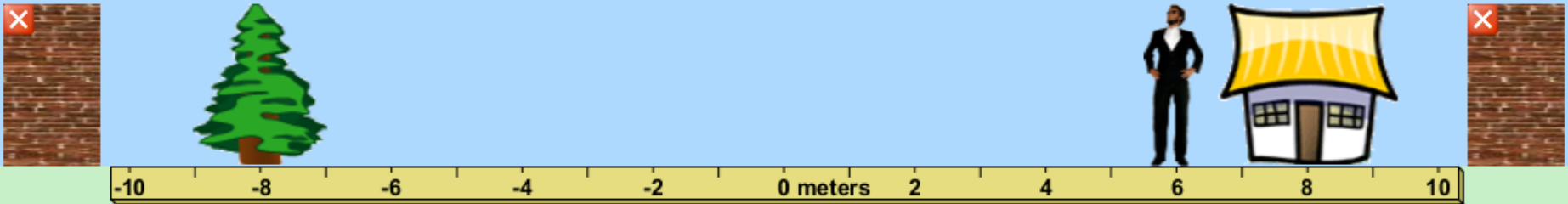


**Speed, acceleration, friction,
inertia, force, gravity**

11/13/15

59.5 seconds



Position

6.00 m



Velocity

0.00 m/s



Velocity Vector

Acceleration

0.00 m/s²



Acceleration Vector

Speed and Acceleration

- Which car has a higher speed?

A



B



C. Not enough information

Speed and Acceleration

- Which car has a higher speed?

A



B



C. Not enough information

Speed and Acceleration

- Which car has a greater acceleration?

A



B



C. Not enough information

Speed and Acceleration

- Which car has a greater acceleration?

A



B



C. Not enough information

Acceleration

Rate of change of speed

If a car accelerates at 20 miles/hour/second it means that every second the car speeds up by 20 miles/hour

Starts at 20 miles per hour.

1 second later it is going

A. 40 miles/hour

B. 30 miles/hour

C. 22 miles/hour

D. 60 miles/hour

Acceleration

Rate of change of speed

If a car accelerates at 20 miles/hour/second it means that every second the car speeds up by 20 miles/hour

Starts at 20 miles per hour.

1 second later it is going

A. 40 miles/hour

B. 30 miles/hour

C. 22 miles/hour

D. 60 miles/hour

Acceleration

Rate of change of speed

If a car accelerates at 20 miles/hour/second it means that every second the car speeds up by 20 miles/hour

Starts at 20 miles per hour.

2 seconds later it is going

A. 40 miles/hour

B. 30 miles/hour

C. 24 miles/hour

D. 60 miles/hour

Acceleration

Rate of change of speed

If a car accelerates at 20 miles/hour/second it means that every second the car speeds up by 20 miles/hour

Starts at 20 miles per hour.

2 seconds later it is going

A. 40 miles/hour

B. 30 miles/hour

C. 24 miles/hour

D. 60 miles/hour

Acceleration

Rate of change of speed

Often you'll see m/s^2

Just means meters/second/second

1 m/s^2 is equal to

- A. traveling 1 meter every second
- B. A speed of 1 meter/second
- C. Speeding up 1 meter/second every second

Acceleration

Rate of change of speed

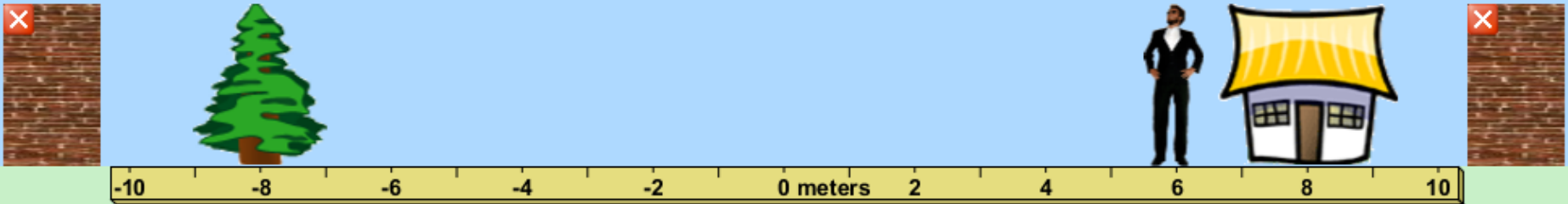
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- A. traveling 1 meter every second
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- C. Speeding up 1 meter/second every second**

59.5 seconds



Position

6.00 m



Velocity

0.00 m/s



Velocity Vector

Acceleration

0.00 m/s²



Acceleration Vector

Natural Motion

- Sitting still
- Constant speed

Natural Motion = No acceleration,
no change in speed

Newton's First Law

If an object has no force acting on it,

If it is at rest, it will remain at rest;

If it is moving, it will continue to move in a straight line at a constant speed.

The natural state of an object - its behavior if free of external influences - is *uniform motion* with constant speed!

If it is moving, it will continue to move in a straight line at a constant speed.

Then, why do things slow down?

- A. Natural motion
- B. Friction
- C. Newton was wrong!

If it is moving, it will continue to move in a straight line at a constant speed.

Why do things slow down?

A. Natural motion

B. Friction

C. Newton was wrong!

Youtube [link](#)



0:02 / 1:58

Settings, Full Screen, and other video player controls.

Inertia

- Harder to get heavier objects going.
 - Takes more force



At rest stays at rest



Inertia

- Harder to stop heavier objects.
 - Takes more force.



In motion stays in motion!

Natural Motion

- Sitting still
- Constant speed

Natural Motion = No acceleration,
no change in speed

Violent Motion

What around us causes natural motion to change?

