

JEOPARDY!



\$100

\$100

\$100

\$100

\$100

\$200

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\$500

**YOU CAN'T  
FORCE ME TO  
MOVE!**

**MAY THE FORCE  
BE WITH YOU**

**I SECOND THAT  
MOTION**

**MOVING  
AGAIN**

**BALANCE**

**THIS!**

**SOLVE THIS!**

**You Can't  
FORCE Me  
to Move!**

**May the  
Force Be  
With You**

**I Second  
that  
MOTION**

**Moving  
Again**

**Balance  
This!**

**Solve  
This!**

100

100

100

100

100

100

200

200

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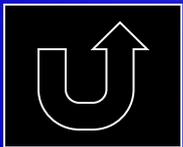
500

500

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**A PUSH OR PULL  
ON AN OBJECT.**

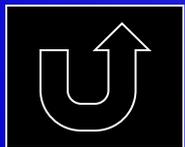
# WHAT IS *Force*



**ENERGY IS  
TRANSFERRED  
FROM ONE  
OBJECT TO  
ANOTHER  
THROUGH THIS.**

**WHAT IS**

**Force?**

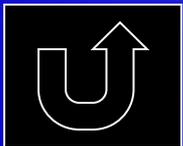


*The only two types of  
Force in the Universe.*

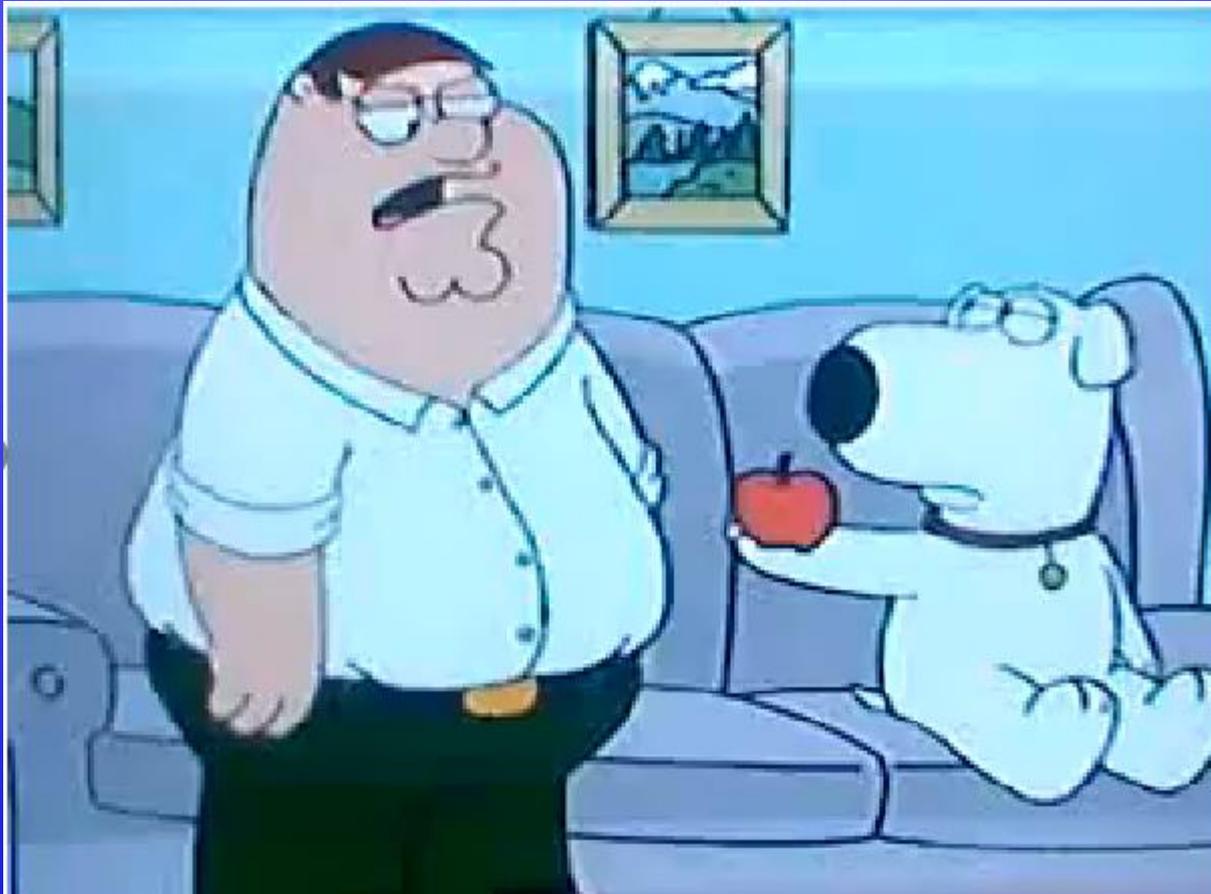


# WHAT ARE

- *Contact Forces*
- *Forces that act at a Distance.*

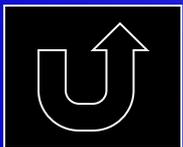
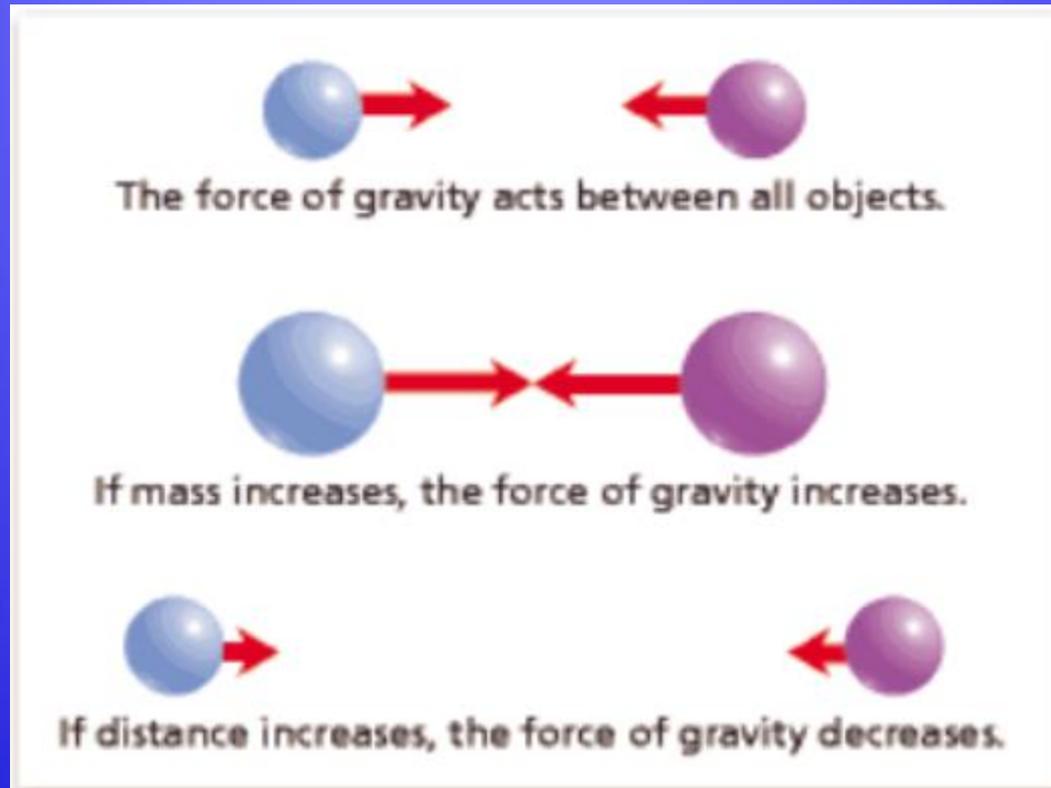


**THE ATTRACTIVE FORCE  
THAT EXISTS BETWEEN  
ANY TWO OBJECTS.**



# WHAT IS

## *Gravitational Force*



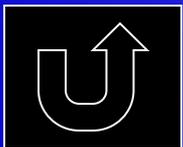
# **THE THREE FORMS OF CONTACT FORCE AND THEIR DEFINITIONS.**

# WHAT ARE

**Applied**: Force put on an object by another object.

**Normal**: Force acting perpendicular to surface of contact

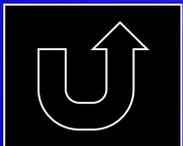
**Friction**: Force that resists motion of object surfaces in contact; acts against the direction of motion.



Three major  
forms of Forces  
Acting at a  
Distance.

**WHAT  
ARE**

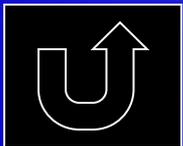
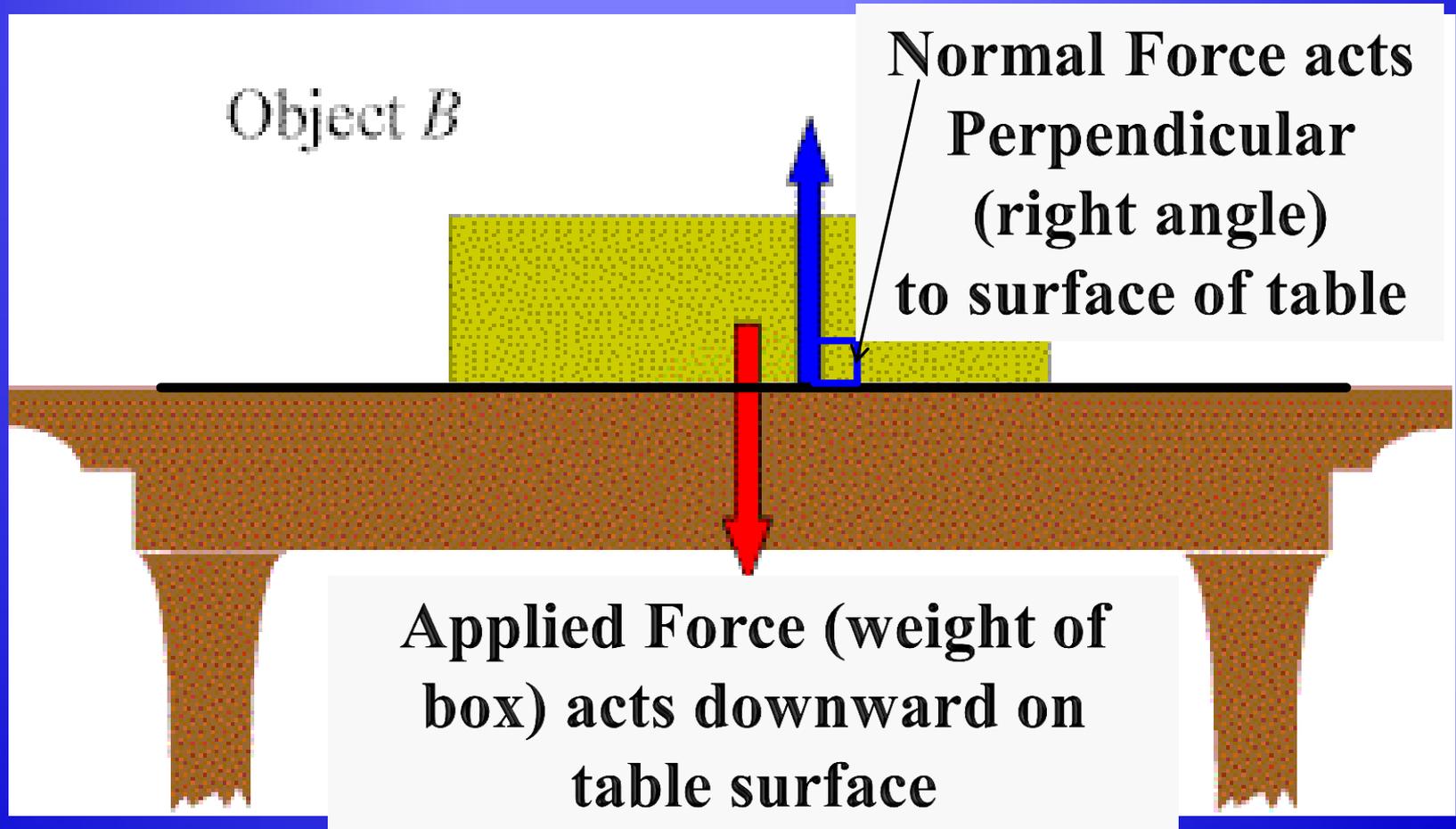
Gravitational  
Magnetic  
Electrical



