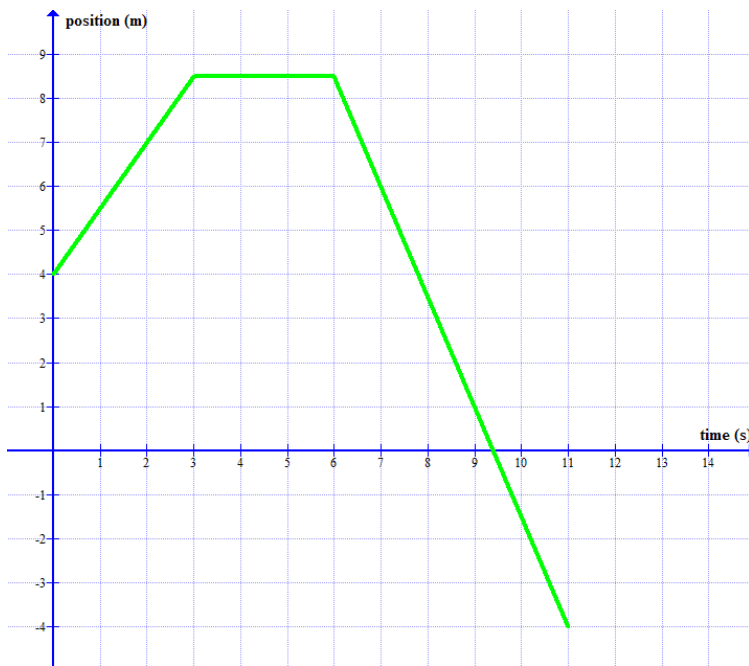


# Graphs of 1-D motion

position vs time



Lets play with some position-time graphs

move the ball so it matches the graph



set velocities to match graph



### velocity vs time



when is the object standing still?  
*18s - 21s + for a bit sec @ 8s*

when does the object change direction?

when is the object speeding up?

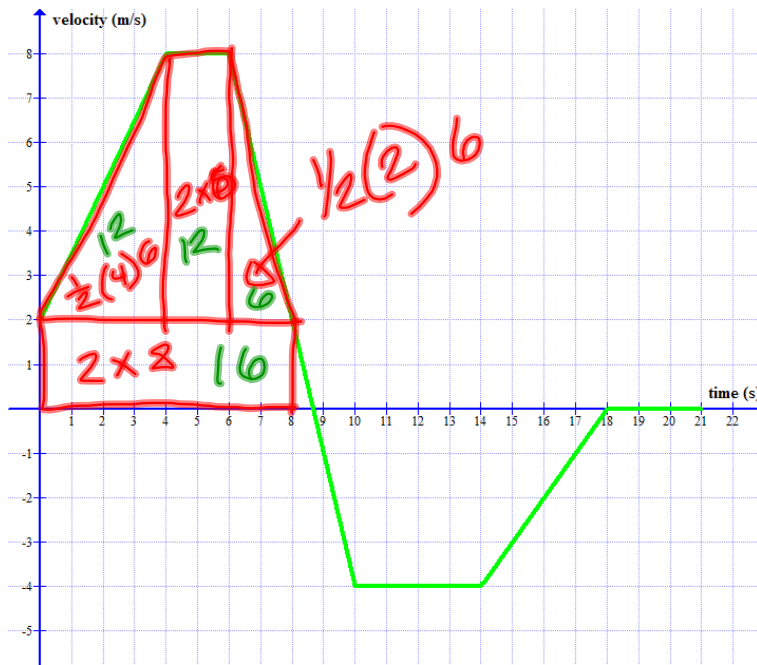
*standing still*

When is the object slowing down?

when is it moving in the positive direction?

when is it moving in the negative direction?

