Day 2 Acceleration

Turn in your Vocab part 1 and have out your speed problems homework for me to check.

Take this time to get started on Vocabulary part 2

Video

Speed Practice Problems

We will continue today's notes on the back of your notes from the previous class.

2.2

Acceleration, Speed and Velocity

- **Acceleration** is the rate of change of velocity. When the velocity of an object changes, the object is accelerating.
- A change in velocity can be either a change in how fast something is moving, or a change in the direction it is moving.
- Acceleration occurs when an object changes its speed, it's direction, or both.

Speeding Up and Slowing Down

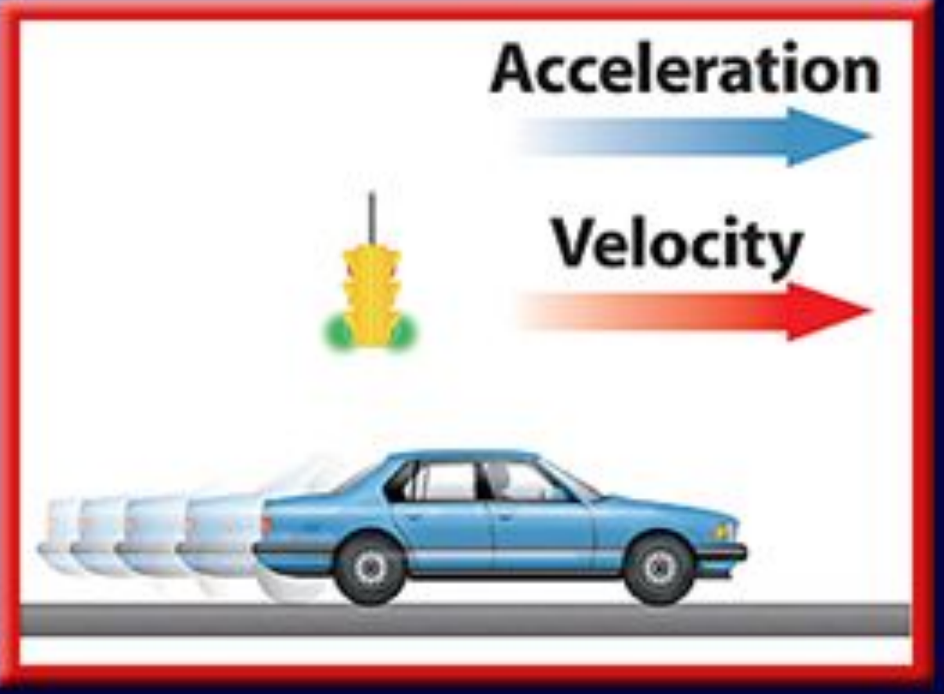
- When you think of acceleration, you probably think of something speeding up. However, an object that is slowing down also is accelerating.

- Acceleration also has direction, just as velocity does.

2.2

Speeding Up and Slowing Down

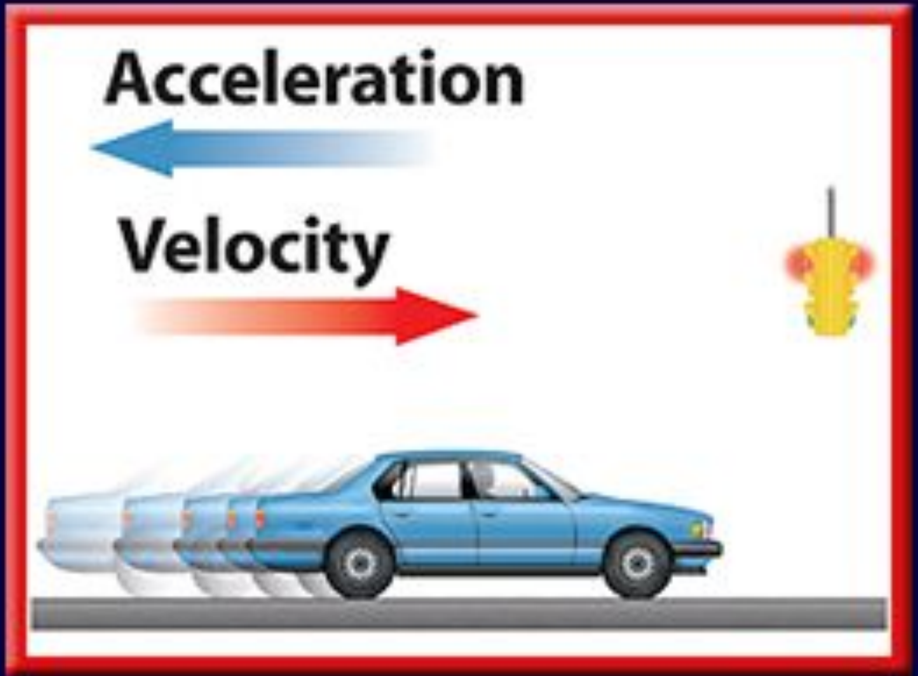
- If the acceleration is in the same direction as the velocity, the speed increases and the acceleration is positive.