**THE PUSH OR PULL  
BACK FROM AN  
OBJECT,  
PERPENDICULAR TO  
THE *SURFACE*  
AGAINST WHICH  
APPLIED FORCE IS  
ACTING.**

# WHAT IS

## *Normal Force*



**THE CONTACT FORCE  
BETWEEN TWO  
OBJECTS THAT  
RESISTS MOTION AND  
ACTS AGAINST THE  
DIRECTION OF  
MOTION.**

# WHAT IS

# *Friction?*



**Number these surfaces in order of least to most friction and explain.**



**Number these surfaces in order of least to most friction.**

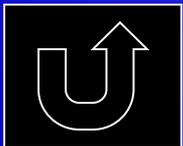
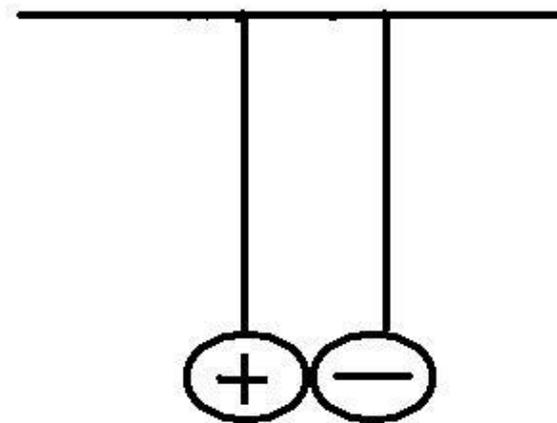
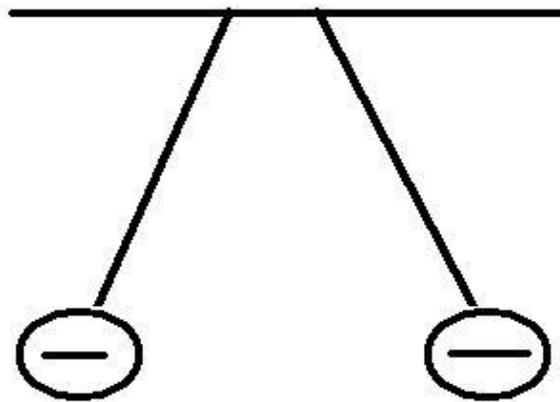
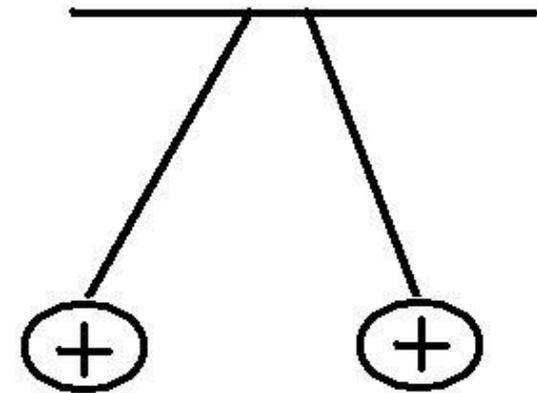


