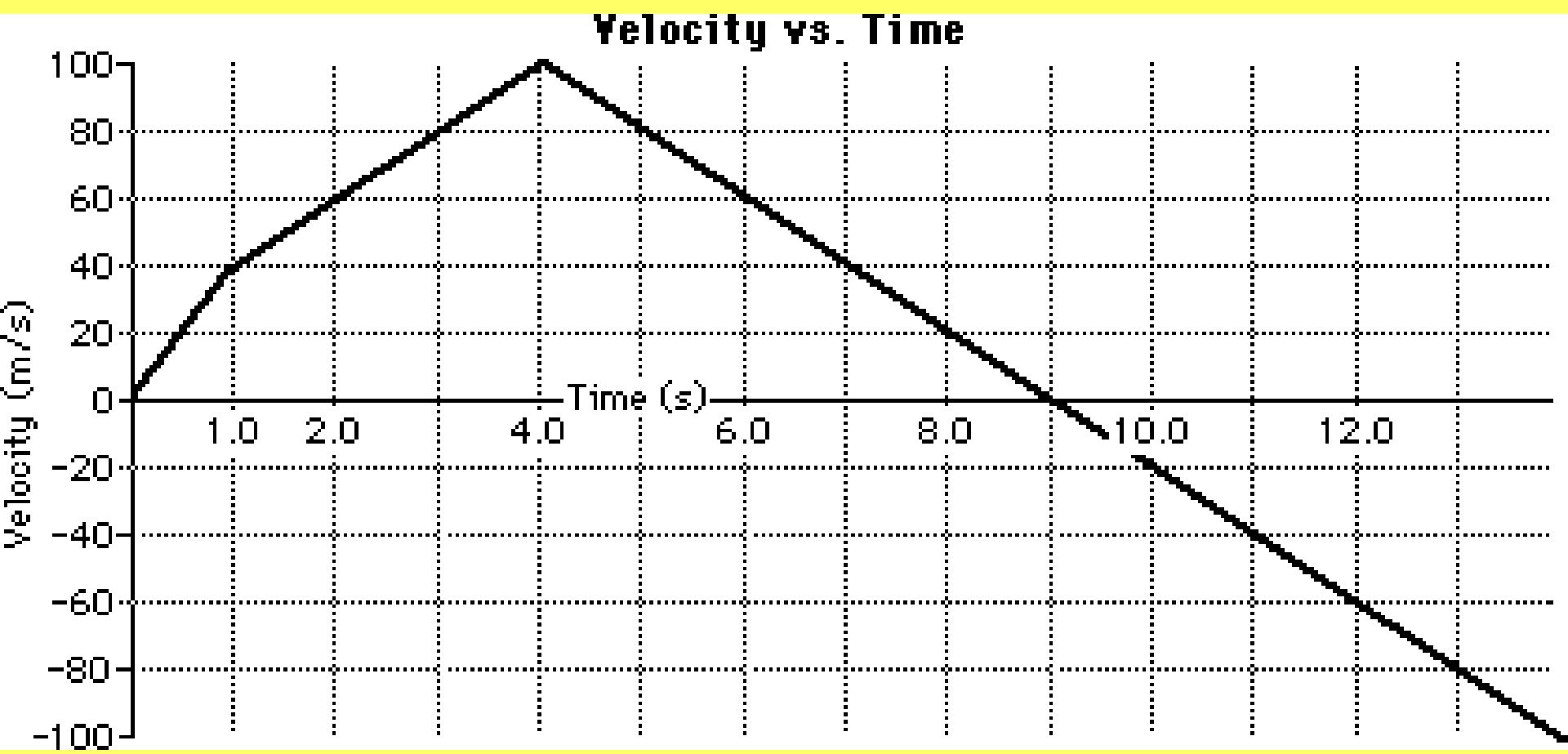
# Which one's which?

Changing Velocity

Constant Velocity



# What's Happening Here?





# *Instantaneous Speed*



What is the average speed of a car that travels 350 kilometers in 5 hours?

- A 7 km/hr
- B 70 km/hr
- C 300 km/hr
- D 1750 km/hr

# THE END