displacement from  $v$  vs  $t$



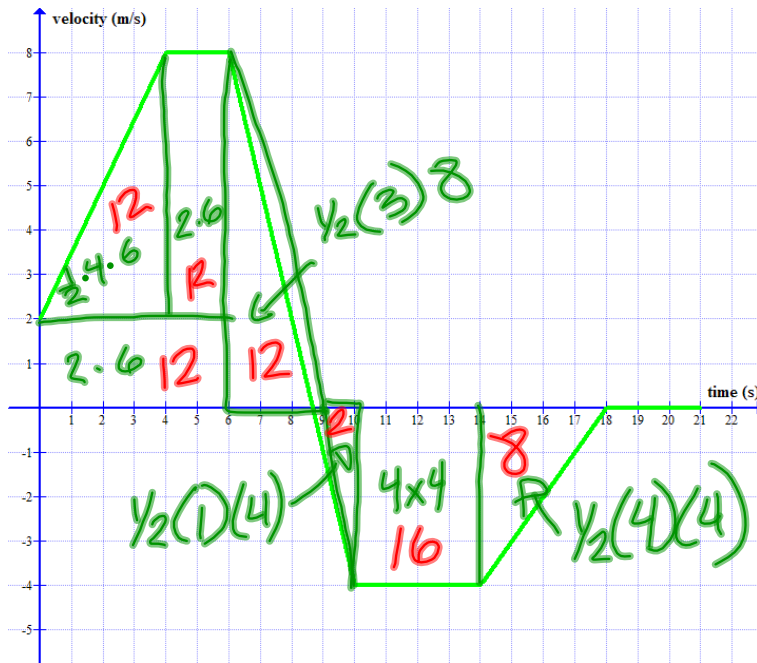
$$d = vt$$

$$\Delta x_8 = 12 + 12 + 6 + 16$$

$$24 + 22$$

$$\Delta x_8 = 46\text{m}$$

displacement = area under curve!



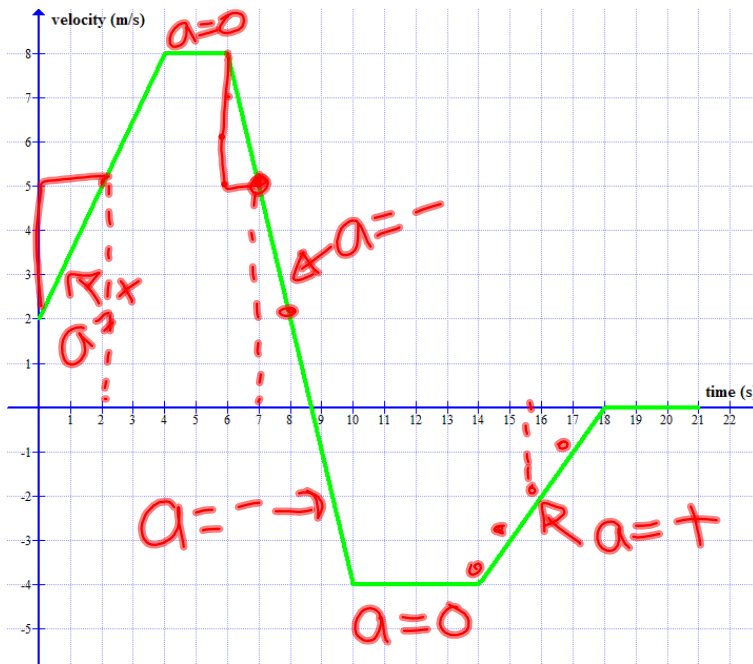
$$\Delta X_{\text{total}} = 12 + 12 + 12 + 12 - (2 + 16 + 8)$$

$$48 - 26$$

$$\Delta X_{\text{total}} = 22 \text{ m}$$

$$\overline{V} = \frac{\Delta X}{t} = \frac{22 \text{ m}}{21} \text{ m/s}$$

## acceleration in velocity-time graphs



we know that acceleration is the change in velocity divided by elapsed time. What element of a velocity-time graph is the acceleration?

Find the acceleration of this object at the following points in time:

- t=2  $a = 3/2 \text{ m/s}^2$
- t=5  $a = 0 \text{ m/s}^2$
- t=7  $a = -3 \text{ m/s}^2$
- t=13  $a = 0 \text{ m/s}^2$
- t=16  $a = 1 \text{ m/s}^2$

ACCELERATION =  
SLOPE !!

Vel

+

-

-

+

acc

+

-

+

-

speeding up

speeding up

Slowing down

slowing down

## Motion Graphs

type of graph	p vs. t	v vs. t
slope	velocity	acceleration
displacement	difference in height of graph	Area under curve
How can you tell if it is accelerating?	it is curved	non zero slope