**Non-contact force  
between charged  
objects, and how  
those charges act.**

# WHAT IS

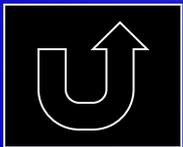
*Electrical*

*Like charges repel,  
unlike charges attract*



**A change in an  
object's position  
relative to a  
reference point.**

# WHAT IS *Motion*

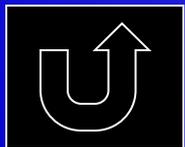


**THE DISTANCE AN  
OBJECT MOVES  
DIVIDED BY HOW  
LONG IT IS IN  
MOTION.**

**WHAT IS**

*Speed or Rate*

$$r=d/t$$



**YOU MUST HAVE  
THIS TO TELL IF AN  
OBJECT IS MOVING.**

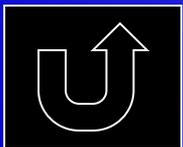
# WHAT IS *Reference Point?*



fig. 1



fig. 2



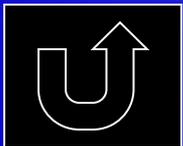
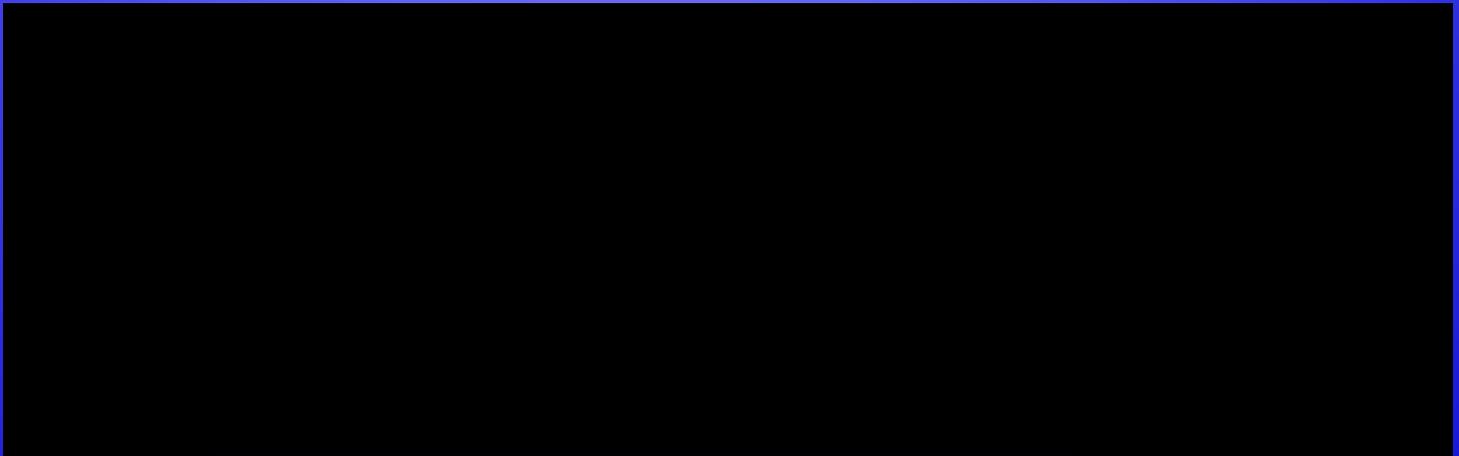
**THREE  
MEASUREMENTS OF  
MOTION AND THEIR  
DEFINITIONS**

# WHAT ARE

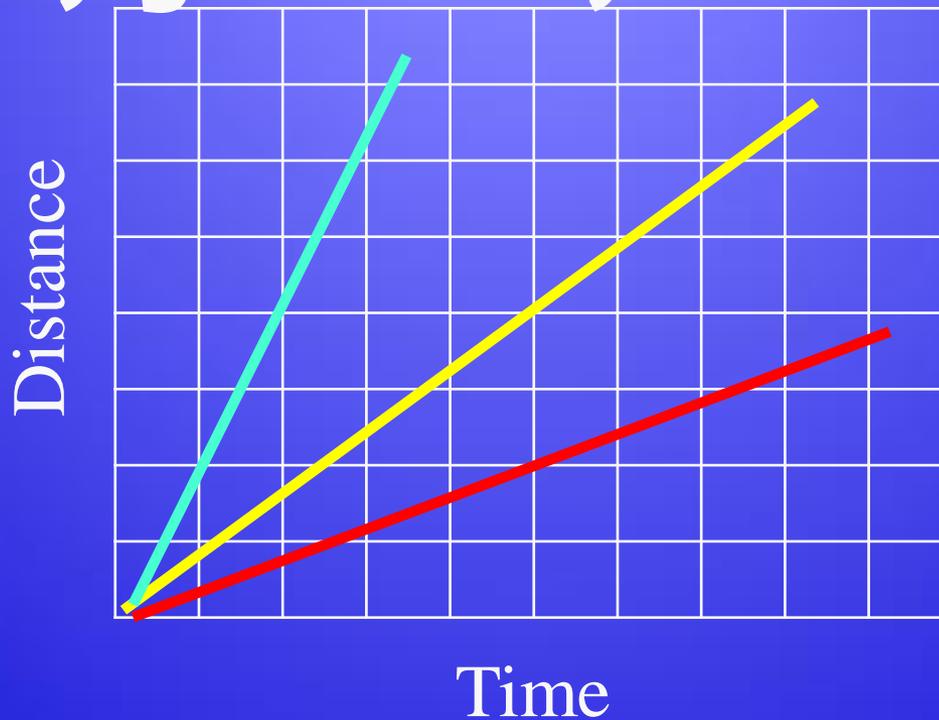
*Speed = Distance / Time*

*Velocity = Speed and Direction*

*Acceleration = Change in Velocity*



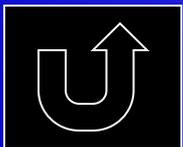
**Type of Speed shown  
on this graph and the  
one that's Fastest  
(red, yellow, or blue).**



# WHAT IS

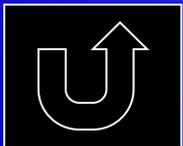
## *Constant Speed and Blue?*

*Remember: A straight line on a  $d/t$  graph is CONSTANT (NOT CHANGING) speed. The steeper the line (slope), the faster the speed. A flat (horizontal) line is ZERO speed or not moving.*



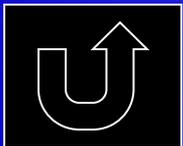
**A CHANGE IN  
VELOCITY.**

# What is **ACCELERATION?**



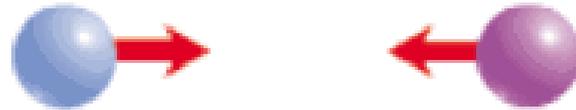
# **SPEED AND DIRECTION**

# WHAT IS VELOCITY?

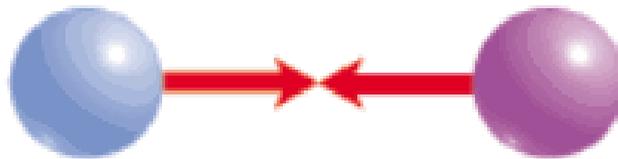


**THE STRENGTH OF  
GRAVITATIONAL FORCE  
BETWEEN TWO OBJECTS  
DEPENDS ON THESE  
TWO FACTORS *AND*  
THEIR RELATIONSHIP.**

# What are Mass and Distance?



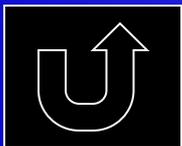
The force of gravity acts between all objects.