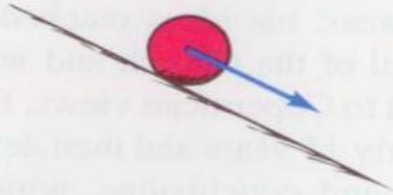
- Friction
- Gravity
- Pushing
- Pulling

FORCES

Gravity

Galileo's Inclined Planes

Slope downward—
Speed increases



Slope upward—
Speed decreases



No slope—
Does speed change?



No slope –
Does speed change?

A. No

B. Yes

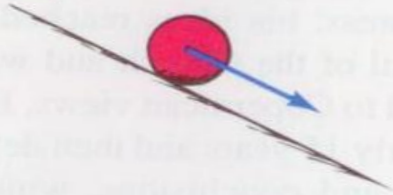
C. Yes, only if other force involved

D. Not sure

Gravity

Galileo's Inclined Planes

Slope downward—
Speed increases



Slope upward—
Speed decreases



No slope—
Does speed change?



No slope –
Does speed change?

A. No

B. Yes

C. Yes, only if other force involved

D. Not sure

Which ball wins?

- A. High Road
- B. Low Road
- C. Tie



Which ball wins?

A. High Road

B. Low Road

C. Tie



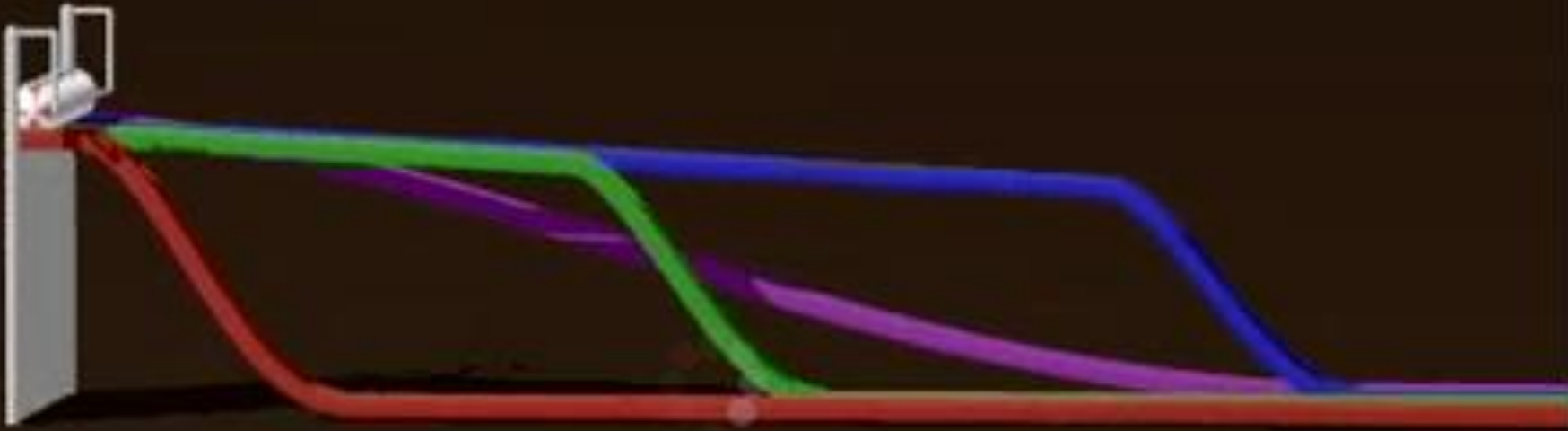
Which ball wins?

A. Red

C. Purple

B. Green

D. Blue



Gravity

- Gravity is a force that **pulls** downward
- *Weight* measures the force of gravity

Gravity pulls

- A. Harder on heavier objects
- B. Harder on lighter objects
- C. The same on all objects

- **Mass:** A property of an object. A measure of the amount of “stuff” or matter contained in an object. Measured in slugs (English) or grams (metric)
- **Weight:** The force due to gravity on an object. The force with which an object is pulled to Earths’ (or other planet/moon) surface. Measured in pounds (English) or Newtons (metric).



Weight

What weighs more?

- A. heavier objects
- B. lighter objects
- C. they weigh the same



Gravity

Weight measures the force of gravity

Gravity pulls

- A. Harder on heavier objects
- B. Harder on lighter objects
- C. The same on all objects

Gravity

- Gravity is a force that **pulls** downward
- *Weight* measures the force of gravity

Gravity pulls

- A. Harder on heavier objects**
- B. Harder on lighter objects
- C. The same on all objects

Galileo's famous experiment

If a person drops two rocks, one very heavy and one very light, which hits the ground first?

- A. The heavy rock
- B. The light rock
- C. They hit the ground at the same time



Galileo's famous experiment

If a person drops two rocks, one very heavy and one very light, which hits the ground first?

- A. The heavy rock
- B. The light rock
- C. They hit the ground at the same time**



WAIT!

Gravity pulls harder on heavier objects

How do they hit the ground at the same time?

Terms from today:

Speed

Acceleration

Friction

Inertia

Natural Motion

Violent Motion

WAIT!

Gravity pulls harder on heavier objects

How do they hit the ground at the same time?

Terms from today:

Speed

Acceleration

Friction

Inertia

Natural Motion

Violent Motion

Inertia

- Harder to get heavier objects going.
 - Takes more force



At rest stays at rest

Gravity

- Works out perfectly.
- If more inertia then gravity supplies more force.

Always the same rate of speeding up

$$9.8 \text{ m/s}^2$$

This question is on the quiz

Hammer and Feather



Moon

- No air
- Not enough gravity to keep it on the moon.