2.2

Speeding Up and Slowing Down

- If the speed decreases, the acceleration is in the opposite direction from the velocity, and the acceleration is negative.



- The pitcher throws. The ball speeds toward the batter. Off the bat it goes. It's going, going, gone! A home run!
- Before landing, the ball went through several changes in motion. It sped up in the pitcher's hand, and lost speed as it traveled toward the batter. The ball stopped when it hit the bat, changed direction, sped up again, and eventually slowed down. Most examples of motion involve similar changes. In fact, rarely does any object's motion stay the same for very long.

You can feel acceleration!

If you're moving at 500mph east without turbulence, there is no acceleration.

But if the plane hits an air pocket and drops 500 feet in 2 seconds, there is a large change in acceleration and you will feel that!

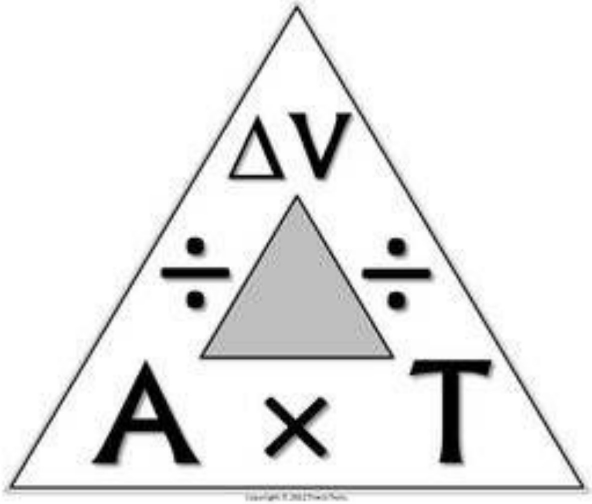
It does not matter whether you speed up or slow down; it is still considered a change in acceleration.

Calculating Acceleration

Acceleration = $\frac{\text{Change in velocity}}{\text{Total time}}$

So…Acceleration = $\frac{\text{(Final speed – Initial speed)}}{\text{Time}}$

Video



Calculating Acceleration

As a roller-coaster car starts down a slope, its speed is 4 m/s. But 3 seconds later, at the bottom, its speed is 22 m/s. What is its average acceleration?

What information have you been given?

Initial speed = 4 m/s
Final Speed = 22 m/s
Time = 3 s

Calculating Acceleration

What quantity are you trying to calculate?

The average acceleration of the roller-coaster car.

What formula contains the given quantities and the unknown quantity?