If mass increases, the force of gravity increases.



If distance increases, the force of gravity decreases.



*Kameron was so excited about going to science class, he couldn't stop talking about it! As soon as the bell rang, he sprinted from the cafeteria and ran to Rm 10-213, a distance of 900 m, at a rate of 15 m/s, leaving a trail of bleeding, crying 6<sup>th</sup> graders in his wake. How long did it take him to get to his FAVORITE class in the world?*

# WHAT IS

$$t = d/r$$

Time = distance/rate

$$\frac{900\text{m}}{15\text{m/s}} = 60\text{s}$$



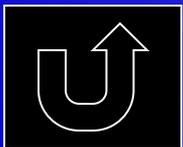
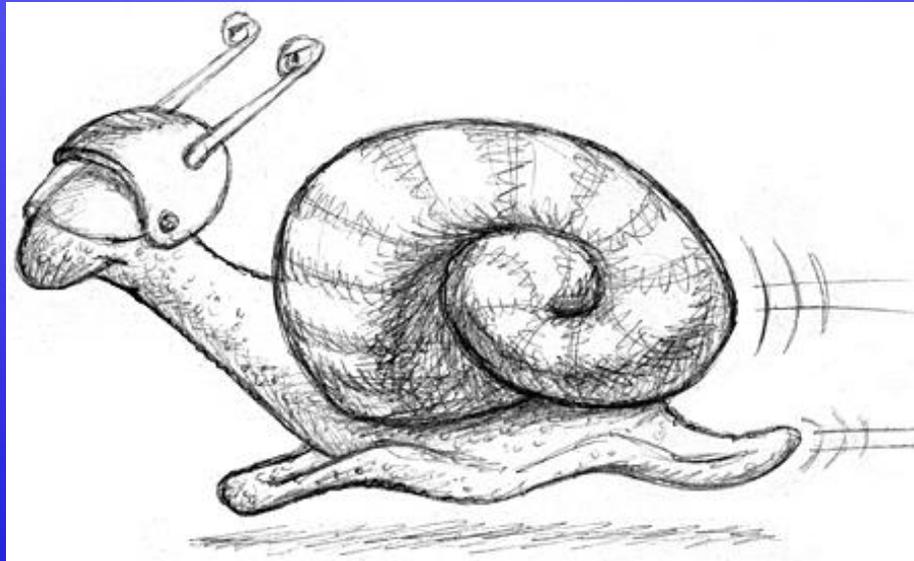
Phillip, on the other hand, is notorious for being tardy, and once again decided to take a circuitous route to Science class. He walked at a rate of  $0.25 \text{ m/s}$  (being sure to smile and say “hello” to all the girls along the way). He walked into class 3 minutes after the bell (total time: 7 minutes). How far did Phillip walk?

# WHAT IS

$$d=rt$$

*Distance = Rate x Time*

$$0.25\text{m/s} \times 420\text{s} = 105\text{m}$$



- *Mia always gets to Science class on time. From her previous class, she walked 600m in 2.5 minutes. What was her speed (rate) in m/s?*

# WHAT IS

$$r = d/t$$

$$\underline{600m} = 4m/s$$

150s



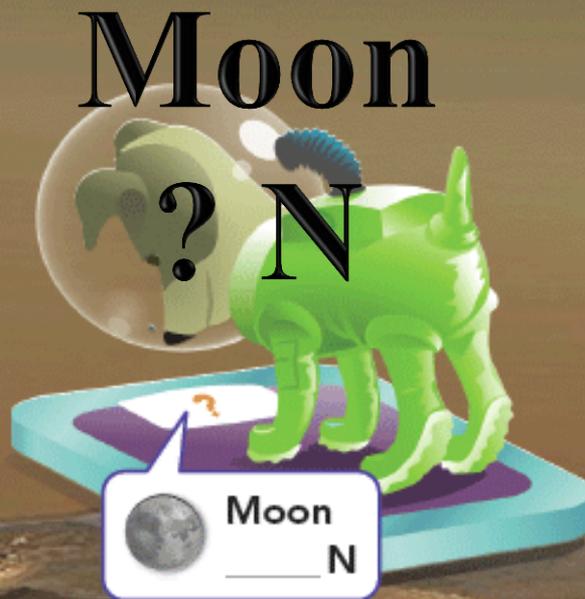
Weight is the measurement of the strength of gravitational force between two objects. Mars' gravity is about  $\frac{1}{3}$  as strong as Earth's, and the Moon's gravity is about  $\frac{1}{6}$  as strong as Earth's.

If Space Dog weighs 60 N on Earth, what would he weigh on Mars and the moon?

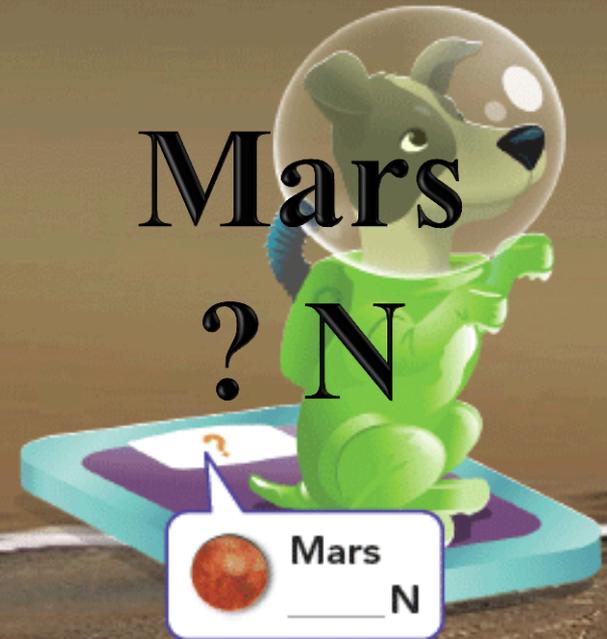
**Earth**  
60 N



**Moon**  
? N



**Mars**  
? N

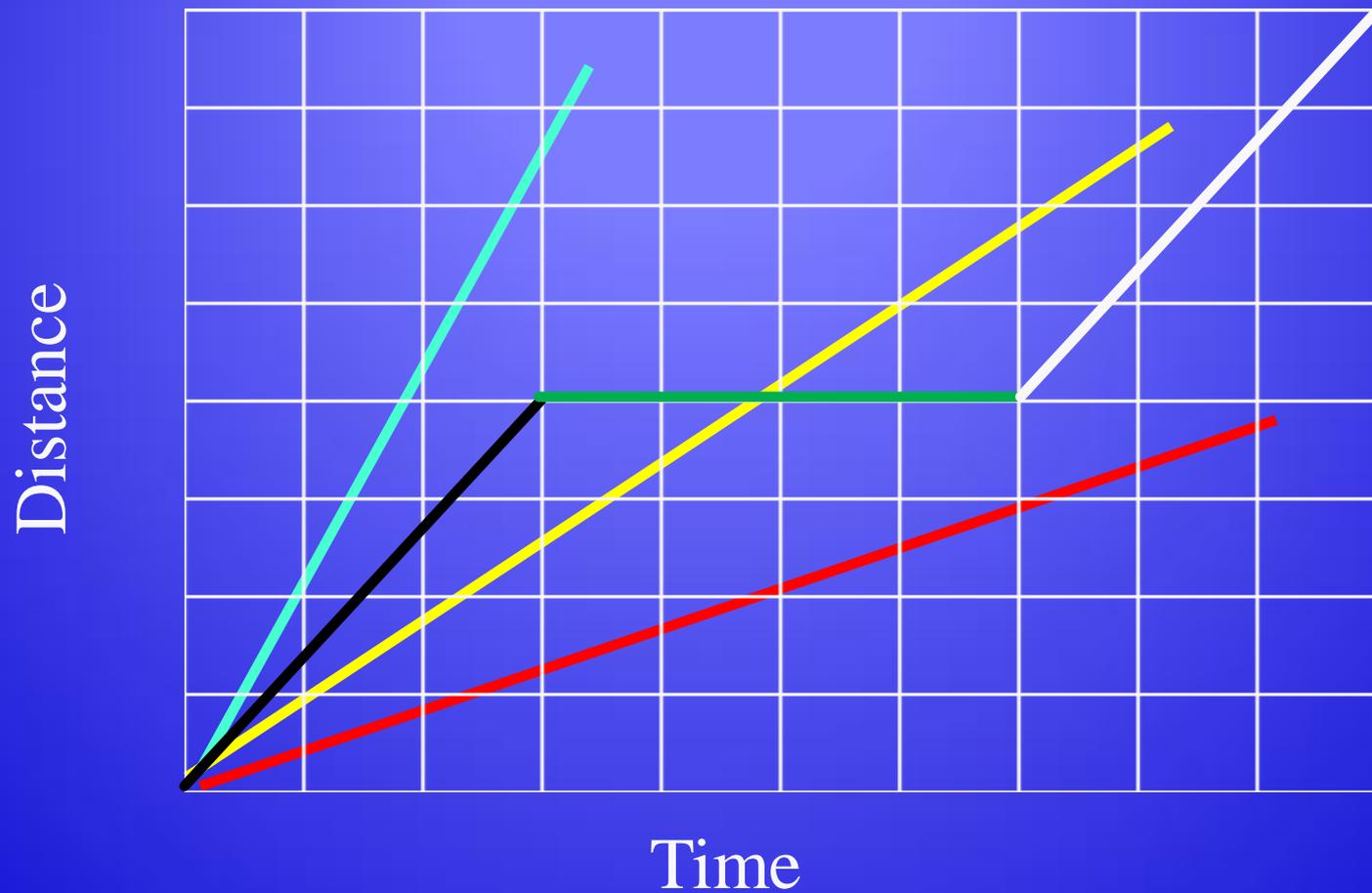


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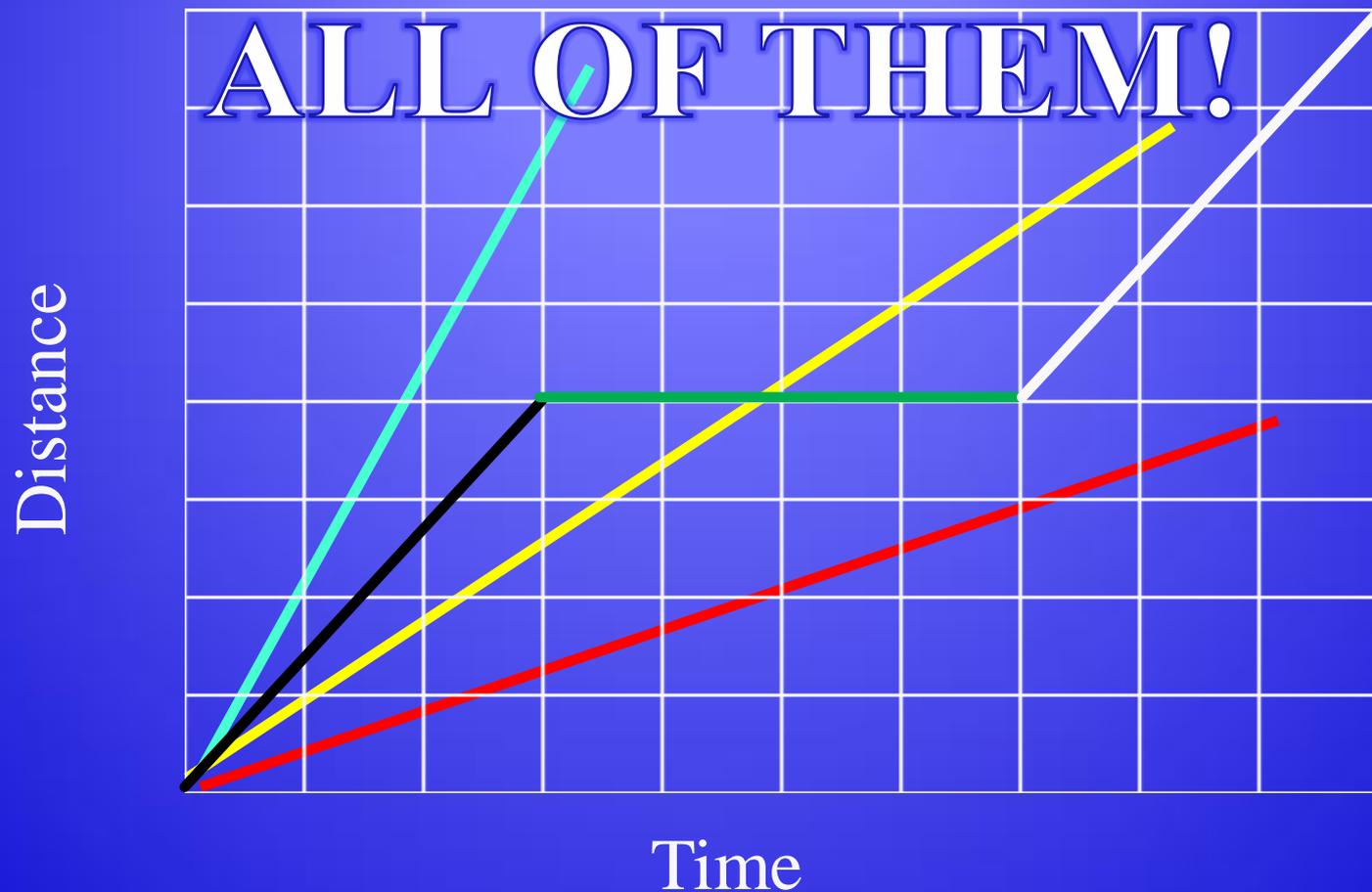
If Space Dog weighs 60 N on Earth, what would he weigh on Mars and the moon?



# WHICH LINES SHOW BALANCED FORCES ON THIS DISTANCE/TIME GRAPH?



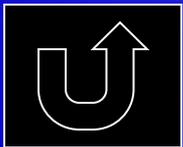
# WHICH LINES SHOW BALANCED FORCES ON THIS DISTANCE/TIME GRAPH?



**THIS HAPPENS  
TO AN OBJECT'S  
MOTION WHEN  
FORCES ARE  
BALANCED.**

**WHAT IS**

*NOTHING! It doesn't  
change.*