Acceleration = (Final speed – Initial speed)/Time

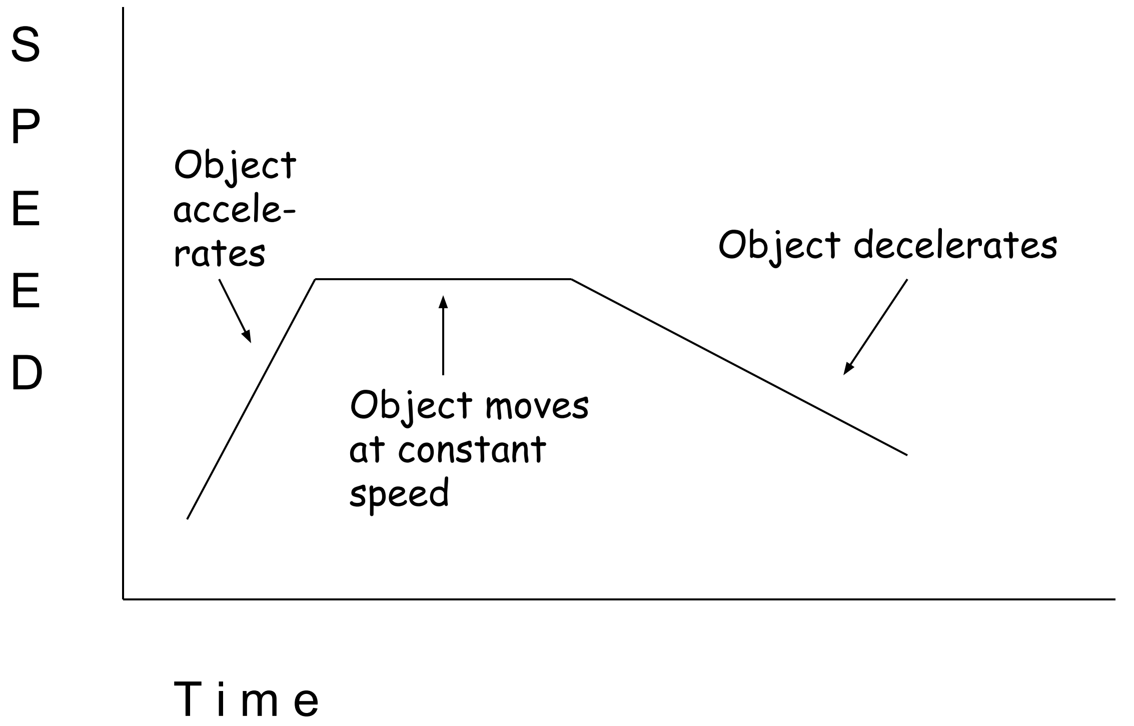
Perform the calculation.

Acceleration = (22 m/s – 4 m/s)/3 s = 18 m/s/3 s

Acceleration = 6 m/s2

The roller-coaster car’s average acceleration is 6 m/s2.