# Net Force

The change in motion of an object is determined by the net force acting on the object. What is the net force for each situation?

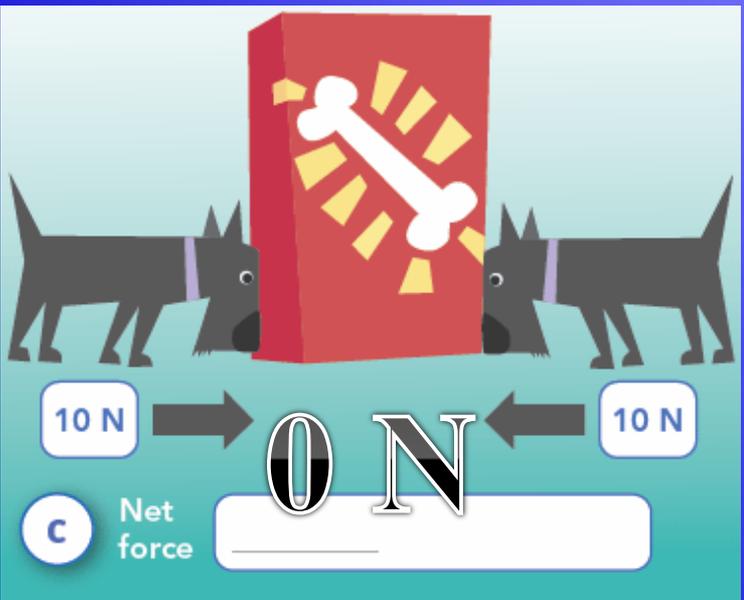
Diagram a shows a large dog pushing a red box with a bone icon to the right with a force of 16 N. A smaller black dog is also pushing the box to the right with a force of 10 N. Below the diagram, the text reads "a Net force" followed by a blank input field.

Diagram c shows two black dogs pushing a red box with a bone icon. One dog is pushing the box to the right with a force of 10 N, and the other dog is pushing the box to the left with a force of 10 N. Below the diagram, the text reads "c Net force" followed by a blank input field.

Diagram b shows a large dog pushing a red box with a bone icon to the right with a force of 20 N. A smaller black dog is pushing the box to the left with a force of 10 N. Below the diagram, the text reads "b Net force" followed by a blank input field.

# Net Force

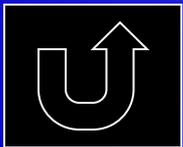
The change in motion of an object is determined by the net force acting on the object. What is the net force for each situation?



**THE COMBINATION  
OF ALL FORCES  
ACTING ON AN  
OBJECT.**

# WHAT IS

*Net  
Force*



**CAUSE A CHANGE IN  
AN OBJECT'S  
VELOCITY.**

**WHAT ARE**

*Unbalanced Forces*

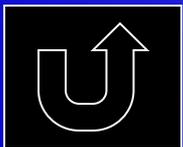


**AN EXAMPLE OF  
ACCELERATION WITH  
CONSTANT SPEED**

# WHAT IS

- A NASCAR race car moving at 250km/hr turning on the curve.
- An F-15 banking/turning at Mach 1.8.
- A fan blade spinning.

**REMEMBER, ACCELERATION IS  
CHANGING SPEED AND/OR  
DIRECTION**

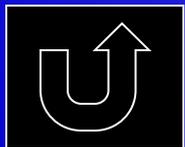


**A CAR SLOWING  
DOWN FOR A STOP  
LIGHT IS DOING THIS.**

# WHAT IS

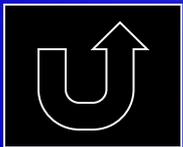
*Accelerating*

*(Negative acceleration)*



**A WAY OF STUDYING THE  
UNIVERSE USING AN  
ORDERED APPROACH,  
OBJECTIVE ANALYSIS OF  
DATA OBTAINED THROUGH  
CAREFUL OBSERVATION,  
REPEATABLE RESULTS, AND  
LOGICAL REASONING AND  
INFERENCE.**

# WHAT IS SCIENCE?



**FINAL**  
**JEOPARDY!**

**FINAL**  
**CATEGORY:**  
**Science**

If every force  
(action) has an equal  
and opposite force  
(reaction), how does  
anything ever move?

**WHAT IS THE FORCES ARE  
ACTING ON DIFFERENT  
OBJECTS, SO THEY DON'T  
CANCEL OUT.**

***SEE NEXT SLIDE FOR  
COMPLETE EXPLANATION.***

*A cup sits on a saucer on a table on the earth. The earth's gravity pulls down on the cup. What is the equal-and-opposite force required by Newton's second law? Half the students will say the saucer pushing up on the cup. WRONG! It's the cup's gravity pulling up on the earth!*

*The key to dealing with equal-and-opposite forces is to remember that they're acting on different objects - that's why the forces don't cancel out. To help students isolate the forces acting on an object, physics teachers tell them to mentally draw a plastic bag around it. Say you're pushing a box across the floor. Yeah, the box is pushing you back, but that's irrelevant- all we're concerned about is the forces acting on the box. So draw a plastic bag around it. The forces acting on the box include you pushing it, gravity pulling it down, the floor pushing it up, and the friction of the floor preventing it from sliding freely. Whether the box moves at all depends on the sum of the forces acting on it alone.*

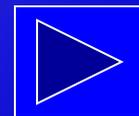
*Now let's isolate you. You have the force of the box pushing back on you, the gravity of the earth pulling you down, the floor pushing you up, and the friction of the floor giving you traction so you can push forward. The force that allows you to move forward is the friction from the floor! (You wouldn't move forward if the floor were made of slippery ice.) The equal-and-opposite force isn't some mysterious additional thing also acting on you, it's your feet pushing against the floor. That force isn't your problem; the floor has to deal with it.*

*Let's isolate the floor. It has the force of your weight pushing it down, gravity pulling it down, beams and joists holding it up, your feet trying to push the floor horizontally backwards as you get traction, and walls or nails or friction against the joists keeping the floor from sliding horizontally out of your house. Why doesn't the floor move? People forget - a force can cause an acceleration or a deformation. The floor doesn't accelerate, but it bows a bit.*

*Let's isolate the house. OK, let's not - no need to make this as long as one of Dex's religious columns. The point is clear enough: Equal-and-opposite forces aren't a recipe for paralysis. If you're looking for an excuse not to move boxes, you'll have to blame your bad back.*



# DAILY DOUBLE



# JEOPARDY! SLIDE SHOW NOTES

- The font for the question & answer slides is “Enchanted;” a copy of this font is located in the “REAL Jeopardy Template” folder. (This font will need to be installed in the C:/WINDOWS/FONTS folder of the computer running the show.) In order to keep all of the sounds and fonts together, copy the entire “REAL Jeopardy Template” folder.
- To change the categories:
  - 1. Go to “Edit” and “Replace...”
  - 2. In the Find box, type CATEGORY 1 (all caps)
  - 3. In the Replace box, type the category in all caps (for example, PRESIDENTS)
  - 4. Click Replace All...
- To use the Daily Double:
  - 1. Choose which dollar values to set as Daily Double
  - 2. Link that dollar value to one of the DD slides
  - 3. Link the arrow on the DD slide to the correct question slide (so dollar/category match)

## **RUNNING THE JEOPARDY! SLIDE SHOW**

- *On the game board with the categories on top, click on the desired dollar value. (The first game board is used only to blink in the dollar values like the show.)*
- **ICONS:**
  - ? Go to the answer screen.
  - House Go back to the game board.
  - Right Arrow (on Daily Doubles) Go to the question screen.
  - Turned-up Arrow Reload question screen after incorrect guess

# END OF GAME

*Daily Doubles and  
usage notes follow...*