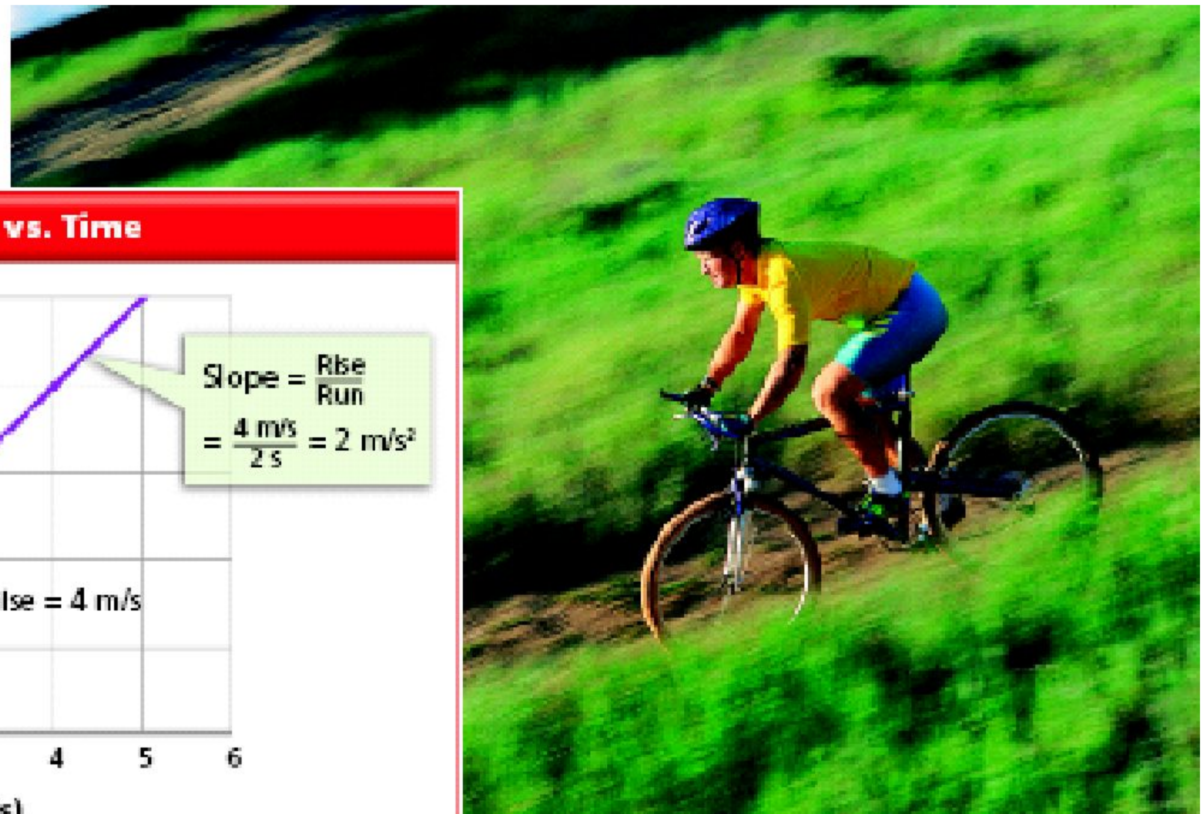
Graphing acceleration

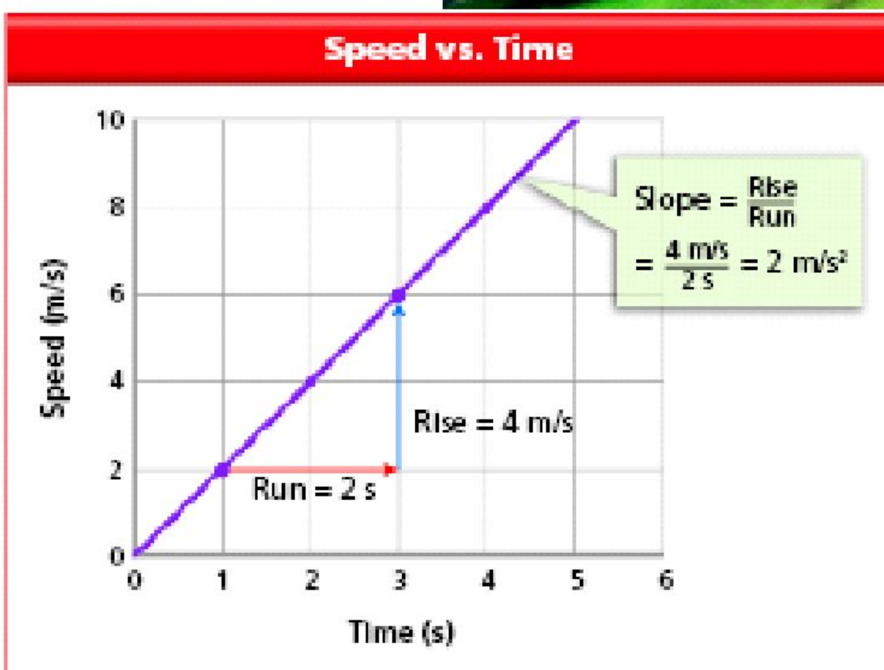


Now You Try:

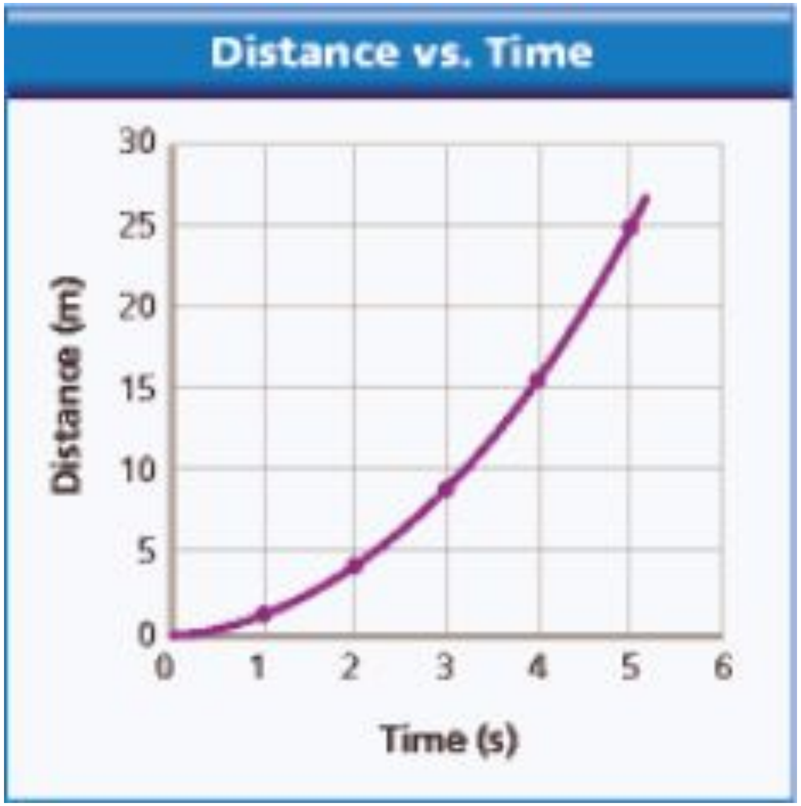
A roller coasters velocity at the top of the hill is 10 m/s. Two seconds later it reaches the bottom of the hill with a velocity of 26 m/s. What is the acceleration of the coaster?

The slanted, straight line on this speed-versus-time graph tells you that the cyclist is accelerating at a constant rate. The slope of a speed-versus-time graph tells you the object's acceleration. **Predicting** *How would the slope of the graph change if the cyclist were accelerating at a greater rate? At a lesser rate?*





Since the slope is increasing, you can conclude that the speed is also increasing. You are accelerating.



Distance-Versus-Time Graph The curved line on this distance-versus-time graph tells you that the cyclist is accelerating.

Acceleration Problems

A roller coaster is moving at 25 m/s at the bottom of a hill. Three seconds later it reaches the top of the hill moving at 10 m/s. What was the acceleration of the coaster?

Initial Speed = 25 m/s

Final Speed = 10 m/s

Time = 3 seconds

Remember (final speed – initial speed) ÷ time is acceleration.

(10 m/s – 25 m/s) ÷ 3 s = -15 m/s ÷ 3 s = -5 m/s2

This roller coaster is decelerating.

A car’s velocity changes from 0 m/s to 30 m/s in 10 seconds. Calculate acceleration.

Final speed = 30 m/s

Initial speed = 0 m/s

Time = 10 s

Remember (final speed – initial speed) ÷ time is acceleration.

(30 m/s – 0 m/s) ÷ 10 s = 30 m/s ÷ 10 s = 3 m/s2

A satellite's original velocity is 10,000 m/s. After 60 seconds it s going 5,000 m/s. What is the acceleration?

Remember (final speed – initial speed) ÷ time is acceleration.

Final speed (velocity) = 5000 m/s

Initial speed (velocity) = 10,000 m/s

Time = 60 seconds

(5000 m/s – 10,000 m/s) ÷ 60 s = -5000 m/s ÷ 60 s

= -83.33 m/s2

**This satellite is decelerating.

- If a speeding train hits the brakes and it takes the train 39 seconds to go from 54.8 m/s to 12 m/s what is the acceleration?

Remember (final speed – initial speed) ÷ time is acceleration.

Final speed= 12 m/s

Initial speed= 54.8 m/s

Time = 39 s

12 m/s – 54.8 m/s ÷ 39 s = -42.8 m/s ÷ 39 s

= -1.097 m/s2

This train is decelerating.

Homework

Worksheet on Motion Graphs.

Go to Google classroom, make a copy of the worksheet. When complete submit it back to me.